RAPID3 (Routine Assessment of Patient Index Data 3), a Rheumatoid Arthritis Index Without Formal Joint Counts for Routine Care: Proposed Severity Categories Compared to Disease Activity Score and Clinical Disease Activity Index Categories

THEODORE PINCUS, CHRISTOPHER J. SWEARINGEN, MARTIN BERGMAN, and YUSUF YAZICI

ABSTRACT. ***Objective.*** To compare 4 categories (high, moderate, and low severity, and near-remission) of RAPID3 (Routine Assessment of Patient Index Data 3), an index without formal joint counts, which is scored in < 10 seconds to 4 categories of the Disease Activity Score (DAS28) and Clinical Disease Activity Index (CDAI) in patients with rheumatoid arthritis (RA).

Methods. All patients complete a Multidimensional Health Assessment Questionnaire (MDHAQ) at each visit. A physician/assessor 28-joint count and erythrocyte sedimentation rate (ESR) were completed in 285 patients with RA in usual care by 3 rheumatologists to score DAS28, CDAI, and RAPID3. RAPID3 includes the 3 MDHAQ patient self-report RA Core Data Set measures for physical function, pain, and patient global estimate. Proposed RAPID3 (range 0–10) severity categories of high (> 4), moderate (2.01–4), low (1.01–2), and near-remission (≤ 1) were compared to DAS (0–10) activity categories of high (> 5.1), moderate (3.21–5.1), low (2.61–3.2), and remission (≤ 2.6), and CDAI (0–76) categories of > 22, 10.1–22.0, 2.9–10.0, and ≤ 2.8. Additional RAPID scores, which add to RAPID3 a physician/assessor or patient self-report joint count and/or assessor global estimate, were also analyzed. Statistical significance was analyzed using Spearman correlations, cross-tabulations, and kappa statistics.

Results. All RAPID scores were correlated significantly with DAS28 and CDAI (rho > 0.65, p < 0.001). Overall, 78%–84% of patients who met DAS28 or CDAI moderate/high activity criteria met similar RAPID severity criteria, and 68%–77% who met DAS28 or CDAI remission/low activity criteria also met similar RAPID criteria. RAPID3 was as informative as other indices.

Conclusion. RAPID3 provides a feasible, informative quantitative index for busy clinical settings. (First Release Sept 15 2008; J Rheumatol 2008;35:2136–47; doi:10.3899/jrheum.080182)

Key Indexing Terms:
RHEUMATOID ARTHRITIS ROUTINE ASSESSMENT OF PATIENT INDEX DATA
MULTIDIMENSIONAL HEALTH ASSESSMENT QUESTIONNAIRE
REMISSION SEVERITY

Quantitative assessment has advanced therapies for patients with rheumatoid arthritis (RA) over the last 2 decades. "Tight control" according to a Disease Activity Score 28 (DAS28)[1-3] is associated with significantly better outcomes than usual nonquantitative care of RA[4-9]. However, most RA patient care at this time generally is guided only by a careful, but nonquantitative, history and physical examination. The only quantitative measures included are laboratory tests, which often are not informative and/or not available at the time of the visit[10]. A formal quantitative joint count is not performed at most visits[11], so that DAS28 or Clinical Disease Activity Index (CDAI)[12] are not available. "Documentation" of patient status and changes over time generally is available only from "gestalt" clinical impressions.

Each of 7 RA Core Data Set measures[13,14] have similar relative efficiencies to distinguish active from control treatments in clinical trials[15,16]. Therefore, indices composed of only 3 or 4 Core Data Set measures such as the DAS28[17] or of only the 3 patient-reported Core Data Set measures (physical function, pain, patient global estimate) without joint counts, distinguish active from control treatments in clinical trials (of leflunomide[18,19], methotrexate[18,19], adalimumab[20], and abatacept[21]) at levels similar to American

From the New York University Hospital for Joint Diseases, New York, New York; Medical University of South Carolina, Charleston, South Carolina; and Taylor Hospital, Ridley Park, Pennsylvania, USA.

Supported in part by grants from Bristol-Myers Squibb, the Arthritis Foundation, and the Jack C. Massey Foundation.

T. Pincus, MD, NYU Hospital for Joint Diseases; C.J. Swearingen, MS, Medical University of South Carolina; M. Bergman, MD, Taylor Hospital; Y. Yazici, MD, NYU Hospital for Joint Diseases.

Address reprint requests to Dr. T. Pincus, NYU Hospital for Joint Diseases, 301 East 17th Street, New York, NY 10003.
E-mail: tedpincus@gmail.com

Accepted for publication May 26, 2008.

College of Rheumatology (ACR) criteria[22] and to one another. Scores on the "patient-only" indices are correlated significantly with DAS28 in these clinical trials[18-21] as well as in clinical settings[23].

One "patient-only" index, termed the "routine assessment of patient index data 3" (RAPID3), can be scored in fewer than 10 seconds on a multidimensional Health Assessment Questionnaire (MDHAQ)[24,25] (Figure 1), compared to about 42 seconds for a standard HAQ, and 90 seconds for a quantitative 28-joint count[26]. The MDHAQ can be completed by most patients in 5–10 minutes prior to seeing a rheumatologist, so that a RAPID3 score is available at the time the patient is seen. A RAPID3 score could provide a pragmatic quantitative index for a rheumatologist to assess, monitor, and document patient status in a busy clinical setting.

We compared proposed categories of high, moderate, and low severity and near-remission for RAPID3 to categories for high, moderate, and low activity and remission for DAS28[3,27] and CDAI[28,29] in 285 patients with RA seen by 3 rheumatologists in usual clinical care. We also analyzed additional RAPID scores, which included a joint count by a physician/assessor or by patient self-report[30] and/or a physician global estimate, to assess whether inclusion of these data might provide a substantially more informative index than RAPID3.

MATERIALS AND METHODS

Patients. Patients were studied from 3 rheumatology clinical settings of MB, TP, and YY. Patients were seen by MB in a private-practice setting established in 1987, by TP in an academic setting since 1980, and by YY in both private practice and academic settings since 2001. Each patient (with any diagnosis) seen by these rheumatologists completes a version of an MDHAQ[24,25] at each visit. In addition, 100 consecutive patients with RA at each setting were assessed in usual care according to a "standard protocol to evaluate RA" (SPERA)[31], which also includes a 28-joint count, laboratory tests, and further clinical assessments of RA (see below).

Patients signed consent for de-identified results to be sent anonymously to a data center at Vanderbilt University (Nashville, Tennessee); data from Vanderbilt University patients were de-identified for this study. The study was approved by the Institutional Review Board for the Protection of Human Subjects at Vanderbilt University, and at the other settings. The 3 settings are the US participants in the international QUEstionnaire in STandard clinical care of RA (QUEST-RA) program[32].

MDHAQ questionnaire. The MDHAQ (Figure 1)[24,25] is a 2-sided, single-sheet instrument, adapted from the standard HAQ[33], designed to facilitate review and scoring by a health professional in a busy clinical setting. Patients complete the MDHAQ while waiting to see the physician, so that scores are available for physician review at the time the patient is seen. Many versions have been developed in response to clinical observations and requests of rheumatologists; all versions are at least 80% identical.

Version R783 of the MDHAQ includes 5 scales on Page 1 (Figure 1A) to assess physical function, psychological distress, pain, patient global estimate, and a self-report joint count on a RA Disease Activity Index (RADAI)[30,34]. Thirteen items (1a–1m) are queried for 4 responses: without any difficulty (= 0), with some difficulty (= 1), with much difficulty (= 2), and unable to do (= 3), as on the HAQ[33]. The first 10 items (1a–1j) are activities, 8 identical to the HAQ, one from each of the 8 HAQ categories, reported as a modified HAQ (MHAQ) in 1983[35], as well as 2 complex activities, "walk 2 miles or 3 kilometers" and "participate in recreation and sports as you would like," added in 1995[24,25]. The 10 activities are scored without a calculator or computer, as a physical function (FN) score of 0–30, which may be recoded as 0–10 using a scoring template on Page 1. Three items (1k–1m) concerning sleep, anxiety, and depression have been found to be informative in patient care in the standard HAQ format[24], but are not scored formally.

