

# The Patient Activity Scale-II Is a Generic Indicator of Active Disease in Patients with Rheumatic Disorders

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**ABSTRACT. Objective.** To determine whether the Patient Activity Scale-II (PAS-II) is a generic measure of disease activity by assessing whether the relationship of PAS-II with treatment decision (indicating disease activity) is invariant across disease.

**Methods.** The Health Assessment Questionnaire-II (HAQ-II), a 10 cm visual analog scale for “pain,” and another for “patient global assessment” were recorded from 1000 consecutive patients attending rheumatology outpatient clinics. Active disease was defined as treatment intensity increased and inactive disease was defined as treatment intensity unchanged or decreased. A logistic regression analysis was conducted with active disease as the dependent variable and the predictor variables were PAS-II, diagnostic category, and the interaction between diagnostic category and PAS-II.

**Results.** PAS-II had a weak but statistically significant association with active disease that was independent of diagnosis. An increase of 1 point in PAS-II increased the odds of being in the active disease state by 1.19 (95% CI 1.10 to 1.37). The relationship between active disease state and PAS was not affected by diagnostic category.

**Conclusion.** PAS-II can be used as a generic self-report indicator of active disease across different rheumatic disorders, and not just in rheumatoid arthritis. The strength of the relationship with disease activity is weak and physician-derived indicators remain very important. (J Rheumatol First Release July 1 2010; doi:10.3899/rheum.100008)

*Key Indexing Terms:*

HEALTH ASSESSMENT QUESTIONNAIRE  
QUESTIONNAIRE

RHEUMATIC DISEASE  
PATIENT ACTIVITY SCALE-II

The Patient Activity Scale-II (PAS-II) is a composite index of disease activity status that combines the Health Assessment Questionnaire-II (HAQ-II)<sup>1,2</sup> and a 10 cm visual analog scale (VAS) for pain and patient global assessment. PAS-II defines levels of clinical activity that adequately predict treatment change and mortality in patients with rheumatoid arthritis (RA)<sup>3</sup>. The PAS-II is essentially equivalent to the Routine Assessment of Patient Index Data 3 (RAPID3), except that the 3 components are combined to range 0 to 30 (rather than averaged to range 0 to 10)<sup>4</sup>. The RAPID3 has been shown to discriminate between active intervention and placebo in clinical trials of RA as well as the Disease Activity Scale<sup>4</sup>. Although it was developed and validated for use in RA, the measures used to construct PAS-II are not specific to RA, so there appears to be the possibility that PAS-II could also be useful in other rheumatic

diseases. The RAPID3 has been used in the clinic in all rheumatic diseases and appears to be helpful, although the published information is mostly descriptive<sup>5</sup>. Our aim was to assess the strength of the relationship between PAS-II and active disease status among all patients attending a regional rheumatology department, and whether this relationship was the same for different disease categories, implying that it could be a useful generic measure.

## MATERIALS AND METHODS

All patients attending the rheumatology outpatient clinics at the Wellington Regional Rheumatology Unit routinely complete a questionnaire, which consists of the HAQ-II and a 10 cm VAS for pain and for patient global assessment. Data were obtained from 1000 consecutive patient visits. The PAS-II score was calculated from these data as:

$$(\text{HAQII} \times 3.33 + \text{Pain} + \text{PtGlob})/3$$

The score ranges from 0 (no disease activity) to 10 (very severe activity). Medical records were reviewed to ascertain the disease activity status for that particular clinic visit. Active disease status was defined as “treatment intensity increased” and inactive disease status was defined as “treatment intensity unchanged or decreased.” Patients for whom treatment changed because of side effects were excluded from this analysis since disease activity status was indeterminate. Data were also collected on the demographic details (age, sex) and disease diagnosis. The disease diagnoses were divided into 5 diagnostic categories (RA, other inflammatory arthritis, autoimmune connective tissue diseases, noninflammatory arthritis, and others). “Other inflammatory arthritis” consisted of ankylosing spondylitis, psoriatic arthritis, gout, and other inflammatory arthritis. “Noninflammatory group” consisted of osteoarthritis and fibromyalgia syndrome.

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“Autoimmune connective tissue” diseases included systemic lupus erythematosus, systemic sclerosis, and undifferentiated connective tissue diseases. “Others” included conditions such as polymyalgic syndrome, inflammatory myositis, Sjögren’s syndrome, Behçet’s disease, and plantar fasciitis.

A logistic regression analysis was conducted with active disease status as the dependent variable and the predictor variables being PAS-II, diagnostic category, and the interaction between diagnostic category and PAS-II. Only the first visit values were used for patients with more than 1 visit (patients rather than visits were the unit of analysis). In a separate regression analysis, each component of the PAS-II composite (VAS for pain, VAS for global assessment, and HAQ-II) was analyzed as an independent predictor of active disease state, to evaluate whether any 1 particular component contributed in predicting disease activity status. A receiver-operating characteristic (ROC) curve was plotted for sensitivity and 1 — specificity for every value of PAS-II in predicting active disease status. The area under the curve (AUC) indicated the strength of the association between PAS-II and active disease status.

