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Quality of Life Assessment: a Comparison of Four Questionnaires: for Measuring Improvements after Total Hip Replacement

M. BORSTLAP, J.L. ZANT, R.M. VAN SOESBERGEN, J.K. VAN DER KORST

Summary **Three experimental questionnaires were compared with the Influence of Rheumatic Diseases on Health and Lifestyle (IRGL) questionnaire, a Dutch version of the Arthritis Impact Measurement Scales. Sixty-two patients with osteoarthritis (OA) and 35 patients with rheumatoid arthritis (RA), all of whom underwent hip arthroplasty, completed the study.**

Results showed that visual analogue scales for pain, stiffness, fatigue, and anxiety were strongly correlated with a number of the IRGL scales.

Patient preference scales were sensitive to change and provided additional information on aspects of the patients' quality of life (QOL) that were felt to be important by the patients themselves. The questionnaire on performance in various roles in life was insensitive to change.

In existing questionnaires, there is an attempt to represent the concept of QOL in terms of its most important aspects. Such realizations of the concept of QOL are not entirely suitable for application in clinical trials. The IRGL is overly complex, and its sometimes comprehensive scales do not deal with the possible effects of treatment. Neither of these properties is conducive to sensitivity to change. Visual analogue scales reduce the complexity. A simpler representation of QOL that can evaluate aspects relevant to treatment is recommended.

Key words **Total Hip, AIMS, Visual Analogue Scales, Rheumatoid Arthritis, Osteoarthritis**

INTRODUCTION

There is a growing interest in quality of life (QOL) as a measure of outcome (1,2). Generic QOL questionnaires, such as the Sickness Impact Profile (SIP), the Nottingham Health Profile (NHP), and the McMaster Health Index Questionnaire (MHIQ), were developed to put this concept into effect (3-5). These are appropriate for comparing or discriminating among populations with different diseases (6). There have, for example, been comparative studies of patients with rheumatoid arthritis (RA), with either other chronic diseases or healthy subjects (7,8). It has also been recommended that the concept of QOL be used to evaluate the effects of treatments in clinical research (9). Generic QOL instruments may, however, fail to take important aspects of particular diseases into account. For patients suffering from rheumatic diseases, for example, pain requires additional attention (10). QOL measurements that deal with specific diseases or disease groups, such as the Arthritis Impact Measurements Scales (AIMS) for rheumatic diseases, have been developed to meet such needs (11). Feinstein, however, has drawn attention to certain potential problems with these instruments (12). They fail to take patients' individual preferences into account and are susceptible to unsatisfactory application. The latter is due in part to their complexity.

The multi-dimensional IRGL (Influence of Rheumatic Diseases on Health and Lifestyle), a Dutch version of the AIMS, has been used to investigate the effects of total hip replacement on QOL (13). The dimensions measured are of general importance, but there is no opportunity for patients to indicate which elements are of particular importance to their own QOL. These may not even be included in the questionnaire as it stands. Aspects of QOL, such as important aims or effects of treat-

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From the Jan van Breemen Institute, Centre for Rheumatology and Rehabilitation, Dr. Jan van Breemenstraat 2, 1056 AB Amsterdam, The Netherlands.

ment, may be missing or go unrecognized in the comprehensive scales of the IRGL questionnaire. With these difficulties in mind, we put forward the following questions.

Firstly, how informative are relatively simple visual analogue scales (VAS) for pain, stiffness, fatigue, and tension/anxiety in comparison to the IRGL? These four scales were chosen, because they assess the most commonly reported complaints of patients with rheumatic diseases (14). Secondly, how informative are questionnaires concerning individual patient preferences? We chose the MACTAR (McMaster Toronto Arthritis) to measure patient preferences (15). We also investigated the applicability of patient performance in several roles in life (16) as a representation of QOL.