The MDHAQ pain and global estimate VAS format is a 10-cm horizontal line format or 21 numbered circles. [At the time of these studies, the 10-cm horizontal line was used, but the 21-circle VAS is now used by each of the authors[36].] The RADAI self-report joint count[30,34] is scored as 0–48; the raw 0–48 score may be recoded to 0–10 using a scoring template on Page 1. Boxes printed on the right side are included for the physician to record scores for pain, global estimate, and RADAI.

Page 2 of the MDHAQ (Figure 1B), the reverse side, includes a review of systems symptom checklist, scales for morning stiffness, change in status, exercise, fatigue VAS, recent medical history, and demographic data. All analyses in this report are derived from the scales on Page 1.

RAPID3 scores. RAPID3 scores are designed for usual clinical care, although they also may be useful for clinical research. The 3 Core Data Set measures on the MDHAQ, for function (FN), pain (PN), and patient global estimate (PTGL), are each scored 0–10 and recorded on the MDHAQ. The raw total score of 0–30 may be recoded to 0–10 using a scoring template at the bottom of Page 1. RAPID3 is mathematically identical to a patient activity score (PAS)[23]. RAPID3 on the MDHAQ can be computed in about 10 seconds or less[26].

Other RAPID scores. Other RAPID scores that add further measures to RAPID3 were developed and analyzed to assess whether additional measures by a physician/assessor or patient might provide a substantially more informative index than RAPID3. Each index is labeled with a number after "RAPID" indicating the number of included measures, followed by abbreviations of these measures (Table 1).

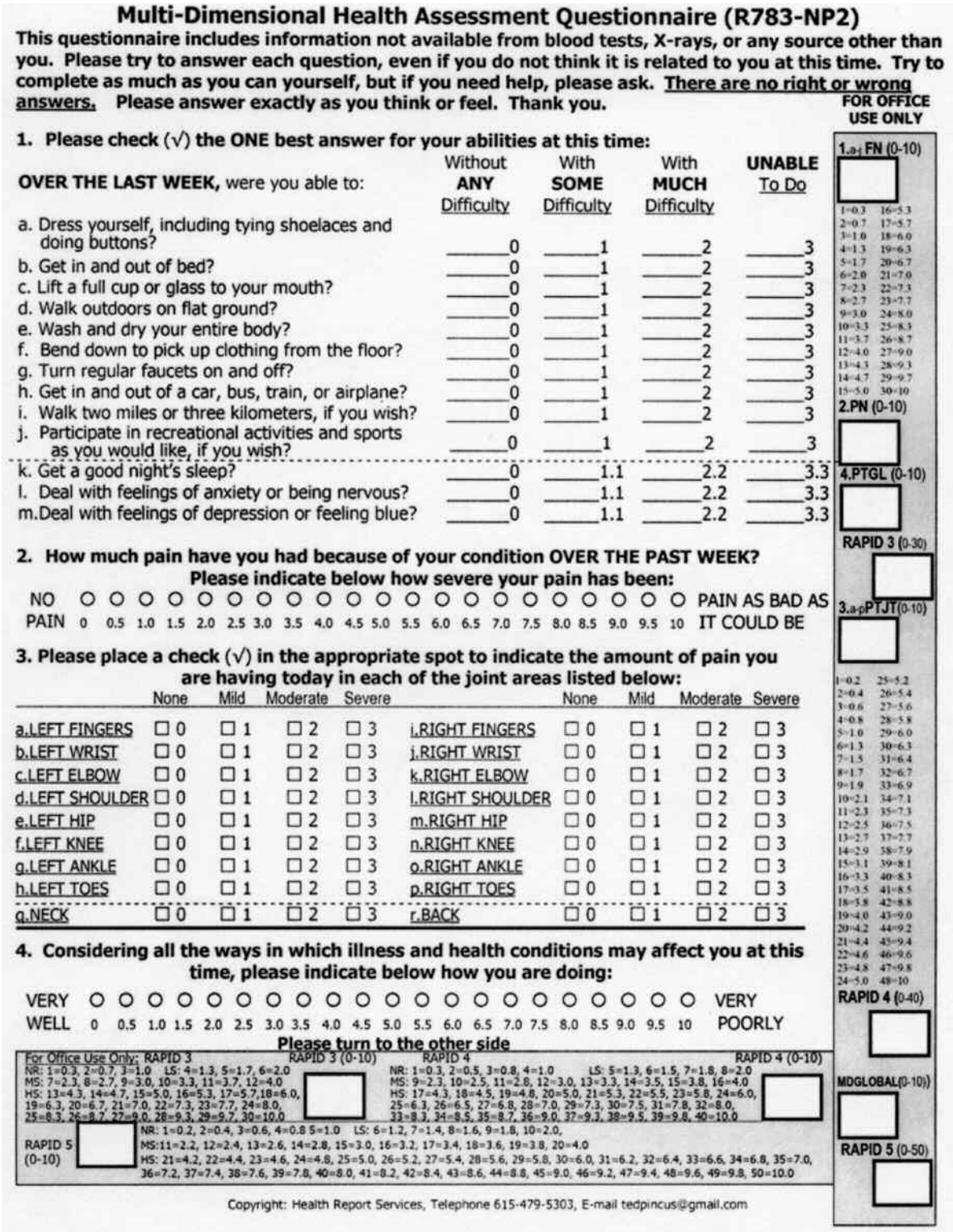
RAPID4MDJC (Table 1) adds to RAPID3 a standard 28 swollen and tender joint count[37] performed by a physician/assessor, based on a rationale that this joint count is the most specific[38] and most highly valued[39] measure to assess patients with RA. To calculate RAPID4MDJC, the 28-joint count is scored 0–54 (0–28 tender joints; 0–26 swollen joints, not including the shoulder), recoded to a 0–10 scale using division by 5.4, then added to RAPID3 for a total of 0–40.

RAPID4PTJC (Table 1) adds to RAPID3 a RADAI self-report joint count[30], based on a rationale that a formal quantitative joint count is not performed at most RA patient visits[11], and a RADAI self-report joint count is correlated significantly with a physician/assessor joint count[30]. As noted, the RADAI is scored 0–48, and recoded to a 0–10 scale using a scoring template on the MDHAQ. A raw RAPID4MDJC or RAPID4PTJC 0–40 scores may be divided by 4 to give an adjusted 0–10 score, using a template at the bottom of Page 1 (Figure 1)[26].

RAPID5 (Table 1) adds to RAPID4PTJC a physician/assessor global estimate, based on a rationale to include in an index the measure with the highest relative efficiency in most clinical trials[15,40], physician/assessor estimate of global status, as well as a joint count measure. The RAPID5 0–50 raw score may be divided by 5 to give an adjusted 0–10 score using a template at the bottom of Page 1 of the MDHAQ (Figure 1), computed in about 20 seconds[26].

Each of 2 to 5 measures included in a RAPID score is weighted equally on a 0–10 scale, in contrast to ACR improvement criteria[22], DAS28[3], and CDAI[28], in which joint-count data are weighted more heavily than other Core Set measures. Adjustment of all RAPID scores to 0–10 facilitates simple comparisons of all indices to one another and to DAS28 and CDAI. In usual care, RAPID3 may be scored 0–30, for further simplicity.

Other RAPID scores — such as RAPID2, which includes only a physician and a patient global estimate; RAPID4 versions that include RAPID3 plus a swollen joint count, tender joint count or physician global estimate; and RAPID5, with a physician joint count — were also computed. However, results were quite similar to RAPID3, RAPID4PTJC, RAPID4MDJC, and RAPID5, and are not presented in this report.



Multi-Dimensional Health Assessment Questionnaire (R783-NP2)

This questionnaire includes information not available from blood tests, X-rays, or any source other than you. Please try to answer each question, even if you do not think it is related to you at this time. Try to complete as much as you can yourself, but if you need help, please ask. There are no right or wrong answers. Please answer exactly as you think or feel. Thank you.