We did not adjust for sex and age in any of these analyses since the objective of our study was to determine whether the PAS-II score varied in its relationship with treatment decision across different diseases. Since the different diseases also have different age-sex profiles, adjustment of patient-reported outcome scores by age and sex would have confounded interpretation of the relationship of interest. Moreover, since there are no accepted means of reporting age-sex adjusted scores of the components of the PAS-II for use in clinical practice, it is very difficult to construct a PAS-II score that takes this into account.

RESULTS

Data were collected on 1000 consecutive patient visits in which complete PAS-II questionnaires were available, between July 2004 and June 2008. Of these, 883 were first visits (i.e., first within the study period, and may have been new or return patients), and these patients were selected for further analysis. Sixty-nine percent were women. The mean (SD) age was 55.5 (15.7) years. The numbers of patients in each diagnostic category were 295 (33%) RA, 272 (31%) other inflammatory arthritis, 75 (8.5%) noninflammatory disorders, 109 (12%) autoimmune connective tissue diseases, and 132 (15%) other diseases.

Active disease status was observed in 472 patients (54%). There were 25 patients (2.8%) excluded because of indeterminate disease activity status. Disease activity status for each disease category is shown in Table 1. The distribution of PAS-II scores for active compared to inactive disease status is shown in Figure 1. Average (SD) scores for the

PAS-II components were 4.1 (2.8) for pain, 3.8 (2.6) for patient global assessment, and 0.86 (0.65) for HAQ-II.

The results of the logistic regression analysis are shown in Table 2. PAS-II was independently associated with disease activity status (OR 1.19, 95% CI 1.07–1.33) and there was no significant interaction between diagnostic category and PAS-II (p = 0.12).

The ROC curve plots the sensitivity and 1 — specificity for every value of PAS-II in predicting active disease status. The AUC is 0.63 (95% CI 0.60 to 0.67), which indicates that PAS-II statistically significantly discriminates between active and inactive disease states, but not accurately.

Logistic regression analysis was conducted for each component of the PAS-II composite score. The dependent variable was disease outcome, and independent variables were VAS for pain, patient global assessment, and HAQ-II. The results showed that VAS for pain and HAQ-II were the most important contributing factors. The OR for pain was 1.17 (95% CI 1.08–1.26) and for HAQ-II was 1.33 (95% CI 0.98–1.80). The patient global assessment contributed no significant additional value (OR 0.98, 95% CI 0.89–1.07).

DISCUSSION

PAS-II is a composite index that combines 3 generic patient-reported measures. Our study shows that there is a statistically significant relationship between PAS-II and active disease status, confirming the validity of the instrument. The strength of the association between disease activity and PAS-II was not affected by diagnostic category, confirming that it is a generic instrument, valid for rheumatic diseases other than RA.

There are certain limitations to our study. Disease activity status was defined by treatment decision, which can be affected by patient and physician preferences, and treatment availability, as well as by disease activity. Nonetheless, this gold standard has been used to construct other disease activity measures in rheumatology, particularly the Disease Activity Score<sup>6</sup>.

The data suggest that PAS-II could be used more widely across different rheumatic diseases. The PAS-II score is simple and easy to implement. In addition to its use in clinical

Table 1. Frequency of treatment decisions and values of PAS-II components in each disease category.

Category	Treatment Decision, n (%)			Change Because of Side Effects	HAQ-II, mean (SD)	Pain, mean (SD)	Patient Global, mean (SD)
	No Change	Increased Intensity	Decreased Intensity				
Rheumatoid arthritis	118 (40.0)	140 (47.5)	28 (9.5)	9 (3.1)	0.95 (0.65)	4.11 (2.78)	3.78 (2.58)
Other inflammatory arthritis	116 (42.6)	131 (48.2)	15 (5.5)	10 (3.7)	0.77 (0.62)	4.06 (2.78)	3.86 (2.63)
Noninflammatory disorder	37 (49.3)	36 (48.0)	2 (2.7)	0 (0.0)	1.06 (0.65)	5.18 (2.58)	4.75 (2.51)
Autoimmune connective tissue disease	55 (50.5)	40 (36.7)	10 (9.2)	4 (3.7)	0.70 (0.59)	3.56 (2.80)	3.73 (2.65)
Other	60 (45.5)	40 (30.3)	30 (22.7)	2 (1.5)	0.84 (0.69)	3.93 (3.03)	3.54 (2.63)

PAS: Patient Activity Scale; HAQ: Health Assessment Questionnaire.