PATIENTS AND METHODS

From April 1989 to September 1990, patients from 7 hospitals who had osteoarthritis (OA) or RA and were waiting for a first total hip replacement were enrolled in the study. Each of them was examined at home four times by the same observer (MB). The first of these visits took place two weeks before the operation; the follow-up visits, 3, 6 and 12 months after the operation.
At each visit, 4 questionnaires were completed:

- the IRGL, a multi-dimensional instrument (13). On the basis of the study of Liang et al. comparing five health status instruments for arthritis research and on the basis that only one of these was available as a reliable and validated Dutch version, we have chosen for the IRGL, a Dutch version of the AIMS (13, 27). Physical well-being is assessed by questions regarding mobility, self-care, and pain; psychological well-being or mood: by anxiety, depression, and cheerfulness. Social well-being is subdivided in social network indices (number of friends and number of contacts in neighbourhood) and social support scales (potential support, actual support, and mutual visits). In addition, an impact scale assesses the influence of rheumatic diseases on various areas of daily life.
- VAS for pain, stiffness, fatigue, and tension/anxiety, measured from 0 to 10. The lower the score, the more favourable the patient's condition.
- MACTAR (15): patients were asked to name 5 preferences, i.e. activities or functions which they most hope will improve after the operation. Tugwell suggested that a similar instrument that used VAS for scoring would be even more sensitive. We have followed Tugwell's suggestion and evaluated preferences on an 11-point VAS scale before and 12 months after the operation. The scores were reduced to a single patient preference score according to the method of Tugwell (16).
- the Groningen Social Roles Questionnaire, in which the patient evaluates the fulfillment of 8 roles (17), in self-care, in daily activities in the home, as a partner, as a parent, as a member of the extended family, as a citizen, as a friend and neighbour, and at work. Patients estimated their performance on 11-point visual analogue scales.

Statistics

To compare the informativeness of the VAS with that of the IRGL, we drew up a correlation table and carried out a factor analysis. The latter was used to investigate the conceptual relationships between the VAS and IRGL. The analyses require a normal distribution. Where this condition was not fulfilled, the variables were normalized by taking their natural logarithm (18).

To appraise the patient preference questionnaire, nonparametric methods were used to analyze results pre- and postoperatively (19).

RESULTS

Sixty-two OA patients and 35 RA patients completed the study. The characteristics of the participating patients are described in detail (20). The RA patients had an average age of 61 years; the OA patients were on average nearly 9 years older. The two groups were comparable with respect to marital status and education. Eighty-four percent of the OA group, but only 66% of the RA group, consisted of women. Mean disease duration in the RA group was 10.2 years. Rheumatoid factor was positive in 74% of the RA patients; erosions were found in 91%; and 86% were assigned to Steinbrocker class III or IV.

Comparison of VAS with IRGL

IRGL: Pain and mobility scores improved significantly in both OA and RA groups following total hip replacement. The OA patients' mood also improved significantly, while the RA group showed only a favourable tendency in this respect. The impact of OA had almost disappeared, but the impact of RA was scarcely diminished. Arthroplasty had no effect on the social dimension in either group (20).

Visual Analogue Scales: Before surgical intervention, the two groups gave their symptoms nearly identical scores (Table I). Afterwards, the scores indicated more marked

Table I: *Visual analogue scales, representing 'main complaints' of the rheumatic diseases, on 11-point scales, statistics Friedman test.*

OA (n-62)	Pre- operative	3 months	6 months	12 months	
	mean SD	mean SD	mean SD	mean SD	p
Pain	6.3±2.5	3.6±2.7	3.4±2.7	3.2±2.7	<.0001
Stiffness	6.6±2.3	3.9±2.6	3.9±2.6	3.6±2.9	<.0001
Fatigue	6.2±2.6	4.0±2.6	4.4±3.0	4.0±2.9	.0001
Anxiety	4.8±3.1	3.1±2.6	3.1±2.5	3.1±2.9	.001
RA (n=35)	Pre- operative	3 months	6 months	12 months	
	mean SD	mean SD	mean SD	mean SD	p
Pain	6.3±2.2	4.5±2.5	4.0±2.4	4.0±2.6	.01
Stiffness	6.5±2.2	4.5±2.5	4.0±2.5	3.9±2.8	.0007
Fatigue	5.8±2.5	5.1±2.7	4.6±2.5	4.7±2.9	.30
Anxiety	4.5±2.6	2.8±2.0	3.2±2.7	3.4±2.7	.28