FOR OFFICE USE ONLY

1. Please check (√) the ONE best answer for your abilities at this time:

OVER THE LAST WEEK, were you able to:	Without **ANY** Difficulty	With **SOME** Difficulty	With **MUCH** Difficulty	**UNABLE** To Do
a. Dress yourself, including tying shoelaces and doing buttons?	0	1	2	3
b. Get in and out of bed?	0	1	2	3
c. Lift a full cup or glass to your mouth?	0	1	2	3
d. Walk outdoors on flat ground?	0	1	2	3
e. Wash and dry your entire body?	0	1	2	3
f. Bend down to pick up clothing from the floor?	0	1	2	3
g. Turn regular faucets on and off?	0	1	2	3
h. Get in and out of a car, bus, train, or airplane?	0	1	2	3
i. Walk two miles or three kilometers, if you wish?	0	1	2	3
j. Participate in recreational activities and sports as you would like, if you wish?	0	1	2	3
k. Get a good night's sleep?	0	1.1	2.2	3.3
l. Deal with feelings of anxiety or being nervous?	0	1.1	2.2	3.3
m. Deal with feelings of depression or feeling blue?	0	1.1	2.2	3.3

1.a-j FN (0-10)

1=0.3 16=5.3
2=0.7 17=5.7
3=1.0 18=6.0
4=1.3 19=6.3
5=1.7 20=6.7
6=2.0 21=7.0
7=2.3 22=7.3
8=2.7 23=7.7
9=3.0 24=8.0
10=3.3 25=8.3
11=3.7 26=8.7
12=4.0 27=9.0
13=4.3 28=9.3
14=4.7 29=9.7
15=5.0 30=10

2.PN (0-10)

4.PTGL (0-10)

RAPID 3 (0-30)

2. How much pain have you had because of your condition OVER THE PAST WEEK?
Please indicate below how severe your pain has been:

NO PAIN 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 PAIN AS BAD AS IT COULD BE

3.a-pPTJT(0-10)

1=0.2 25=5.2
2=0.4 26=5.4
3=0.6 27=5.6
4=0.8 28=5.8
5=1.0 29=6.0
6=1.3 30=6.3
7=1.5 31=6.4
8=1.7 32=6.7
9=1.9 33=6.9
10=2.1 34=7.1
11=2.3 35=7.3
12=2.5 36=7.5
13=2.7 37=7.7
14=2.9 38=7.9
15=3.1 39=8.1
16=3.3 40=8.3
17=3.5 41=8.5
18=3.8 42=8.8
19=4.0 43=9.0
20=4.2 44=9.2
21=4.4 45=9.4
22=4.6 46=9.6
23=4.8 47=9.8
24=5.0 48=10

3. Please place a check (√) in the appropriate spot to indicate the amount of pain you are having today in each of the joint areas listed below:

	None	Mild	Moderate	Severe		None	Mild	Moderate	Severe
a.LEFT FINGERS	☐ 0	☐ 1	☐ 2	☐ 3	i.RIGHT FINGERS	☐ 0	☐ 1	☐ 2	☐ 3
b.LEFT WRIST	☐ 0	☐ 1	☐ 2	☐ 3	j.RIGHT WRIST	☐ 0	☐ 1	☐ 2	☐ 3
c.LEFT ELBOW	☐ 0	☐ 1	☐ 2	☐ 3	k.RIGHT ELBOW	☐ 0	☐ 1	☐ 2	☐ 3
d.LEFT SHOULDER	☐ 0	☐ 1	☐ 2	☐ 3	l.RIGHT SHOULDER	☐ 0	☐ 1	☐ 2	☐ 3
e.LEFT HIP	☐ 0	☐ 1	☐ 2	☐ 3	m.RIGHT HIP	☐ 0	☐ 1	☐ 2	☐ 3
f.LEFT KNEE	☐ 0	☐ 1	☐ 2	☐ 3	n.RIGHT KNEE	☐ 0	☐ 1	☐ 2	☐ 3
g.LEFT ANKLE	☐ 0	☐ 1	☐ 2	☐ 3	o.RIGHT ANKLE	☐ 0	☐ 1	☐ 2	☐ 3
h.LEFT TOES	☐ 0	☐ 1	☐ 2	☐ 3	p.RIGHT TOES	☐ 0	☐ 1	☐ 2	☐ 3
q.NECK	☐ 0	☐ 1	☐ 2	☐ 3	r.BACK	☐ 0	☐ 1	☐ 2	☐ 3

4. Considering all the ways in which illness and health conditions may affect you at this time, please indicate below how you are doing:

VERY WELL 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 VERY POORLY

Please turn to the other side

RAPID 4 (0-40)

MDGLOBAL(0-10)

RAPID 5 (0-50)

For Office Use Only: RAPID 3 RAPID 3 (0-10)
NR: 1=0.3, 2=0.7, 3=1.0 LS: 4=1.3, 5=1.7, 6=2.0
MS: 7=2.3, 8=2.7, 9=3.0, 10=3.3, 11=3.7, 12=4.0
HS: 13=4.3, 14=4.7, 15=5.0, 16=5.3, 17=5.7,18=6.0, 19=6.3, 20=6.7, 21=7.0, 22=7.3, 23=7.7, 24=8.0, 25=8.3, 26=8.7, 27=9.0, 28=9.3, 29=9.7, 30=10.0

RAPID 4 RAPID 4 (0-10)
NR: 1=0.3, 2=0.5, 3=0.8, 4=1.0 LS: 5=1.3, 6=1.5, 7=1.8, 8=2.0
MS: 9=2.3, 10=2.5, 11=2.8, 12=3.0, 13=3.3, 14=3.5, 15=3.8, 16=4.0
HS: 17=4.3, 18=4.5, 19=4.8, 20=5.0, 21=5.3, 22=5.5, 23=5.8, 24=6.0, 25=6.3, 26=6.5, 27=6.8, 28=7.0, 29=7.3, 30=7.5, 31=7.8, 32=8.0, 33=8.3, 34=8.5, 35=8.7, 36=9.0, 37=9.3, 38=9.5, 39=9.8, 40=10.0

RAPID 5 (0-10)
NR: 1=0.2, 2=0.4, 3=0.6, 4=0.8 5=1.0 LS: 6=1.2, 7=1.4, 8=1.6, 9=1.8, 10=2.0,
MS:11=2.2, 12=2.4, 13=2.6, 14=2.8, 15=3.0, 16=3.2, 17=3.4, 18=3.6, 19=3.8, 20=4.0
HS: 21=4.2, 22=4.4, 23=4.6, 24=4.8, 25=5.0, 26=5.2, 27=5.4, 28=5.6, 29=5.8, 30=6.0, 31=6.2, 32=6.4, 33=6.6, 34=6.8, 35=7.0, 36=7.2, 37=7.4, 38=7.6, 39=7.8, 40=8.0, 41=8.2, 42=8.4, 43=8.6, 44=8.8, 45=9.0, 46=9.2, 47=9.4, 48=9.6, 49=9.8, 50=10.0

Figure 1A. Multidimensional Health Assessment Questionnaire (MDHAQ), Version R783. The front page (A) includes 5 scales to assess physical function, psychological distress, pain, patient global estimate, and a self-report joint count on a RA Disease Activity Index (RADAI)[30,34]. The 10 physical function activities (items 1a–1j) are each scored 0, 1, 2, or 3 (as with the HAQ), for a total of 0–30; the raw 0–30 score is recoded as 0–10 using a scoring template on the right side of the page. A brief psychological distress scale of 3 queries concerning sleep, anxiety, and depression (items 1k–1m) is given below the 10 activities; these queries may be informative to the rheumatologist in patient care, but are not scored formally. Scoring templates for pain, self-report joint count, and patient global estimate measures are also available on the right side of the page, and for RAPID indices at the bottom of the page. RAPID3 includes the 3 RA Core Data Set patient self-report measures: physical function, pain, and patient global estimate of status. RAPID4PTJC adds to RAPID3 a RADAI joint count, and RAPID5 adds to RAPID4PTJC a physician global estimate of patient status. Reprinted with permission: Health Report Services.

5. Please check (√) if you have experienced any of the following over the last month:

__Fever	__Lump in your throat	__Paralysis of arms or legs
__Weight gain (>10 lbs)	__Cough	__Numbness or tingling of arms or legs
__Weight loss (<10 lbs)	__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

FOR OFFICE USE ONLY

5.ROS ☐ 6. AM ☐ 7.CHG ☐ 8. EX ☐ 9. FT ☐ 10.HX ☐

6. When you awakened in the morning OVER THE LAST WEEK, did you feel stiff? ☐No ☐Yes
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.

