

THE AMERICAN COLLEGE OF RHEUMATOLOGY 1991 REVISED CRITERIA FOR THE CLASSIFICATION OF GLOBAL FUNCTIONAL STATUS IN RHEUMATOID ARTHRITIS

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Objective. To develop and validate revised criteria for global functional status in rheumatoid arthritis (RA).

Methods. Revised criteria were formulated and tested for criterion and discriminant validity in 325 patients with RA.

Results. The revised criteria developed are as follows: class I = able to perform usual activities of daily living (self-care, vocational, and avocational); class II = able to perform usual self-care and vocational activities, but limited in avocational activities; class III = able to perform usual self-care activities but limited in vocational and avocational activities; class IV = limited in ability to perform usual self-care, vocational, and avocational activities. Usual self-care activities include dressing, feeding, bathing, grooming, and toileting; vocational and avocational activities are both patient-desired and age-, and sex-specific. The distribution

properties of this classification schema were superior to those of the original Steinbrocker criteria. Mean Health Assessment Questionnaire scores were significantly ($P < 0.0001$) different between, and increased across, the 4 classes.

Conclusion. Although there are limitations inherent in the use of global ordinal scales, the American College of Rheumatology revised criteria will be useful in describing the functional consequences of RA. A more detailed quantitative measure of physical disability should be used, however, for optimal monitoring of patients' clinical status in office practice and clinical research.

In 1949, the Committee for Therapeutic Criteria of the New York Rheumatism Association, chaired by Dr. Otto Steinbrocker, published recommendations for a definition of rheumatoid arthritis (RA), classification of stages of RA progression, criteria for therapeutic response of RA disease activity, and classification of functional impairment (1). The classification of functional impairment, subsequently accepted as the American Rheumatism Association (ARA) classification of functional capacity in RA (Table 1), was developed as an adjunct to criteria for staging of RA, for the purpose of classifying patients at entry into therapeutic trials. In addition, it was designed to reflect response to therapy and to provide "... helpful insight into the usefulness of the whole treatment program, which may include such general procedures as physical therapy, rehabilitation measures, psychotherapy, orthopedic corrections, analgesic and constitutional therapy and many others" (1).

The Steinbrocker, or ARA, functional classes, as they are usually called, provide a quick and simple

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Table 1. Classification of functional capacity in rheumatoid arthritis*

Class I	Complete functional capacity with ability to carry on all usual duties without handicaps
Class II	Functional capacity adequate to conduct normal activities despite handicap of discomfort or limited mobility of one or more joints
Class III	Functional capacity adequate to perform only few or none of the duties of usual occupation or of self-care
Class IV	Largely or wholly incapacitated with patient bedridden or confined to wheelchair, permitting little or no self-care

* Steinbrocker criteria; reprinted, with permission, from *Journal of the American Medical Association* (1).

method for classifying functional capacity, and have been widely accepted and extensively used by rheumatologists over the past 40 years. In the last decade, newer approaches to conceptualizing function in patients with arthritis (for review, see ref. 2) have led to the development of several valid and reliable quantitative methods of measuring functional status in these patients (for review, see ref. 3). These self-report questionnaires, which measure physical function and, to various degrees, other aspects of health status including psychological and social well-being, have been used increasingly in clinical research, including clinical trials (4,5), and have been applied in the evaluation and monitoring of individual patients in routine clinical practice (6-8).

Although a detailed self-report questionnaire appears to be the optimal tool for use as an adjunct in the assessment and monitoring of clinical status in patients with RA (8), there are situations, including assessment of disability status, in which a rapid global assessment of functional status by a health professional is useful. Accordingly, in 1988, the Diagnostic and Therapeutic Criteria Committee of the American College of Rheumatology (ACR) appointed a subcommittee, the Subcommittee on Functional Status and Disease Severity in Rheumatoid Arthritis, to review and, if necessary, revise, the original Steinbrocker criteria for functional capacity in RA.

The subcommittee identified several limitations in the Steinbrocker criteria, including 1) the absence of definitions of terms and guidelines for application; 2) the lack of prior validation; and 3) the existing conventional clinical wisdom that the vast majority of patients cluster in functional class II, with few patients with established RA being in class I or IV. Given the

widespread recognition and use of the Steinbrocker criteria, the subcommittee decided to attempt to address these limitations and revise these criteria, with the objective that the revised criteria would be useful for classification of functional status during the clinical evaluation of patients with RA, and possibly for the determination of work disability. A study of adult patients with RA was conducted to validate the revised criteria. Formal testing of intra- and interobserver reliability was not performed.