Table II: *Correlations between IRGL scales and the four visual analogue scales, in which scores of the OA and RA patients were combined.* **=p<.01, **=p<.001*

VAS	Pain	Stiffness	Fatigue	Anxiety
IRGL				
Mobility	-.04	-.13	-.33*	-.13
Self care	-.16	.02	-.16	-.24
Pain	.69**	.49**	.31*	.31*
Anxiety	.01	.07	.35**	.47**
Depression	-.09	-.02	.08	.20
Cheerful mood	.17	-.21	-.17	-.33**
# Neighbours	-.04	.11	.06	-.00
# Friends	.05	.16	-.05	-.01
Potential support	.39**	.14	.03	.11
Actual support	.04	-.01	-.03	-.02
Mutual visits	.10	.10	-.07	.04
Impact	.19	.16	.47**	.06

Table III: *Factor analysis after varimax rotation on IRGL scales and four VAS scales, in which scores of the OA and RA patients were combined. Only loadings greater than 0.50 are shown.*

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
VAS:						
Pain	.88					
Stiffness	.59					
Fatigue				.69		
Anxiety		.60				
IRGL:						
Mobility				-.51	-.56	
Self care					-.68	
Pain	.81					
Anxiety		.87				
Depression		.56			.58	
Cheerful mood		-.77				
# Friends			.67			
# Neighbours			.71			
Potential support					.52	
Actual visits						.81
Mutual visits			.72			
Impact				.76		

improvement in the OA group; patients achieved a favourable level in that group one year after the operation. There was significant improvement in the scores for each of the four items in the OA group, but only for pain and stiffness in the RA group.

The scores of all four VAS scales had normal distributions. The distributions for the depression scale, number of friends, and number of neighbours were skewed to the right with skewness > 1. The skewness of these variables was reduced to less than 1.0, the margin required for Pearson correlations and the subsequent factor analysis, by taking their natural logarithms (18).

There were several significant correlations between IRGL scales and VAS scales (Table II). The IRGL pain scale correlated with each of the VAS scales. The strongest of these correlations was 0.69 with the VAS pain scale. The IRGL anxiety scale correlated with the VAS fatigue and anxiety scales. Fatigue was significantly correlated with the IRGL mobility and pain scales and also with the IRGL anxiety and disease impact scales. The VAS anxiety scale was significantly associated with anxiety, cheerfulness, and pain scales of the IRGL. The IRGL potential support scale and VAS pain scale were also correlated.

Factor analysis was performed on the variables of the IRGL and VAS, and 6 factors with values greater than 1 were identified. These accounted for approximately 70% of the total variance (Table III). The two pain scales had their greatest loading on the first factor. The loading of VAS stiffness on the first factor was 0.59. VAS anxiety and the IRGL moods, depression, cheerfulness, and anxiety, had their loading on the second factor. The fatigue VAS scale, together with the IRGL mobility and impact scales formed an 'activities undermining' factor. Fac-

Table V: *Life roles questionnaire. Statistical analysis: Friedman nonparametric analysis, @ achieved statistical significance (p< =0.01).*