7. How do you feel TODAY compared to ONE WEEK AGO? Please check (✓) only one.
Much **B**etter ☐ (1), **B**etter ☐ (2), the **S**ame ☐ (3), **W**orse ☐ (4), **M**uch **W**orse ☐ (5) than one week ago

8. How often do you exercise aerobically (sweating, increased heart rate, shortness of breath) **for at least one-half hour** (30 minutes)**? Please check (✓) only one.**
☐ 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)

9. How much of a problem has UNUSUAL fatigue or tiredness been for you OVER THE PAST WEEK?

FATIGUE IS ○ FATIGUE IS A
NO 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 MAJOR PROBLEM

10. Over the last 6 months have you had: [Please check (√)]

☐No ☐Yes	An operation	☐No ☐Yes	Change(s) of arthritis drugs or other drugs
☐No ☐Yes	Inpatient hospitalization	☐No ☐Yes	Change(s) of address
☐No ☐Yes	A new illness, accident or trauma	☐No ☐Yes	Change(s) of marital status
☐No ☐Yes	An important new symptom	☐No ☐Yes	Change job or work duties, quit work, retired
☐No ☐Yes	Side effect(s) of any drug	☐No ☐Yes	Change of medical insurance, Medicare, etc.
☐No ☐Yes	Smoke cigarettes regularly	☐No ☐Yes	Change of primary care or other doctor

Please explain any "Yes" answer below, or indicate any other health matter that affects you:

_____

_____

SEX: ☐ Female, ☐ Male **ETHNIC GROUP:** ☐ Asian, ☐ Black, ☐ Hispanic, ☐ White, ☐ Other_____

Your Occupation _____
Work Status: ☐ Full-time, ☐ Part-time, ☐ Disabled
☐ Homemaker, ☐ Self-Employed, ☐Retired,
☐ Seeking work, ☐ Other_____

Please circle the number of years of school you have completed:
1 2 3 4 5 6 7 8 9 10
11 12 13 14 15 16 17 18 19 20

Please write your weight: _____ lbs. height: _____ inches

Your Name_____ **Date of Birth** _____ **Today's Date** _____

Page 2 of 2 Thank you for completing this questionnaire to help keep track of your medical care. R783NP2

FOR OFFICE USE ONLY: I have reviewed [check(✓)]: ___FN, ___ PN, ____GL, ___RADAI, ___RAPID, ____ROS, ____HX
Name: _____ Signature_____

Figure 1B. The reverse side (B) includes a review of systems, morning stiffness, change in status, exercise activity, fatigue VAS, recent medical history, and demographic data. This information is not included in RAPID scores, but provides useful data for clinical care. Reprinted with permission: Health Report Services.

Table 1. Composition of Routine Assessment of Patient Index Data (RAPID) indices.

Measure	DAS28	CDAI	RAPID 3	RAPID 4PTJC	RAPID 4MDJC	RAPID 5
Number of measures included	4	4	3	4	4	5
Physical function			√	√	√	√
Pain			√	√	√	√
Patient global estimate	√	√	√	√	√	√
MD/Assessor global estimate		√				√
Tender joint count (MD)	√	√			√	
Swollen joint count (MD)	√	√				
Patient joint count (RADAI)				√		√
ESR/CRP	√					
Scale — raw score	0–10	0–76	0–30	0–40	0–40	0–50
Scale — adjusted score			0-10	0–10	0–10	0–10

MD: physician; RADAI: Rheumatoid Arthritis Disease Activity Index; ESR: erythrocyte sedimentation rate; CRP: C-reactive protein.

DAS28 and CDAI. DAS28[3] includes 4 measures: 28 swollen joint count, 28 tender joint count, ESR, and patient global estimate, and is scored 0–10 using a DAS calculator (also available at the DAS website: http://www.das-score.nl/www.das-score.nl/). The CDAI[12,28] includes 4 measures, 3 identical to DAS28, substituting a physician/assessor global estimate for ESR. The CDAI is scored as a simple 0–76 total: 0–28 for 2 joint counts, and 0–10 for 2 global estimates. Four DAS28 activity categories[27] are: > 5.1 = high, 3.21–5.1 = moderate, 2.61–3.2 = low, and ≤ 2.6 = remission. The corresponding CDAI categories[29] are > 22 = high, 10.1–22.0 = moderate, 2.9–10.0 = low, and ≤ 2.8 = remission. Proposed severity (rather than activity) categories for RAPID3 are: > 4 = high, 2.01–4 = moderate, 1.01–2 = low, and ≤ 1 = near-remission, on an adjusted 0–10 scale. On an unadjusted 0–30 scale, the severity categories are defined as > 12 = high, 6.01–12 = moderate, 3.01–6 = lower, and ≤ 3 = near-remission. These cutpoints were selected on the basis of clinical experience of the senior author over 20 years[41] and analyses of adalimumab[42] and abatacept[21] clinical trial data.

Statistical analyses. The SPERA protocol was completed in 318 patients in the 3 clinical settings. One or more measures were missing in 33 patients (10.4%), primarily ESR and self-report of RADAI joint count. Analyses were conducted only in the 285 patients for whom complete data were available for all included measures and indices.

All data were entered into a Microsoft Access database, which had been developed for management of longitudinal studies[31], and SPERA data in the cross-sectional, multinational QUEST-RA protocol[32]. The data were transferred to SAS® V9.2 (SAS, Cary, NC, USA) for statistical analyses. Demographic measures, clinical measures, RA Core Data Set measures, indices, and therapies in the 3 settings were compared using analysis of variance for continuous variables, and chi-square analysis for discontinuous variables. Spearman rank-nonparametric correlation coefficients were computed to compare individual Core Data Set measures, duration of disease, DAS28, CDAI, and various RAPID scores. Cross-tabulations were computed to compare 4 DAS28 and CDAI categories of high disease activity (DAS = 5.1–10; CDAI = 22–78), moderate activity (DAS = 3.2–5.1; CDAI = 10.1–22), low activity (DAS = 2.61–3.2; CDAI = 3.81–10), and remission (DAS = 0–2.6; CDAI = 0–28) to the 4 proposed RAPID categories of high severity (4.01–10), moderate severity (2.01–4.0), low severity (1.01–2.0), and near-remission (0–1.0). Statistical significance of the level of agreement of the different scales was evaluated using chi-square, kappa, and weighted kappa statistics.

RESULTS

Patients. The 285 patients included 88, 119, and 78 from 3 different clinical settings who had complete data available (Table 2). The mean age was 57.4 years, 73% were female, 68.4% Caucasian, 18.6% African American, and 6.7% Hispanic. The mean duration of disease was 4.9, 8.2, and 14.0 years in practices established in 2001, 1987, and 1980, respectively. One practice included 50% African American patients and 23% Hispanic patients, who were a small minority in the other practices.

Among RA Core Data Set measures, mean patient questionnaire scores for function, pain, and global estimate did not differ significantly in the 3 practices, yielding mean RAPID3 scores of 2.9 (means of 2.7, 2.8, and 3.3 in the 3 practices). Overall mean swollen joint count was 3.7, tender joint count 3.5, physician global estimate 2.0, and ESR 23.4. Some differences were statistically significant, but clinically plausible, explained by lower swollen joint counts, lower physician global estimate, and higher ESR in one setting, and lower tender joint counts in another setting.

The mean DAS28 score of 3.4 differed statistically across the 3 settings, reflecting lower tender joint counts in one setting; no significant differences were seen between CDAI or RAPID scores. The overall mean DAS28 of 3.4, CDAI of 10.6, and RAPID3 of 2.9 are only slightly above the cutpoints for "low activity" or "low severity" in these 3 practices, in which an aggressive approach to control inflammation as completely as possible is pursued, although 17% of patients had high disease activity by DAS28 or CDAI (see below).

Overall, 61.8% of the patients were treated with prednisone, 72.3% with weekly low-dose methotrexate, and 28.4% with biological agents. In one practice, prednisone was taken by most patients, but with a mean dose of 4 mg per day, on a longterm basis[43]. The data concerning these 285 patients appear to reflect a relatively typical population of patients with RA in the US, although variation was seen in many variables across the 3 settings, as seen in multicenter clinical trials.

Spearman correlations of DAS28, CDAI, and RAPID scores.

Table 2. Demographic, RA Core Data Set, indices, and medication data in 285 patients seen by 3 rheumatologists (MB, TP, YY) by setting. Values are mean (standard deviation) unless otherwise indicated.