PATIENTS AND METHODS

Development of revised criteria. The ACR revised criteria for the classification of global functional status were developed using the nominal group method (9). In its deliberations, the subcommittee considered the criteria for evaluating the usefulness of functional assessment instruments, summarized by Bombardier and Tugwell (10), including purpose, content validity (comprehensiveness), face validity (credibility), criterion validity (accuracy), discriminant validity (sensitivity across patients), construct validity (biological sense), and feasibility (11). Addressing these guidelines and the identified limitations in the Steinbrocker criteria noted above, revised criteria for the classification of functional status in RA were formulated (Table 2).

Case recruitment. To validate the revised criteria, consecutive adult patients with RA were studied prospectively beginning in November 1989. Study patients were identified by the 6 subcommittee members, from their respective university and/or private practice settings. All patients fulfilled the ACR 1987 criteria for the classification of RA (12).

Data collection. The 1-page data collection form included questions about sociodemographic factors such as age, sex, marital status, and years of formal education. After interviewing and examining the patient, the physician assigned the functional class based on the original Steinbrocker criteria and the revised criteria. At the same visit,

Table 2. American College of Rheumatology revised criteria for classification of functional status in rheumatoid arthritis*

Class I	Completely able to perform usual activities of daily living (self-care, vocational, and avocational)
Class II	Able to perform usual self-care and vocational activities, but limited in avocational activities
Class III	Able to perform usual self-care activities, but limited in vocational and avocational activities
Class IV	Limited in ability to perform usual self-care, vocational, and avocational activities

* Usual self-care activities include dressing, feeding, bathing, grooming, and toileting. Avocational (recreational and/or leisure) and vocational (work, school, homemaking) activities are patient-desired and age- and sex-specific.

the patient completed the Health Assessment Questionnaire (HAQ) (13).

Statistical analysis. All data forms were mailed to the Arthritis Research and Clinical Center in Wichita, where they were checked for completeness; questions or ambiguities were referred to the original physician for clarification. Data were entered into a database on a microcomputer; error checks were performed, and all errors were corrected. Comparisons between centers for discrete and continuous variables were performed by chi-square test and analysis of variance, respectively. Comparison of HAQ scores with ACR revised global functional class was performed using analysis of variance. Data were analyzed using the Statistical Analysis System (SAS Institute, Cary, NC). *P* values (2-tailed) less than 0.05 were considered significant.

RESULTS

Overall, 325 patients with RA participated in this validation study. Patients ranged in age from 20 to 84 years (mean $\pm$ SD 56.4 ± 13.2 years); 77.8% were female, 68.3% were high school graduates, the mean level of education was 12.2 years, and the mean HAQ score was 1.3 (indicating moderate disability). Some differences in age and sex distribution by center were seen, with the Chicago patient group being older (mean 63.9 years) and having a smaller proportion of females (60%); however, only the difference in age distribution by center was statistically significant ($P = 0.001$). There were no significant differences between centers in the distribution of patients across the Steinbrocker or ACR revised global functional classes, or the mean HAQ score.

Complete information on functional classification by the Steinbrocker criteria and by the ACR revised criteria was available for 323 patients and 324 patients, respectively. The distribution of RA patients by level of functional capacity differed between the Steinbrocker and the ACR revised global functional classifications (Figure 1). As expected, almost 75% of the patients were categorized in Steinbrocker class II, and more than 90% were in classes II and III combined. Only 22 patients (6.8%) were judged to have complete functional ability (class I), and only 5 (1.5%) were largely or wholly incapacitated (class IV), according to the Steinbrocker criteria. In contrast, using the ACR revised criteria, 43 patients (13.3%) were categorized in class I (complete ability to perform all usual activities), 130 (40.1%) were in class II with an equal number in class III, and 21 (6.5%) were in class IV. Thus, although 80% of the patients remained in classes II and III, the distribution became more uni-

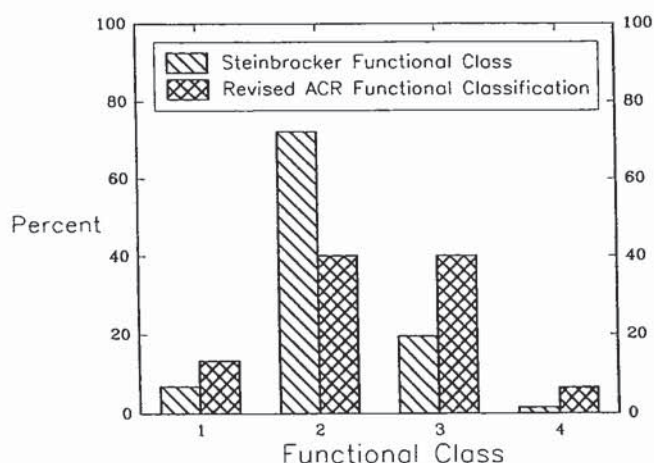


Figure 1. Distribution of rheumatoid arthritis patients by original Steinbrocker and American College of Rheumatology (ACR) revised global functional class. By the Steinbrocker classification, there were 22 patients in class I, 233 in class II, 63 in class III, and 5 in class IV. By the ACR revised classification, there were 43 in class I, 130 in class II, 130 in class III, and 21 in class IV.

form, with more than 10% in class I and more than 5% in class IV.