OA	Pre-oper Mean SD	3 months Mean SD	6 months Mean SD	12 months Mean SD	p
Self care	7.9 ± 2.1	8.1 ± 2.5	8.3 ± 2.0	8.9 ± 1.7	.30
Daily activities at home	5.9 ± 3.0	6.3 ± 3.0	7.4 ± 2.4	7.5 ± 2.8	.08
Being a member of the family	7.3 ± 2.7	8.1 ± 2.5	7.9 ± 1.8	8.5 ± 1.6	.54
Being a partner	5.3 ± 3.7	6.4 ± 3.8	6.4 ± 3.7	7.1 ± 3.6	.65
Being a parent	7.0 ± 3.5	7.8 ± 3.1	7.6 ± 2.7	8.7 ± 2.0	.49
Being a citizen	6.0 ± 3.0	6.3 ± 2.6	6.7 ± 2.1	7.1 ± 2.3	.35
Relationships with friends and neighbours	5.7 ± 2.7	6.6 ± 2.2	7.0 ± 2.0	7.5 ± 2.2	.02
Work @	4.4 ± 2.8	5.3 ± 2.8	6.0 ± 2.7	6.5 ± 2.5	.001
RA	**Pre-oper Mean SD**	**3 months Mean SD**	**6 months Mean SD**	**12 months Mean SD**	**p**
Self care	6.8 ± 2.8	7.8 ± 2.2	7.7 ± 1.8	7.6 ± 2.6	.52
Daily activities at home	6.1 ± 2.8	6.7 ± 2.3	7.2 ± 1.9	6.8 ± 2.3	.26
Being a member of the family	6.6 ± 2.2	7.4 ± 1.8	7.9 ± 1.9	7.9 ± 1.5	.04
Being partner	5.3 ± 3.7	5.3 ± 3.8	8.1 ± 1.5	7.6 ± 1.5	.09
Being a parent	7.0 ± 3.4	7.2 ± 2.9	8.3 ± 2.0	7.9 ± 2.1	.19
Being a citizen	5.5 ± 2.3	6.1 ± 2.4	6.2 ± 2.5	5.9 ± 2.1	.47
Relationships with friends and neighbours	5.8 ± 2.6	6.5 ± 2.1	7.0 ± 1.8	6.7 ± 2.1	.10
Work @	3.5 ± 2.8	5.6 ± 2.6	5.1 ± 2.8	4.8 ± 2.8	.01

Table IV: Individual preferences. Wilcoxon sign rank test.

	Pre-operative Mean SD	12 months Mean SD	p
Pref OA (n=62)	2.1 2.1	6.8 3.0	<.0001
Pref RA (n=35)	2.2 1.9	6.2 3.0	<.0001

tors 3 (social contacts), 5 (feeling of dependence) and 6 (actual social support) were formed from IRGL scales only.

Appraisal of the individual patient preferences questionnaire OA and RA patients indicated personal preferences that were for the most part related to their physical and social functioning. The items showed considerable uniformity across the two groups and are actually represented in the IRGL. Nearly all patients included alleviation of pain and improvement in walking among their preferences. The corresponding scores demonstrated a considerable resemblance between the OA and RA groups (Table IV). In both, the mean preference value shifted significantly from approximately 2 preoperatively to more than 6 one year after the operation.

Both OA and RA groups showed a favourable tendency in all roles in life (Table V). The improvement in the OA group was continuous during the year following the operation, while in the RA group the values appeared to decline from 6 months postoperatively. However, the only significant improvement in role fulfillment in either group was in the work role. In view of the patients' ages, 'work' was apparently interpreted as 'obligatory tasks'.

DISCUSSION

It did not appear practicable to operationalize QOL as 'performance in various roles in life at the level of individual preference', owing to the low sensitivity of the latter. It has also been argued that items for therapy evaluation should not be made so vague or general that they present clinicians with difficulties of interpretation (21).

The difference between the pre- and postoperative values for individual preferences is great in both OA and RA groups. There was, thus, a marked improvement in issues that were of momentary importance to the patients' QOL. The value of this measurement does not lie in the number of issues with which the IRGL is supplemented, but in the stress placed on the items that the patients themselves feel to be relevant. In a study by Tugwell, however, more than 30% of these items were not included in either the MHIQ or the Lee Functional Index (functional index in rheumatoid arthritis) (17).