	MB	TP	YY	All Patients	p
N	88	119	78	285	
Age, yrs	56.2 (15.6)	58.5 (14.5)	57.1 (13.5)	57.4 (14.6)	0.536
Duration, yrs	8.2 (6.8)	14.0 (10.1)	4.9 (6.0)	9.7 (9.0)	< 0.001
Education, yrs	13.6 (2.1)	13.8 (2.9)	13.4 (4.0)	13.6 (3.0)	0.604
Female*	62 (70.5)	82 (68.9)	64 (82.1)	208 (73.0)	0.076**
Race					< 0.001**
Caucasian*	68 (77.3)	113 (95.0)	14 (17.9)	195 (68.4)	
African American*	10 (11.4)	4 (3.4)	39 (50.0)	53 (18.6)	
Hispanic*	1 (1.1)	0	18 (23.1)	19 (6.7)	
RA Core Data Set measures					
Physician/assessor measures					
Swollen 28 joint count	4 (4.4)	4.3 (3.9)	2.4 (3.8)	3.7 (4.1)	0.004
Tender 28 joint count	1.5 (3.3)	4.4 (6)	4.3 (4.8)	3.5 (5.2)	< 0.001
Physician global estimate VAS	2.3 (1.8)	2.1 (1.1)	1.6 (1.4)	2.0 (1.4)	0.003
Laboratory measure					
Erythrocyte sedimentation rate	18.9 (22)	20.9 (18.5)	32.3 (33.2)	23.4 (24.9)	< 0.001
Patient measures					
Function	2.0 (1.8)	2.2 (1.9)	2.3 (2.0)	2.1 (1.9)	0.551
Pain VAS	3.2 (2.6)	3.3 (2.6)	4.0 (2.9)	3.5 (2.7)	0.104
Patient global estimate VAS	2.8 (2.4)	2.9 (2.4)	3.6 (2.7)	3.1 (2.5)	0.074
Clinical indices					
DAS28	2.7 (1.6)	3.6 (1.5)	3.7 (1.7)	3.4 (1.7)	< 0.001
CDAI	10.7 (9.6)	13.7 (10.8)	11.9 (11.1)	12.3 (10.6)	0.127
RAPID3	2.7 (2.1)	2.8 (2.1)	3.3 (2.4)	2.9 (2.2)	0.130
RAPID4PTJC	2.4 (1.9)	2.6 (2)	3.1 (2.2)	2.7 (2)	0.180
RAPID4MDJC	2.3 (1.7)	2.5 (1.8)	2.8 (2)	2.5 (1.8)	0.064
RAPID5	2.4 (1.8)	2.5 (1.7)	2.8 (2)	2.5 (1.8)	0.282
Treatment					
Prednisone*	39 (44.3)	108 (90.8)	29 (37.2)	176 (61.8)	< 0.001**
Methotrexate*	62 (70.5)	95 (79.8)	49 (62.8)	206 (72.3)	0.030**
Biologic agents*†	29 (33.0)	37 (31.1)	15 (19.2)	81 (28.4)	0.103**

* Values are reported as number of patients (percentage of total patients in column). Significance of differences between sites; ** p values for discontinuous variables were calculated by chi-square; all other p values (continuous variables) were calculated by analysis of variance (ANOVA). † Biologic agents include adalimumab, etanercept, and infliximab. VAS: visual analog scale.

Among the 285 patients with complete data, DAS28 was correlated significantly with RAPID3 (rho = 0.66, p < 0.001; Table 3) and with other RAPID scores (rho = 0.65–0.73, p < 0.001; Table 3). CDAI was also correlated significantly with RAPID3, at somewhat higher levels than DAS28 (rho = 0.74, p < 0.001; Table 3), as well as with all other RAPID scores (rho = 0.74–0.83, p < 0.001; Table 3). As expected, the highest correlation was seen between DAS28 and CDAI (rho = 0.84, weighted kappa = 0.60, p < 0.001), as 3 of the 4 measures in the DAS and CDAI (swollen joint count, tender joint count, patient global estimate) are identical. RAPID4MDJC, which includes 2 measures in common with DAS28 and CDAI (tender joint count, patient global estimate), was correlated at higher levels with DAS28 and CDAI than RAPID3, which includes only one measure found on the DAS28 and CDAI (patient global estimate). Nonetheless, RAPID3 was correlated significantly (at levels almost as high as RAPID scores with more common measures) with DAS28 and CDAI. The correlation of RAPID3 with DAS28 (rho = 0.66) is greater than the correlation of CRP with ESR (rho = 0.51) or of any Core Data Set measure with duration of disease (all rho < 0.16).

Table 3. Spearman correlation coefficients for DAS28, CDAI, and all RAPID indices in 285 patients in 3 clinical settings.

	DAS28	CDAI	RAPID3	RAPID 4PTJC	RAPID 4MDJC
CDAI	0.844				
RAPID3	0.658	0.742			
RAPID4PTJC	0.654	0.748	0.989		
RAPID4MDJC	0.731	0.828	0.988		
RAPID5	0.692	0.805	0.981	0.991	0.985

p < 0.001 for all comparisons.

Four categories of DAS28, CDAI, and RAPID3 scores. Among the 285 patients, 50 (17%) met DAS28 criteria for high activity (> 5.1), compared to 90 (32%) with moderate activity (3.3–5.1), 40 (14%) with low activity (2.7–3.2), and

105 (37%) in remission (≤ 2.6) (Table 4A). The proportions of patients in 4 categories for RAPID3 were 31% with high severity (> 4.0), 25% with moderate severity (2.1–4.0), 18% with low severity (1.1–2.0), and 26% in near-remission (≤ 1.0) (Table 4A).

Among the 50 patients with high activity according to DAS28, 96% had high or moderate severity according to RAPID3 (Table 4A). Of the 105 patients in DAS28 remission, 73% had low severity or near-remission according to RAPID3 (Table 4A). The weighted kappa statistic for agreement of RAPID3 with DAS28 was 0.44 ($p < 0.001$).

CDAI criteria for high activity (> 22.0) were met by 17% of the patients, compared to 32% with moderate activity (10.1–22.0), 33% with low activity (2.9–10.0), and 18% with remission (≤ 2.8) (Table 4B). Among 50 patients with CDAI high activity, 96% had high or moderate RAPID3 severity (Table 4B). Among 52 patients in CDAI remission, 98% were in near-remission or low severity (Table 4B). The weighted kappa statistic for agreement of RAPID3 with CDAI was 0.51 ($p < 0.001$), somewhat higher than for DAS28.

Four categories of DAS28, CDAI, and other RAPID scores. Agreement of DAS28 (Table 5) and CDAI (Table 6) with RAPID4 and RAPID5 indices was quite similar to agreement with RAPID3. Of the 50 patients with DAS28 high activity, 94%–96% met high or moderate severity criteria for the other 3 RAPID scores (Table 5), similar to 96% for RAPID3 (Table 4A). Of the 105 patients in DAS28 remission, 76%–81% were in near-remission or low severity according to the other RAPID scores (Table 5), similar to the 73% according to RAPID3 (Table 4A).

Of the 50 patients with CDAI high activity, 96%–98% met high or moderate severity criteria for the other RAPID scores (Table 6), similar to 96% for RAPID3 (Table 4B). Of the 52 patients in CDAI remission, 98%–100% were in RAPID near-remission or low severity categories (Table 6), similar to 98% for RAPID3 (Table 4B). Chi-square and weighted kappa statistics of 0.43–0.57 for comparisons of RAPID indices were all statistically significant ($p < 0.001$) and in the same range.

Two categories of DAS28, CDAI, and RAPID scores. Agreement between DAS, CDAI, and RAPID scores is summarized in Table 7 according to 2 categories: moderate and high activity/severity versus remission/near-remission and low activity/severity. The results suggest little incremental value to calculate indices that include additional measures beyond the 3 Core Data Set patient measures in RAPID3, particularly considering the time required.

DISCUSSION

Quantitative measures, ranging from blood pressure to serum glucose, have advanced clinical care in many diseases. Specific evidence of the value of quantitative data according to DAS28 has been documented in clinical trials of patients with RA[4-9]. However, DAS28, or the simplified CDAI, requires a formal quantitative joint count, and is not available at most visits of patients with RA to a rheumatologist. A clinician can provide good patient care for RA

Table 4. RAPID3 scores compared to DAS28 and CDAI in 285 patients at 3 sites. All percentages are row percentages, except total in rightmost column (column percentages).

