

ORIGINAL REPORT

## IMPACT OF MULTIMORBIDITY ON FUNCTIONING: EVALUATING THE ICF CORE SET APPROACH IN AN EMPIRICAL STUDY OF PEOPLE WITH RHEUMATIC DISEASES

Gert Jan Wijnhuizen, PhD<sup>1</sup>, Rom J. M. Perenboom, PhD<sup>1</sup>, Francisca Galindo Garre, PhD<sup>1</sup>, Yvonne F. Heerkens, PhD<sup>2</sup> and Nico van Meeteren, PhD<sup>1</sup>

From the <sup>1</sup>TNO, Leiden and <sup>2</sup>Dutch Institute of Allied Health Care, HAN University, Leiden, The Netherlands

**Objective:** Chronic conditions can lead to considerable deterioration in functioning. Several condition-specific Core Sets, selections of categories from the International Classification of Functioning, Disability and Health (ICF), have been developed to facilitate the rehabilitation process. Considering the increase in patients with more than one specific condition, we evaluated the impact of multimorbidity on functioning and the implications for the Core Set approach.

**Design:** Internet survey.

**Subjects:** A total of 127 people with a rheumatic disease and 707 people with rheumatic disease and multimorbidity were included.

**Methods:** Self-report information on chronic conditions and perceived functioning using the IMPACT-S (ICF Measure of Participation and Activities Screener) questionnaire, measuring the ICF component activities and participation (32 items).

**Results:** The mean number of reported serious limitations/restrictions was 5.6 (standard deviation (SD) 5.7) for respondents with rheumatic disease and 6.7 (SD 6.8) for respondents with rheumatic disease and multimorbidity ( $p < 0.05$ ). Seventeen items were relevant (more than 20% of the respondents reported serious limitations/restrictions) for individuals with rheumatic disease and multimorbidity, and 12 items were relevant for individuals with rheumatic disease only.

**Conclusion:** Multimorbidity seriously aggravates the already existing functioning problems of people with rheumatic disease. We recommend that in the ICF Core Set approach more emphasis is given to systematic empirical analysis of the impact of multimorbidity on functioning.

**Key words:** rheumatic disease; multimorbidity; functioning; ICF; Core Set.

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Correspondence address: Rom Perenboom, TNO, NL-2333AL Leiden, The Netherlands. E-mail: rom.perenboom@tno.nl

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the International Classification of Functioning, Disability and Health (ICF) (16), including Core Sets for rheumatoid arthritis (8, 10, 11). A Core Set is a selection of the categories of the ICF that are relevant to describe the functioning of patients with a specific condition. Core Sets are developed by clinical experts using a qualitative iterative consensus approach for each specific condition. They include categories from the ICF components of Body functions, Body structures, Activities and Participation, and Environmental factors. However, while a Core Set is focused on the impact on functioning of one specific condition, it should be borne in mind that an increasing number of patients has multimorbidity, the co-occurrence of two or more chronic conditions in one person (17–20). This trend brings into question the usefulness of single-condition-aimed Core Sets, because a person with multimorbidity has additional problems that might also affect functioning, in addition to the problems caused by the main health condition. Consequently, the current focus of a Core Set on a specific chronic condition should be questioned, as it may miss relevant problems in functioning in people with multimorbidity.

In their study of people with rheumatic diseases (RD), Loza et al. (4) showed that multimorbidity seriously worsened the self-reported daily functioning of affected individuals, measured with the Short Form-12 (SF-12) (physical and mental component) and the Health Assessment Questionnaire (HAQ) (health-related quality of life). Although this study showed the general impact of multimorbidity on RD, it is not known what the impact of multimorbidity is on functioning as described by the ICF (the framework for the Core Set approach). Therefore, the aim of this study was to examine, for the categories of the ICF component “Activities and Participation”, the impact of multimorbidity on the self-reported functioning (activity limitations, participation restrictions) of people with RD. The findings are discussed from the perspective of the current ICF Core Set approach.