It was of interest to examine the differences in functional classification of individual patients, with the use of the 2 criteria systems. Of the 233 patients in Steinbrocker class II, 23 (10%) were categorized in class I by the ACR revised criteria, 128 (55%) remained in class II, and 82 (35%) were categorized in class III, indicating more severe functional deficits overall, which were not identified by the original Steinbrocker criteria. Of the 63 patients in Steinbrocker class III, 46 (73%) remained in class III by the new criteria, while 17 (27%) were categorized in class IV, again demonstrating that the new criteria schema is more sensitive in the identification of more severe grades of disability.

Figure 2 presents the distribution of HAQ scores by ACR revised global functional class. The mean HAQ scores were significantly different between the 4 classes, and increased across the 4 classes, demonstrating a correlation between higher HAQ score and greater global functional deficit. This is evidence of the criterion and discriminant validity of the revised global functional classification schema.

DISCUSSION

The ACR revised criteria for global functional status in rheumatoid arthritis represent a useful modification of the original Steinbrocker criteria. The

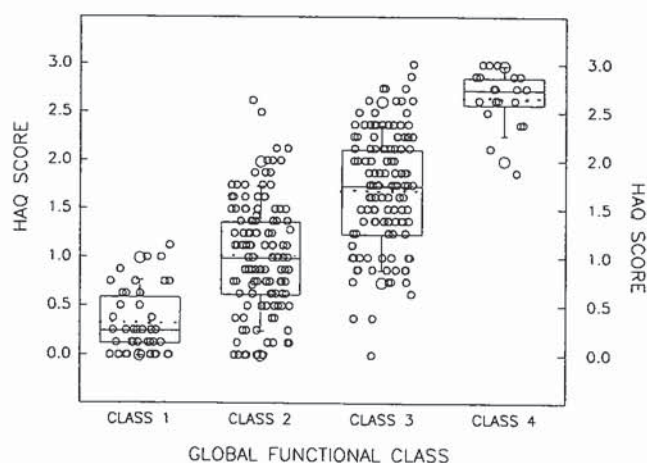


Figure 2. Distribution of Health Assessment Questionnaire (HAQ) scores by American College of Rheumatology revised global functional class. Box plots include the 25th, median (50th), and 75th percentile values; vertical bars represent the 10th and 90th percentile values. Dots within the boxes are the means. Mean HAQ scores by functional class were as follows: class I 0.334, class II 1.023, class III 1.703, and class IV 2.667 ($F = 124.7$, $P < 0.0001$).

revised criteria preserve continuity with the Steinbrocker criteria in that they consist of a 4-point scale, similar to the American Heart Association criteria for functional limitation in patients with organic heart disease, and they provide a quick and easy method for the physician or other arthritis health professional to classify patients. They represent a theoretical improvement over the original criteria and their use results in a more uniform distribution of RA patients by global functional class. They are more sensitive in their ability to identify both complete functional capacity on one end of the spectrum (class I), and more severe limitation in self-care activities on the other (class IV). In addition, by focusing on the patient's ability to perform desired age- and sex-specific vocational activities, the revised criteria should allow better accuracy for determining work disability and may be useful in identifying subjects who are eligible for disability payments from Social Security or other sources.

The conceptual framework of functional capacity that the subcommittee considered during its deliberations was the classification of the consequences of disease proposed by the World Health Organization (WHO) (14). The consequences of disease are classified into impairments, disabilities, and handicaps. Impairment is defined as "any loss or abnormality of psychological, physiological, or anatomical structure or function." It is the disease's consequence at the organ level. Disability is defined as "any restriction or

lack of ability to perform an activity in the manner . . . considered normal for a human being." This represents a disturbance at the level of the person, and arises as either a direct or an indirect consequence of an impairment. Finally, handicap is defined as "a disadvantage for a given individual, resulting from an impairment or disability, that limits or prevents the fulfillment of a role that is normal (depending on the age, sex, and social and cultural factors) for the individual." This is a social consequence for the individual, which results from the impairment and/or disability.

In reviewing the Steinbrocker classification of functional capacity, it was clear that functional capacity was defined as a mixture of impairment and disability. For instance, Steinbrocker class II included a measure of impairment: ". . . handicap of discomfort or limited mobility of one or more joints" (Table 1). The ACR revised criteria for global functional status eliminate the assessment of impairment. The focus has been directed toward limitations in self-care and avocational and vocational activities, all dimensions of disability as defined by the WHO.