Simpler measures would be easier to interpret and could increase the clinical utility of existing QOL questionnaires (22). Huskisson stated that visual analogue scales provide a reliable method of measuring pain severity (23). In this study, pain scale of the VAS correlated strongly with that of the IRGL and, therefore, appears to be a valid alternative. The IRGL anxiety scale had a fairly high correlation with that of the VAS. The impact dimension of the IRGL, which indicates the amount of restriction that patients with rheumatic diseases find in performing certain activities in various areas of life, was associated with the VAS fatigue scale.

Remarkably, VAS stiffness did not have a highly negative correlation with IRGL mobility, but appeared to reflect pain. A reduction in the complexity of the IRGL might be achieved by replacing the appropriate IRGL scales with our VAS scales and adding further VAS scales as necessary to cover all relevant IRGL scales.

Another disadvantage that we have encountered in instruments like the IRGL is the presence of scales that are irrelevant to the evaluation of hip joint surgery (20). In the present study, patients were unable to see any connection between questions about the numbers of their neighbours or friends and the surgical intervention. In our study, the social dimension did not appear to respond to therapy, whereas specific social items listed among the patient preferences improved markedly.

Other studies have brought out more aspects of the QOL of RA patients: internal control over disease, feelings of isolation, feelings of dependence, feelings of being understood by medical attendants or others, and income (14, 24, 25). Any one of these items could be of interest in the appropriate setting. One noteworthy result of our factor analysis is that the factor formed by low mobility, low self care, high depression, and high potential support appears to reflect feelings of dependence.

Despite complexity, and absence of specific patient preferences, the QOL questionnaire used here has brought important changes in nonsomatic dimensions to light (20). Certain adaptations of and additions to the IRGL could be recommended. The use of VAS scales decreases complexity and so facilitates interpretation. It is useful to include items and register patient preferences. This has been done in the new version of the AIMS, AIMS 2 (26).

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REFERENCES

1. Bergner, M. Measurement of health status. Med Care 1985, 23, 696-704.
2. Bell, M.J., Bombardier, C., Tugwell, P. Measurement of functional status, quality of life, and utility in rheumatoid arthritis. Arthritis Rheum 1990, 33, 591-601.
3. Bergner, M., Bobbitt, R.A., Carter, W.B. The Sickness Impact Profile: development and final revision of a health status measure. Med Care 1981, 19, 787-805.
4. Hunt, S., McKenna, S., McEwen, J., Williams, J., Papp, E. The Nottingham Health Profile: subjective health status and medical consultations; Soc Sci Med 1981, 15A, 221-229.
5. Chambers, L.W., MacDonald, L.A., Tugwell, P., Buchanan, W.W., Kraag, G. The McMaster Health Index questionnaire as a measure of quality of life for patients with rheumatoid arthritis. J. Rheumatol, 1982, 9, 780-784.
6. Walker, S.R., Rosser, R.M. Quality of Life: Assessment and Application. London, MTP press 1988, 205-222.
7. Mason, J.H., Weener, J.L., Gertman, P.M., Meenan, R.F. Health status in chronic disease: A comparative study of rheumatoid arthritis. J. Rheumatol 1983, 10, 763-768.
8. Ahlmen, E.M., Bengtsson, C.B., Sullivan, B.M., Bjelle, A. A comparison of overall health between patients with rheumatoid arthritis and a population with and without rheumatoid arthritis. Scand J Rheumatol 1990, 19, 413-421.
9. Meenan, R.F., Anderson, J.J., Kazis, L.E., Egger, M.J., Altz-Smith, M., Samuelson, C.O., Willkens, R.F., Solsky, M.A., Hayes, S.P., Blocka, K.L., Weinstein, A., Guttadauria, M., Kaplan, S.B., Klippel, J. Outcome assessment in clinical trials; Evidence for the sensitivity of health status measure. Arthritis Rheum 1984, 27, 1344-1352.
10. Kazis, L.E., Meenan, R.F., Anderson, J.J. Pain in the rheumatic diseases; investigation of a key health status component. Arthritis Rheum 1983, 26, 1017-1022.
11. Meenan, R.F., Gertman, P.M., Mason, J.H., Dunaif, R. The arthritis impact measurement scales; further investigations of a health status measure. Arthritis Rheum 1982, 25, 1048-1053.
12. Feinstein, A.R., Josephy, B.R., Wells, C.K. Scientific and clinical problems in indexes of functional disability. Ann Intern Med 1986, 105, 413-420.
13. Huiskes, C.J.A.E., Kraaimaat, F.W., Bijlsma, J.W.J. Development of a self-report questionnaire to assess the impact of rheumatic diseases on health and lifestyle. J Rehabilitation Sciences 1990, 3, 65-70.