A. DAS28 vs RAPID3

	RAPID3 Scores				
DAS28	4.1–10, High Severity	2.1–4.0, Moderate Severity	1.1–2.0, Low Severity	0–1.0, Near-remission	Total
> 5.1, high activity	37 (74%)	11 (22%)	1 (2%)	1 (2%)	50 (17%)
3.21–5.1, moderate activity	39 (43%)	27 (30%)	16 (18%)	8 (9%)	90 (32%)
2.61–3.2, low activity	4 (10%)	15 (38%)	10 (25%)	11 (27%)	40 (14%)
0–2.6, Remission	10 (10%)	18 (17%)	24 (23%)	53 (50%)	105 (37%)
Total	90 (31%)	71 (25%)	51 (18%)	73 (26%)	285

Kappa 0.26, weighted kappa 0.44.

B. CDAI vs RAPID3

	RAPID3 Scores				
CDAI	4.1–10, High Severity	2.1–4.0, Moderate Severity	1.1–2.0, Low Severity	0–1.0, Near-remission	Total
> 22, high activity	39 (78%)	9 (18%)	1 (2%)	1 (2%)	50 (17%)
10.1–22.0, moderate activity	36 (40%)	33 (36%)	15 (17%)	6 (7%)	90 (32%)
2.9–10, low activity	15 (16%)	28 (30%)	25 (27%)	25 (27%)	93 (33%)
0–2.8, remission	0 (0%)	1 (2%)	10 (19%)	41 (79%)	52 (18%)
Total	90 (31%)	71 (25%)	51 (18%)	73 (26%)	285

Kappa 0.32, weighted kappa 0.51.

Table 5. DAS28 compared to other RAPID scores in 285 patients at 3 sites. All percentages are row percentages, except total in rightmost column (column percentages).

A. DAS28 vs RAPID4PTJC

	RAPID4PTJC Scores				
DAS28	4.1–10, High Severity	2.1–4.0, Moderate Severity	1.1–2.0, Low Severity	0–1.0, Near-remission	Total
> 5.1 high activity	37 (74%)	10 (20%)	2 (4%)	1 (2%)	50 (17%)
3.21–5.1, moderate activity	30 (33%)	32 (36%)	20 (22%)	8 (9%)	90 (32%)
2.61–3.2, low activity	5 (12%)	14 (35%)	8 (20%)	13 (33%)	40 (14%)
0–2.6, remission	8 (7%)	18 (17%)	28 (27%)	51 (49%)	105 (37%)
Total	80 (28%)	74 (26%)	58 (20%)	73 (26%)	285

Kappa 0.26, weighted kappa 0.44.

B. DAS28 vs RAPID4MDJC

	RAPID4MDJC Scores				
DAS28	4.1–10, High Severity	2.1–4.0, Moderate Severity	1.1–2.0, Low Severity	0–1.0, Near-remission	Total
> 5.1, high activity	37 (74%)	11 (22%)	2 (4%)	0 (0%)	50 (17%)
3.21–5.1, moderate activity	23 (25%)	41 (46%)	19 (21%)	7 (8%)	90 (32%)
2.61–3.2, low activity	1 (2%)	13 (33%)	15 (38%)	11 (27%)	40 (14%)
0–2.6, remission	3 (3%)	17 (16%)	29 (28%)	56 (53%)	105 (37%)
Total	64 (22%)	82 (29%)	65 (23%)	74 (26%)	285

Kappa 0.36, weighted kappa 0.53.

C. DAS28 vs RAPID5

	RAPID5 Scores				
DAS28	4.1–10, High Severity	2.1–4.0, Moderate Severity	1.1–2.0, Low Severity	0–1.0, Near-remission	Total
> 5.1, high activity	37 (74%)	10 (20%)	3 (6%)	0 (0%)	50 (17%)
3.21–5.1, moderate activity	25 (28%)	38 (42%)	20 (22%)	7 (8%)	90 (32%)
2.61–3.2, low activity	4 (10%)	14 (35%)	12 (30%)	10 (25%)	40 (14%)
0–2.6, remission	5 (5%)	19 (18%)	27 (26%)	51 (51%)	105 (37%)
Total	71 (25%)	81 (28%)	62 (22%)	71 (25%)	285

Kappa 0.32, weighted kappa 0.48.

patients in most situations based on a history and qualitative physical examination, without quantitative data. However, availability of numerical data may enhance decisions, outcomes[4-9], and documentation of changes in patient status.

A careful history and physical examination, including a nonquantitative joint examination, form the foundation of any encounter of a physician and patient with RA. Nonetheless, RAPID3, which requires 10 seconds to calculate, can provide a valid index to supplement the findings with quantitative data in usual clinical care. Although correlations of RAPID with CDAI and DAS28 were highest for RAPID4MDJC, which includes a swollen and tender joint count by a physician/assessor, the incremental differences may not justify the 90 seconds required to perform a formal quantitative joint count as a routine practice.

It may appear inappropriate to suggest that a formal tender and swollen joint count performed by a physician/assessor is not required for an index to assess and monitor status of patients with RA in usual care. The joint examination provides the primary information for diagnosis and monitoring of patients with RA and clearly reflects disease pathogenesis. A formal quantitative joint count is the most specific RA measure[39]. However, several lines of evidence suggest that RAPID3, accompanied by a careful nonquantitative joint examination, but without a formal joint count, may have considerable value for usual RA care.

First, indices of only the 3 patient-reported Core Data Set measures are correlated with DAS28 in clinical trials of leflunomide[18,19], methotrexate[18,19], adalimumab[20], and abatacept[21], and in clinical settings[23], and distinguish between active and control treatments in clinical trials as effectively as ACR and DAS criteria.

Second, the times required to score various RA measures include 90 seconds to perform a 28-joint count, 14.6 seconds to calculate DAS28 at the DAS website, 42 seconds to score a HAQ, 7.5 seconds to calculate 3 MDHAQ scores for physical function, pain and global status, 9.6 seconds to calculate RAPID3, and 20 seconds to calculate RAPID5[26]. The

Table 6. CDAI compared to other RAPID scores in 285 patients at 3 sites. All percentages are row percentages, except total in rightmost column (column percentages).

A. CDAI vs RAPID4PTJC

	RAPID4PTJC Scores				
CDAI	4.1–10, High Severity	2.1–4.0, Moderate Severity	1.1–2.0, Low Severity	0–1.0, Near-remission	Total
> 22, high activity	38 (76%)	10 (20%)	1 (2%)	1 (2%)	50 (17%)
10.1–22.0, moderate activity	30 (33%)	35 (39%)	18 (20%)	7 (8%)	90 (32%)
2.9–10, low activity	12 (13%)	28 (30%)	30 (32%)	23 (25%)	93 (33%)
0–2.8, remission	0 (0%)	1 (2%)	9 (17%)	42 (81%)	52 (18%)
Total	80 (28%)	74 (26%)	58 (20%)	73 (26%)	285

Kappa 0.35, weighted kappa 0.52.

B. CDAI vs RAPID4MDJC

	RAPID4MDJC Scores				
CDAI	4.1–10, High Severity	2.1–4.0, Moderate Severity	1.1–2.0, Low Severity	0–1.0, Near-remission	Total
> 22, high activity	39 (78%)	10 (20%)	1 (2%)	0 (0%)	50 (17%)
10.1–22.0, moderate activity	22 (24%)	43 (48%)	21 (23%)	4 (5%)	90 (32%)
2.9–10, low activity	3 (3%)	29 (31%)	35 (38%)	26 (28%)	93 (33%)
0–2.8, remission	0 (0%)	0 (0%)	8 (15%)	44 (85%)	52 (18%)
Total	64 (22%)	82 (29%)	65 (23%)	74 (26%)	285

Kappa 0.42, weighted kappa 0.60.

C. CDAI vs RAPID5

	RAPID5 Scores				
CDAI	4.1–10, High Severity	2.1–4.0, Moderate Severity	1.1–2.0, Low Severity	0–1.0, Near-remission	Total
> 22, high activity	38 (76%)	10 (20%)	2 (4%)	0 (0%)	50 (17%)
10.1–22.0, moderate activity	25 (28%)	43 (48%)	18 (20%)	4 (4%)	90 (32%)
2.9–10, low activity	8 (9%)	28 (30%)	35 (38%)	22 (24%)	93 (33%)
0–2.8, remission	0 (0%)	0 (0%)	7 (13%)	45 (87%)	52 (18%)
Total	71 (25%)	81 (28%)	62 (22%)	71 (25%)	285

Kappa 0.42, weighted kappa 0.59.