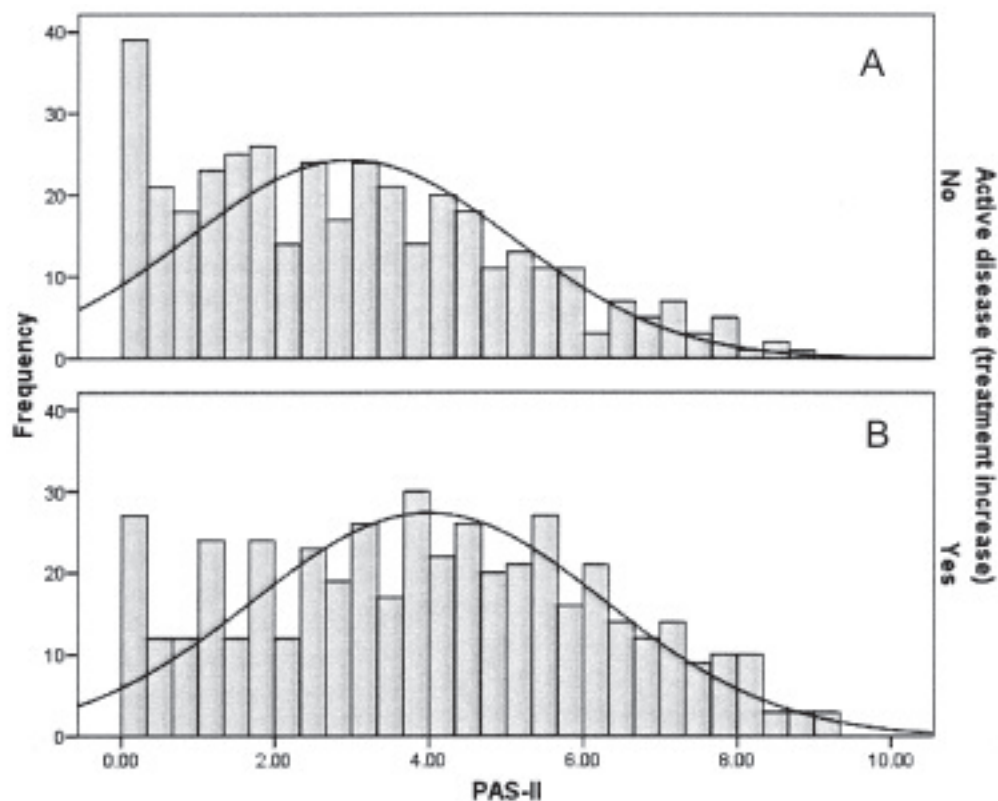


Figure 1. Distribution of PAS-II scores for patients without active disease (A) and with active disease (B; normal curve superimposed).

Table 2. Logistic regression analysis for active disease status as a function of PAS-II, diagnostic group, and the interaction term (-2log-likelihood 1123, model chi-square fit 50.7 with 3 degrees of freedom,  $p < 0.001$ ).

	p	OR (95% CI)
PAS-II	0.002	1.19 (1.07 to 1.33)
Diagnostic group*	0.090	
Other IA	0.099	0.57 (0.29 to 1.11)
Noninflammatory	0.033	0.26 (0.07 to 0.90)
Connective tissue disorders	0.280	0.64 (0.28 to 1.45)
Other	0.723	1.15 (0.54 to 2.45)
Diagnostic group $\times$ PAS-II	0.120	
Other IA by PAS-II	0.098	1.16 (0.97 to 1.37)
Noninflammatory by PAS-II	0.169	1.20 (0.93 to 1.56)
Connective tissue disorders by PAS-II	0.827	1.02 (0.83 to 1.27)
Other by PAS-II	0.217	0.91 (0.76 to 1.10)
Constant	0.339	0.77

\* Reference category is "rheumatoid arthritis". PAS: Patient Activity Scale; IA: inflammatory arthritis.

studies or routine clinical practice, the generic properties suggest that the PAS-II could be used to compare disease activity across different rheumatic diseases.

The major limitation to the more general use of the PAS-II is the relatively poor discrimination in distinguishing between patients with active disease and those with inactive disease. It is possible that this could be improved by the

addition of disease-specific modules (for example, joint count in RA) or other generic patient-reported factors, such as fatigue.

## REFERENCES

1. Fries JF, Spitz PW, Young DY. The dimensions of health outcomes: the Health Assessment Questionnaire, disability and pain scales. *J Rheumatol* 1982;9:789-93.
2. Wolfe F, Michaud K, Pincus T. Development and validation of the Health Assessment Questionnaire II. A revised version of the Health Assessment Questionnaire. *Arthritis Rheum* 2004; 50:3296-305.
3. 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.
4. Pincus T, Strand V, Koch G, Amara I, Crawford B, Wolfe F, et al. An index of the three core data set patient questionnaire measures distinguishes efficacy of active treatment from that of 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.
5. Pincus T, Askana AD, Swearingen CJ. A multi-dimensional Health Assessment Questionnaire (MDHAQ) and Routine Assessment of Patient Index Data (RAPID3) scores are informative in patients with all rheumatic diseases. *Rheum Dis Clin North Am* 2009;35:819-27.
6. van der Heijde DM, van 't Hof M, van Riel PL, van de Putte LB. Development of a disease activity score based on judgment in clinical practice by rheumatologists. *J Rheumatol* 1993;20:579-81.