### INTRODUCTION

The aim of rehabilitation is to optimize the functioning of patients when their status has deteriorated as a result of (chronic) condition or injury (1–4). To facilitate rehabilitation (5–15), several Core Sets have been developed based on

### METHODS

#### Data collection

Data were collected by means of an internet survey held among people with a chronic illness and/or disability in the Netherlands in 2010 as part of a study on uninsured costs for people with chronic disease and/or disability (21). The internet survey did not allow a respondent to

skip a question; therefore there are no missing values on any of the items. Respondents were approached via the network of patients' associations of the Dutch Council of the Chronically Ill and the Disabled. The patients' associations had asked, via their electronic newsletters, individual members to participate in this internet survey. Because not everyone has internet access, the study population cannot be considered representative of the Dutch population of chronically ill and disabled persons. We selected respondents older than 20 years in accordance with the study of Loza et al. (4).

#### Instruments

Apart from questions on sociodemographic characteristics, the internet survey included questions on the presence of specific chronic conditions, limitations in activities, restrictions in participation, and perceived health. Health was measured using a list of specific chronic conditions as well as an open question for chronic conditions not included in the list. This list was based on the list used in the Permanent Life Situation Survey of Statistics Netherlands (22).

Activity limitations and participation restrictions were measured using IMPACT-S (ICF Measure of Participation and Activities Screener), a validated 32-item questionnaire (self-rating instrument) measuring experienced functioning in categories of all 9 domains of the component Activities and Participation (23). A distinction was made between Activities and Participation by defining the domains of Learning and applying knowledge, General tasks and demands, Communication, Mobility and Self-care as being part of Activities (18 items), and the domains of Domestic life, Interpersonal interactions and relationships, Major life areas and Community, social and civic life as being part of Participation (14 items) (23). An example of an IMPACT-S item is (d920): "Do you experience any restrictions in taking part in recreational or leisure activities?" For example: going out (cafe, show), visiting people, hobby, (competitive) sport or game, travelling.

Each item had 4 response categories: "no", "some", "considerable limitations/restrictions", and "I cannot do that at all". The response categories "no" and "some limitations/restrictions" were considered to reflect *no limitations/restrictions*, whereas the response categories: "considerable limitations/restrictions" and "cannot do that at all" were considered to reflect *serious limitations/restrictions*.

#### Data analyses

Respondents. From the total group ( $n=2,730$ ) of respondents we selected two subgroups of participants, based on the number and type of chronic conditions they reported. Group 1 included respondents who reported RD only ( $n=127$ ), and group 2 respondents who reported RD plus multimorbidity (RD + COM;  $n=707$ ); 1,896 respondents were not included in the analysis because they did not report RD. Differences between general characteristics (sex, age) were tested by  $\chi^2$  (sex) and  $t$ -test (mean age).

A contingency table was used to represent profiles of the proportion of respondents who reported serious limitations/restrictions for all items for each subgroup. In accordance with Huber et al. (24), we considered an item relevant if at least 20% of respondents indicated this activity as being seriously limited/restricted; items for which less than 10% of the respondents reported serious limitations/restrictions were not considered relevant for inclusion.

Per item, differences in proportions between groups 1 and 2 were compared by logistic regression with age and sex as confounders. As multiple tests were used, the test results were corrected by the false discovery rate method (25).

## RESULTS

#### Respondents

The main characteristics of the respondents in the two groups are summarized in Table I.

As shown the age and sex distribution of participants in the two groups were not significantly different. All age categories were represented, although in both groups 70% of the respondents were aged 50–69 years. The 5 chronic conditions reported most frequently by the respondents in group two were allergy, hernia or other chronic back disorders, asthma or chronic obstructive pulmonary disease, diabetes, and depression.

Table II shows the proportion of respondents in both groups who reported serious limitations/restrictions on all items of IMPACT-S and their corresponding ICF category (ICF d codes). The mean number of reported serious limitations/restrictions was 5.6 (standard deviation (SD) 5.7) for respondents with RD and 6.7 (SD 6.8) for respondents with RD and multimorbidity ( $p<0.05$ ).