Table 7. Agreement (percentage) between DAS, CDAI, and RAPID for moderate to high activity/severity versus remission/near-remission to low activity/severity.

	DAS		CDAI	
Versus	Moderate or High	Remission or Low	Moderate or High	Remission or Low
DAS	—	—	82%	83%
CDAI	82%	83%	—	—
RAPID3	81%	68%	84%	70%
RAPID4PTJC	78%	69%	81%	72%
RAPID4MDJC	80%	77%	81%	79%
RAPID5	79%	71%	83%	75%

time to score a CDAI may be similar to RAPID3. However, the 5–10 minutes to acquire the patient data for RAPID3 are those of a patient in the waiting room before seeing the physician, whereas the 90 seconds for a joint count to score a CDAI are taken from the interaction of physician and patient during the limited time for this encounter. These differences may be important in efforts to incorporate quantitative measures into busy clinical settings.

Third, in part as a consequence of the time required, most rheumatologists do not perform a formal *quantitative* (non-quantitative) joint count in usual care, unless required for a clinical trial or medication[11], although most visits of patients with RA include a careful *qualitative* clinical examination. The RADAI self-report joint count is correlated with a tender joint count by a physician at levels of about rho = 0.5–0.6[30], and rho = 0.53 in the database in this study (data not shown). If an assessor is not available to perform a DAS28[1-3] or CDAI[28], a *quantitative* RAPID3 score and self-report joint count, along with a careful *qualitative* joint examination by a physician, may be sufficient for patient assessment and documentation in busy clinical settings.

Fourth, a formal quantitative joint count for swollen and tender joints performed by a physician/assessor has a num-

ber of limitations, which often are overlooked in the rheumatology literature[10], including poor reliability[44-48] (although reliability can be improved with training[46]); lesser sensitivity to detect inflammation than magnetic resonance imaging (MRI) or ultrasound[49]; greater improvement in patients who received placebo or control compared to active treatments than other Core Data Set measures[40]; lesser prognostic value than physical function scores for important severe longterm outcomes such as work disability, costs, and mortality rates[50]; and likelihood to be unchanged or improved over 5 years with traditional therapy while patients experienced progressive joint deformity and disability[51]. All reports emphasize that a joint count should be performed by the same observer at each visit. By contrast, it is possible to monitor a patient quantitatively using a patient questionnaire even if the usual rheumatologist is unavailable, if the patient sees another nonrheumatologist physician, or even at the patient's home or other settings.

We emphasize again that RAPID3 in no way is advocated to replace joint counts in clinical trials or a careful joint examination in clinical care. A formal quantitative joint count is appropriate for clinical trials and other clinical research, in which patients generally are described in groups, despite these limitations. Nonetheless, the limitations described detract from measurement accuracy in individual patients in busy clinical settings, in whom patient questionnaires provide greater reliability than joint counts[52].

Although most patients who met criteria for moderate or high activity according to DAS28 or CDAI met criteria for moderate or high RAPID severity, a few patients had discrepant values. Perhaps these findings may be explained in part by sensitivity of patient questionnaires to longterm joint damage as well as inflammatory activity. Further analyses of discrepant scores are in progress (data not shown).

Several limitations are seen in this study. First, only 3 rheumatologists participated, and it would be desirable to extend these studies to a larger number of rheumatologists. Second, this was a cross-sectional study, and longitudinal data from clinical settings would appear desirable to study further the potential value of RAPID3 in helping to guide therapy. Rigorous longitudinal observations concerning RAPID3 are available from clinical trials[18-21], and further longitudinal data from clinical care currently are being analyzed (data not shown).

The primary objective of this report is to document that categories of a RAPID3 score, an index that does not require a formal joint count, yield results generally quite similar to DAS28 and CDAI categories in usual clinical care, as also seen in clinical trials[21]. Addition of a physician/assessor joint count and/or physician global estimate resulted in somewhat higher correlations with DAS28 and CDAI, but added only marginally to classification of patients. RAPID3 is substantially more easily scored than DAS28 or CDAI, 10 seconds versus 90 seconds for a formal joint count.

Distribution of an MDHAQ to each patient at each visit in the infrastructure of usual clinical care has been the practice in the 3 clinical settings of the authors, for 25, 7, and 3 years, with completion of the questionnaire by > 99% of patients[53]. This practice causes no disruption of patient flow, saves time for the rheumatologist, and provides far superior documentation of patient status than is available in usual rheumatology care. Further use of RAPID3 to assess, monitor, and document patient status quantitatively in busy clinical settings could improve care, enhance documentation, and lead to better outcomes for patients with rheumatic diseases and for the field of rheumatology.

REFERENCES

1. van der Heijde DMFM, van't Hof MA, van Riel PLCM, et al. Judging disease activity in clinical practice in rheumatoid arthritis: first step in the development of a disease activity score. Ann Rheum Dis 1990;49:916-20.
2. van der Heijde DMFM, van't Hof M, van Riel PLCM, van de Putte LBA. Development of a disease activity score based on judgment in clinical practice by rheumatologists. J Rheumatol 1993;20:579-81.
3. Prevoo MLL, van't Hof MA, Kuper HH, van Leeuwen MA, van de Putte LBA, van Riel PLCM. Modified disease activity scores that include twenty-eight-joint counts: Development and validation in a prospective longitudinal study of patients with rheumatoid arthritis. Arthritis Rheum 1995;38:44-8.
4. Mottonen T, Hannonen P, Leirisalo-Repo M, et al. Comparison of combination therapy with single-drug therapy in early rheumatoid arthritis: A randomised trial. FIN-RACo trial group. Lancet 1999;353:1568-73.
5. Puolakka K, Kautiainen H, Möttönen T, et al. Early suppression of disease activity is essential for maintenance of work capacity in patients with recent-onset rheumatoid arthritis: five-year experience from the FIN-RACo trial. Arthritis Rheum 2005;52:36-41.
6. Grigor C, Capell H, Stirling A, et al. Effect of a treatment strategy of tight control for rheumatoid arthritis (the TICORA study): a single-blind randomised controlled trial. Lancet 2004;364:263-9.
7. Goekoop-Ruiterman YPM, de Vries-Bouwstra JK, Allaart CF, et al. Clinical and radiographic outcomes of four different treatment strategies in patients with early rheumatoid arthritis (the BeSt study): a randomized, controlled trial. Arthritis Rheum 2005;52:3381-90.
8. Goekoop-Ruiterman YPM, de Vries-Bouwstra JK, Allaart CF, et al. Comparison of treatment strategies in early rheumatoid arthritis: a randomized trial. Ann Intern Med 2007;146:406-15.
9. Verstappen SMM, Jacobs JWG, van der Veen MJ, et al. Intensive treatment with methotrexate in early rheumatoid arthritis: aiming for remission. Computer Assisted Management in Early Rheumatoid Arthritis (CAMERA, an open-label strategy trial). Ann Rheum Dis 2007;66:1443-9.
10. Pincus T, Yazici Y, Sokka T. Quantitative measures of rheumatic diseases for clinical research versus standard clinical care: differences, advantages and limitations. Best Pract Res Clin Rheumatol 2007;21:601-28.
11. Pincus T, Segurado OG. Most visits of most patients with rheumatoid arthritis to most rheumatologists do not include a formal quantitative joint count. Ann Rheum Dis 2006;65:820-2.
12. Aletaha D, Smolen J. The simplified Disease Activity Index (SDAI) and the clinical Disease Activity Index (CDAI): a review of their usefulness and validity in rheumatoid arthritis. Clin Exp Rheumatol 2005;23:S100-8.