14. de Witte, L.P., Tilli, D.J.P., Ticheler, A.J.G., Winants, B.A.C., van der Horst, F.G., van der Linden, Sj. Leven met een reumatische aandoening. Hoensbroek, 1989.
15. Tugwell, P., Bombardier, C., Buchanan, W.W., Goldsmith, C., Grace, E., Hanna, B. The MACTAR patient preference disability questionnaire: an individualized functional priority approach for assessing improvement in physical disability in clinical trials in rheumatoid arthritis. J Rheumatol 1987, 14, 446-451.
16. Tugwell, P., Bombardier, C., Buchanan, W.W., Goldsmith, C., Grace, E., Benneth, K.J., Williams, H.J., Egger, M., Alarcon, G.S., Guttadauria, M., Yarboro, C., Polisson, R.P., Szydlo, L., Luggen, M.E., Billingsley, L.M., Ward, J.R., Marks, C. Methotrexate in rheumatoid arthritis, impact on quality of life assessed by traditional standard-item and individualized patient preference health status questionnaires. Arch Intern Med 1990, 150, 59-62.
17. Wiersma, D., de Jong, A., Ormel, J., Kraaijkamp, H.J.M. De Groningse sociale beperkingenschaal; manual (handleiding). Rijksuniversiteit Groningen 1986.
18. de Jonge, H., Rumke, C.L., van Strik, R. Medische Statistiek (medical statistics). Free University of Amsterdam 1981.
19. Siegel, S., Castellan, N.J. Jr. Nonparametric statistics for the behavioral sciences, 1988.
20. Borstlap, M., Zant, J.L., van Soesbergen, R.M., van der Korst, J.K. Effects of total hip replacement on quality of life in patients with osteoarthrosis and patients with rheumatoid arthritis. Clin Rheumatol 1994, 13, 45-50.
21. de Neeling, J.N.D. Quality of Life: Het onderzoek naar welzijnseffecten van medische behandelingen. Utrecht, Bunge, 1991.
22. Kazis, L.E., Callahan, L.F., Meenan, R.F., Pincus, T. Health status reports in the care of patients with rheumatoid arthritis. J Clin Epidemiol 1990, 43, 1243-1253.
23. Huskisson, E.C. Measurement of pain. J Rheumatol 1982, 9, 768-769.
24. Hekert, J. Semi-structured interviews in 10 patients with rheumatoid arthritis. (not published).
25. Burckhardt, C.S. The impact of arthritis on quality of life. Nurs Res 1985, 34, 11-16.
26. Meenan, R.F., Mason, J.H., Anderson, J.J., Guccione, A.A., Kazis, L.E. AIMS 2. The content and properties of a revised and expanded arthritis impact measurement scales health status questionnaire. Arthritis Rheum 1992, 35, 1-10.
27. Liang, M.H., Larson, M.G., Cullen, K.E., Schwartz, J.A. Comparative measurement efficiency and sensitivity of five health status instruments for arthritis research. Arthritis Rheum 1985, 28, 542-547.

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Correspondence to: Dr. J.L. ZANT, Jan van Breemen Institute, Jan van Breemenstr. 2, 1056 AB Amsterdam, THE NETHERLANDS.