For almost all IMPACT-S items, more respondents with RD and multimorbidity reported serious limitations/restrictions than did respondents with RD without multimorbidity; significant differences were found for 8 of the items. There were two items, namely: "Fine hand use" and "Hand and arm use", in which more respondents with only RD had serious limitations/restrictions than respondents with RD and multimorbidity, but this difference was not significant. On 12 items, more than 20% of the respondents with RD reported serious limitations/restrictions, whereas on 17 items more than 20% of the respondents with RD and multimorbidity reported serious limitations/restrictions; an increase in 5 items. On 15 items, fewer than 10% of respondents with RD only reported serious limitations/restrictions, whereas among the respondents

Table I. Sex, age and distribution of the most frequently self-reported chronic conditions for Group 1 (respondents with rheumatic disease (RD)) and Group 2 (respondents with RD and multimorbidity; RD + COM)

Characteristics	Group 1 RD	Group 2 RD + COM
Total	127	707
Men, %	30	35
Age, years, mean (SD)	58.6 (11.5)	58.5 (10.5)
Age in categories, %		
20–29 years	2	1
30–39 years	6	4
40–49 years	10	12
50–59 years	32	38
60–69 years	38	32
70–79 years	11	11
≥80 years	2	2
Self-reported chronic conditions other than RD, mean (SD)	0	2.3 (1.0)
Most frequently self-reported chronic conditions, % <sup>a</sup>		
Allergy	-	35
Hernia or other chronic back disorder	-	32
Asthma or chronic obstructive pulmonary disease	-	25
Diabetes	-	19
Depression	-	17
Other	-	24

<sup>a</sup>A person may have reported more than one chronic condition; therefore the percentages do not add-up to 100%.

SD: standard deviation.

Table II. Proportion of respondents (%) in both groups who reported serious limitations/restrictions ("considerable limitations/restrictions" or "I can't do this at all") on the items of IMPACT-S; Group 1: respondents with rheumatic disease only (RD); Group 2: respondents with RD and multimorbidity (RD + COM). The ICF d codes represent the corresponding ICF categories

ICF d codes	IMPACT-S Items	% serious limitations/restrictions	
		Group 1 RD n=127	Group 2 RD+COM n=707
	<i>Learning and applying knowledge</i>		
110-129	1 Purposeful sensory experiences	5	14*
130-159	2 Basic learning	7	11
160-199	3 Applying knowledge	4	15*
	<i>General tasks and demands</i>		
210-2309	4 Task execution in quiet circumstances	3	11
240-2409	5 Task execution in stressful circumstances	17	34*
	<i>Communication</i>		
310-329	6 Communicating, receiving	0	5
330-349	7 Communicating, producing	2	5
350-399	8 Use of communication devices and techniques	4	11
	<i>Mobility</i>		
410-4209	9 Changing and maintaining body positions	51	57
430-4309	10 Lifting and carrying objects	50	58
435-4359	11 Moving objects using lower extremities	32	37
440-4409	12 Fine hand use	26	20
445-4459	13 Gross movements of hand and arm	38	34
450-469	14 Walking and moving	34	47*
470-499	15 Moving around using transportation	21	27
	<i>Self-care</i>		
510-5109	16 Washing and dressing	9	15
540-5409			
520-5309	17 Caring for body parts and toileting	8	11
550-599	18 Eating, drinking, maintaining good health	4	10
	<i>Domestic life</i>		
610-629	19 Acquisition of necessities	13	16
630-6409	20 Household tasks	43	50
650-6509	21 Caring for household objects	27	30
660-699	22 Assisting others	29	32
	<i>Interpersonal interactions and relationships</i>		
710-730	23 General interpersonal interactions	2	4
740-7409	24 Formal relationships	3	6
750-7609	25 Informal and family relationships	3	9
770-7709	26 Intimate relationships	15	26*
	<i>Major life areas</i>		
810-859	27 Education, work and employment	38	49
860-879	28 Economic life	2	7
	<i>Community, social and civic life</i>		
910-9109	29 Community life	13	26*
920-9209	30 Recreational and leisure	33	45*
930-9309	31 Religious and spiritual life	19	25
940-999	32 Citizenship	9	22*

\* $p < 0.05$  difference from group 1 corrected for differences in age and gender and corrected by the false discovery rate method (25). ICF: International Classification of Functioning Disability and Health; RD: rheumatic diseases; IMPACT-S: ICF Measure of Participation and Activities Screener.

with RD and multimorbidity, only 6 items were not reported frequently; a decrease in 9 items.