Though it is more theoretically sound, there remain problems inherent in combining conceptually disparate entities of self-care, avocational, and vocational activities into a single global scale. When assigning the ordinal grades, the subcommittee adopted the assumption that the progression of functional decline would involve recreational and leisure activities first, work-related activities second, and self-care activities last; this progression does not necessarily pertain to every patient with RA. As noted by Yelin and colleagues, patients with RA lose the ability to perform activities at rates different from those found in osteoarthritis patients and normal age- and sex-matched controls (15). Furthermore, it is likely that physicians and other arthritis health professionals who classify patients may not realize the full spectrum of activities impacted by arthritis or the full extent of the patient's loss. These potential limitations emphasize the complex process required for assigning subjects to a particular functional class and support the subcommittee's recommendation that quantitative measures of physical disability be used in conjunction with the revised global functional status classification, to yield the most accurate as possible description of patients at single time points as well as over a number of visits.

In summary, the subcommittee has revised the criteria for classification of global functional status in patients with rheumatoid arthritis and demonstrated the validity of the new criteria. We suggest that these criteria will be useful for describing the global functional consequences of RA, possibly including the

classification of patients with regard to work disability. For optimal assessment of patients in clinical research and routine clinical practice, however, we recognize the advantages of self-report questionnaires (8), and recommend that the global functional status criteria be used in conjunction with one or more of the many instruments available for quantitative measurement of functional status.

REFERENCES

1. Steinbrocker O, Traeger CH, Batterman RC: Therapeutic criteria in rheumatoid arthritis. *JAMA* 140:659-662, 1949
2. Verbrugge L: Disability. *Rheum Dis Clin North Am* 16:741-761, 1990
3. Liang MH: Evaluation of function and health status in rheumatic diseases in clinical research and office practice. *Postgrad Adv Rheumatol* 3:1-14, 1988
4. Meenan RF, Anderson JJ, Kazis LE, Egger MJ, Altz-Smith M, Samuelson CO Jr, Willkens RF, Solsky MA, Hayes SP, Blocka KL, Weinstein A, Guttadauria M, Kaplan SB, Klippel J: Outcome assessment in clinical trials: evidence for the sensitivity of a health status measure. *Arthritis Rheum* 27:1344-1352, 1984
5. Bombardier C, Ware J, Russell IJ, Larson M, Chalmers A, Read JL, and the Auranofin Cooperating Group: Auranofin therapy and quality of life in patients with rheumatoid arthritis: results of a multicenter trial. *Am J Med* 81:565-578, 1986
6. Wolfe F, Kleinheksel SM, Cathey MA, Hawley DJ, Spitz PW, Fries JF: The clinical value of the Stanford Health Assessment Questionnaire Functional Disability Index in patients with rheumatoid arthritis. *J Rheumatol* 15:1480-1488, 1988
7. Pincus T, Callahan F, Brooks RH, Fuchs HA, Olsen NJ, Kaye JJ: Self-report questionnaire scores in rheumatoid arthritis compared with traditional physical, radiographic, and laboratory measures. *Ann Intern Med* 110:259-266, 1989
8. Wolfe F, Pincus T: Standard self-report questionnaires in routine clinical and research practice: an opportunity for patients and rheumatologists. *J Rheumatol* 18:643-646, 1991
9. Delbecq AL, van de Ven AH, Gustafson DH: *Group Techniques for Program Planning: A Guide to Nominal Group and Delphi Processes*. Glenview, CA, Scott, Foresman, 1975
10. Bombardier C, Tugwell P: Methodological considerations in functional assessment. *J Rheumatol* 14 (Suppl 51):6-10, 1987
11. Liang MH, Jette AM: Measuring functional ability in chronic arthritis: a critical review. *Arthritis Rheum* 24:80-86, 1981
12. Arnett FC, Edworthy SM, Bloch DA, McShane DJ, Fries JF, Cooper NS, Healey LA, Kaplan SR, Liang MH, Luthra HS, Medsger TA Jr, Mitchell DM, Neustadt DH, Pinals RS, Schaller JG, Sharp JT, Wilder RL, Hunder GG: The American Rheumatism Association 1987 revised criteria for the classification of rheumatoid arthritis. *Arthritis Rheum* 31:315-324, 1988
13. Fries JF, Spitz PW, Kraines RG, Holman HR: Measurement of patient outcome in arthritis. *Arthritis Rheum* 23:137-145, 1980
14. Wood PHN: Appreciating the consequences of disease: the international classification of impairments, disabilities, and handicaps. *WHO Chron* 34:376-380, 1980
15. Yelin E, Lubeck D, Holman H, Epstein W: The impact of rheumatoid arthritis and osteoarthritis: the activities of patients with rheumatoid arthritis and osteoarthritis compared to controls. *J Rheumatol* 14:710-717, 1987