13. Felson DT, Anderson JJ, Boers M, et al. The American College of Rheumatology preliminary core set of disease activity measures for rheumatoid arthritis clinical trials. Arthritis Rheum 1993;36:729-40.
14. Tugwell P, Boers M. OMERACT Committee. Proceedings of the OMERACT Conferences on outcome measures in rheumatoid arthritis clinical trials, Maastrict, Netherlands. J Rheumatol 1993;20:527-91.
15. Pincus T, Amara I, Segurado OG, Bergman M, Koch GG. Relative efficiencies of physician/assessor global estimates and patient questionnaire measures are similar to or greater than joint counts to distinguish adalimumab from control treatments in rheumatoid arthritis clinical trials. J Rheumatol 2008;35:201-5.
16. Wells G, Li T, Maxwell L, Maclean R, Tugwell P. Sensitivity of measures of function and patient reported outcomes following treatment with abatacept in patients with rheumatoid arthritis [abstract]. Arthritis Rheum 2005;52 Suppl:S467.
17. Fransen J, van Riel PLCM. The disease activity score and the EULAR response criteria. Clin Exp Rheumatol 2005;23:S93-S99.
18. Pincus T, Strand V, Koch G, et al. An index of the three core data set patient questionnaire measures distinguishes efficacy of active treatment from placebo as effectively as the American College of Rheumatology 20% response criteria (ACR20) or the Disease Activity Score (DAS) in a rheumatoid arthritis clinical trial. Arthritis Rheum 2003;48:625-30.
19. Pincus T, Amara I, Koch GG. Continuous indices of Core Data Set measures in rheumatoid arthritis clinical trials: lower responses to placebo than seen with categorical responses with the American College of Rheumatology 20% criteria. Arthritis Rheum 2005;52:1031-6.
20. Pincus T, Chung C, Segurado OG, Amara I, Koch GG. An index of patient self-reported outcomes (PRO Index) discriminates effectively between active and control treatment in 4 clinical trials of adalimumab in rheumatoid arthritis. J Rheumatol 2006;33:2146-52.
21. Pincus T, Bergman MJ, Yazici Y, Hines P, Raghupathi K, Maclean R. An index of only patient-reported outcome measures, routine assessment of patient index data 3 (RAPID3), in two abatacept clinical trials: similar results to Disease Activity Score (DAS28) and other RAPID indices that include physician-reported measures. Rheumatology Oxford 2008;47:345-9.
22. Felson DT, Anderson JJ, Boers M, et al. American College of Rheumatology preliminary definition of improvement in rheumatoid arthritis. Arthritis Rheum 1995;38:727-35.
23. Wolfe F, Michaud K, Pincus T. A composite disease activity scale for clinical practice, observational studies and clinical trials: the patient activity scale (PAS/PAS-II). J Rheumatol 2005;32:2410-5.
24. 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.
25. Pincus T, Sokka T, Kautiainen H. Further development of a physical function scale on a multidimensional Health Assessment Questionnaire for standard care of patients with rheumatic diseases. J Rheumatol 2005;32:1432-9.
26. Yazici Y, Bergman M, Pincus T. Time to score quantitative rheumatoid arthritis measures: 28-joint count, Disease Activity Score, Health Assessment Questionnaire (HAQ), multidimensional HAQ (MDHAQ), and routine assessment of patient index data (RAPID) scores. J Rheumatol 2008;35:603-9.
27. Fransen J, van Riel PLCM. DAS remission cut points. Clin Exp Rheumatol 2006;24:S29-S32.
28. Aletaha D. Pooled indices to measure rheumatoid arthritis activity: a good reflection of the physician's mind? Arthritis Res Ther 2006;8:102-4.
29. Aletaha D, Smolen JS. Remission of rheumatoid arthritis: should we care about definitions? Clin Exp Rheumatol 2006;24:S45-S51.
30. Stucki G, Liang MH, Stucki S, Brühlmann P, Michel BA. A self-administered rheumatoid arthritis Disease Activity Index (RADAI) for epidemiologic research. Arthritis Rheum 1995;38:795-8.
31. Pincus T. A 3-page standard protocol to evaluate rheumatoid arthritis (SPERA): efficient capture of essential data for clinical trials and observational studies. Clin Exp Rheumatol 2005;23:S114-9.
32. Sokka T, Kautiainen H, Toloza S, et al. QUEST-RA: quantitative clinical assessment of patients with rheumatoid arthritis seen in standard rheumatology care in 15 countries. Ann Rheum Dis 2007;66:1491-6.
33. Fries JF, Spitz P, Kraines RG, Holman HR. Measurement of patient outcome in arthritis. Arthritis Rheum 1980;23:137-45.
34. Mason JH, Anderson JJ, Meenan RF, Haralson KM, Lewis-Stevens D, Kaine JL. The Rapid Assessment of Disease Activity in Rheumatology (RADAR) questionnaire: validity and sensitivity to change of a patient self-report measure of joint count and clinical status. Arthritis Rheum 1992;35:156-62.
35. Pincus T, Summey JA, Soraci SA Jr, Wallston KA, Hummon NP. Assessment of patient satisfaction in activities of daily living using a modified Stanford Health Assessment Questionnaire. Arthritis Rheum 1983;26:1346-53.
36. Pincus T, Bergman M, Sokka T, Roth J, Swearingen C, Yazici Y. Visual analog scales in formats other than a 10 cm horizontal line to assess pain and other clinical data. J Rheumatol 2008;35:1550-8.
37. Fuchs HA, Brooks RH, Callahan LF, Pincus T. A simplified twenty-eight joint quantitative articular index in rheumatoid arthritis. Arthritis Rheum 1989;32:531-7.
38. Pincus T. The DAS is the most specific measure, but a patient questionnaire is the most informative measure to assess rheumatoid arthritis. J Rheumatol 2006;33:834-7.
39. Wolfe F, Pincus T, Thompson AK, Doyle J. The assessment of rheumatoid arthritis and the acceptability of self-report questionnaires in clinical practice. Arthritis Care Res 2003;49:59-63.
40. Tugwell P, Wells G, Strand V, et al. Clinical improvement as reflected in measures of function and health-related quality of life following treatment with leflunomide compared with methotrexate in patients with rheumatoid arthritis: Sensitivity and relative efficiency to detect a treatment effect in a twelve-month, placebo-controlled trial. Arthritis Rheum 2000;43:506-14.
41. 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:S69-81.
42. Pincus T, Segurado O. An index based on only patient reported outcome (PRO) measures, without formal joint counts, routine assessment of patient index data (RAPID) classifies patients into 4 severity categories which are similar to Disease Activity Score (DAS28) and clinical Disease Activity Index (CDAI) categories in 4 adalimumab clinical trials [abstract]. Arthritis Rheum 2007;56 Suppl:S705-6.
43. Pincus T, Willoughby J, Sokka T. Clinical improvement over 48 weeks of most rheumatoid arthritis patients treated with 3-5 mg/day prednisone in standard care: documentation using a multi-dimensional Health Assessment Questionnaire (MDHAQ) [abstract]. Arthritis Rheum 2004;50 Suppl:S384.
44. Hart LE, Tugwell P, Buchanan WW, Norman GR, Grace EM, Southwell D. Grading of tenderness as a source of interrater error in the Ritchie Articular Index. J Rheumatol 1985;12:716-7.

45. Lewis PA, O'Sullivan MM, Rumfeld WR, Coles EC, Jessop JD. Significant changes in Ritchie scores. Br J Rheumatol 1988;27:32-6.
46. Klinkhoff AV, Bellamy N, Bombardier C, et al. An experiment in reducing interobserver variability of the examination for joint tenderness. J Rheumatol 1988;15:492-4.
47. Thompson PW, Hart LE, Goldsmith CH, Spector TD, Bell MJ, Ramsden MF. Comparison of four articular indices for use in clinical trials in rheumatoid arthritis: patient, order and observer variation. J Rheumatol 1991;18:661-5.
48. Scott DL, Choy EHS, Greeves A, et al. Standardising joint assessment in rheumatoid arthritis. Clin Rheumatol 1996;15:579-82.
49. Wakefield RJ, Kong KO, Conaghan PG, Brown AK, O'Connor PJ, Emery P. The role of ultrasonography and magnetic resonance imaging in early rheumatoid arthritis. Clin Exp Rheumatol 2003;21:S42-S49.
50. Pincus T, Sokka T. Quantitative measures to assess patients with rheumatic diseases: 2006 update. Rheum Dis Clin North Am 2006;32 Suppl:29-36.
51. Callahan LF, Pincus T, Huston JW III, Brooks RH, Nance EP Jr, Kaye JJ. Measures of activity and damage in rheumatoid arthritis: Depiction of changes and prediction of mortality over five years. Arthritis Care Res 1997;10:381-94.
52. Kvien TK, Mowinckel P, Heiberg T, et al. Performance of health status measures with a pen based personal digital assistant. Ann Rheum Dis 2005;64:1480-4.
53. Pincus T, Wolfe F. An infrastructure of patient questionnaires at each rheumatology visit: Improving efficiency and documenting care. J Rheumatol 2000;27:2727-30.