## DISCUSSION

The results of this study suggest that multimorbidity has a substantial impact on the self-reported functioning of people with RD. They reported serious limitations/restrictions more frequently

and in a significantly broader range of IMPACT-S items and corresponding ICF categories, than respondents with RD only.

The finding of relatively high levels of reported serious limitations/restrictions among people with RD and multimorbidity is in agreement with the findings of Loza et al. (4). While Loza et al (4) presented their results in mean scores from the SF-12 and HAQ, we were able to quantify the reported serious limitations/restrictions for 32 specific ICF categories from the Activities and

Participation component by using the IMPACT-S questionnaire (23). From these data we could evaluate the impact of RD and multimorbidity on human functioning within the framework, which is applied for the ICF Core Set development and application.

Our empirical findings raise some issues about the development and use of ICF Core Sets. Perhaps the most important weakness of the ICF Core Set approach is that it focuses on the functioning of people with only one chronic condition while many people have more than one chronic condition (20). Consequently, the impact of multimorbidity on human functioning is not taken into account. Our data clearly show that multimorbidity has a serious impact on several ICF categories of functioning in people with RD. Given that multimorbidity is increasing in the population (20), more needs to be learned about the impact of multimorbidity on functioning. The current ICF Core Set approach should be redesigned to focus on the individual patient rather than on a specific chronic condition, to make it useful for populations with two or more chronic conditions. This would be consistent with the current discussion of the importance of the whole health experience of patients (20, 26, 27).

Another issue arising from our study is that the ICF Core Sets are developed based on expert consensus, while the study results are based on empirical data reported by individuals. Although the expert consensus procedures are reported explicitly, the selection of ICF Core Set items is not based on input from a broad range of patients and quantitative cut-off points. The empirical approach provides these quantitative data, and explicit cut-off points can be established based on self-reported functioning. The availability of the IMPACT-S questionnaire facilitates the acquisition of empirical data that are closely associated with the ICF categories of activities and participation. In their critical evaluation of the ICF Core Sets for osteoarthritis, Xie et al. (28) also concluded that the brief Core Sets should be supported by more empirical evidence. In addition, an empirical approach allows systematic analysis of the impact of multimorbidity on functioning, which may be helpful for developing an ICF-approach focused on the individual patient.

The reported results should be interpreted within the context of the study. First, only the ICF component "Activities and Participation" was studied, while the ICF Core Sets also include Body functions, Body structures and Environmental factors. Further research is needed to study the impact on these ICF components as well.

Secondly, the data were not acquired from a random sample of people with chronic conditions. Although we had a wide age distribution and both men and women were well represented in each subgroup, the sample is not representative of the population of people with RD and multimorbidity in the general Dutch population. When the data collection procedure is taken into consideration, we expect that the study includes relatively more patients with a severe rheumatic disease and consequently at the poor end of functioning. However, of the people included in our study, 15% had RD only and 85% had RD and multimorbidity, which might reflect the increasing

proportion of the population with comorbid conditions and consequently with more severe functional problems. Nevertheless, the empirical results are in agreement with the findings of Loza et al. (4) and they give a clear illustration of the impact of multimorbidity on a range of relevant ICF items.

In conclusion, we recommend that the focus of the current ICF Core Set approach should shift from individual diseases to individual patients in order to accommodate the increasing proportion of the population with multimorbidity. In this respect, an empirical approach is advocated, which allows systematic analysis of the impact of patterns of multimorbidity on ICF functional profiles. For the empirical approach we advocate, we suggest the creation of an empirical database, including patterns of (co)morbidity and associated patterns of limitations/restrictions for patients with RD. Based on this empirical data-set, the reported (co)morbidity of a client will result in a pattern of relevant limitations/restrictions, but likewise also the abilities to be addressed in the evaluation process of this specific client. Future work would be strengthened by taking into account that different conditions are associated with more burden, thus a scale like the Cumulative Illness Rating Scale (29) or the Total Illness Burden Scale (30) would add a helpful dimension to the work. The availability of the IMPACT-S questionnaire facilitates the collection of empirical data that are closely associated with the ICF categories of Activities and Participation.

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