

Measuring functional health status in primary care using the COOP–WONCA charts: acceptability, range of scores, construct validity, reliability and sensitivity to change

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SUMMARY

Background. The COOP–WONCA charts comprise six scales designed to measure functional health status in primary care.

Aim. A study was undertaken to describe the acceptability, distribution of chart scores, construct validity, test–retest reliability and sensitivity to change when these charts were used in the United Kingdom.

Method. For acceptability, distribution of scores and construct validity, data were obtained from 100 consecutive consulting patients aged 16 years and over and 100 non-consulting age–sex matched individuals from one general practice. In order to examine reliability and sensitivity to change, both groups were followed up two weeks later.

Results. Regarding acceptability, four patients refused to complete the charts during the initial recruitment of the consultants; 74 out of 100 non-consulters returned the first postal questionnaire. The follow-up questionnaire was returned by 68 out of 100 consultants and 57 out of 74 non-consulters. Overall distributions of scores demonstrated reasonable variation. Regarding construct validity, differences between the consultants and non-consulters were all in the anticipated direction and reached statistical significance for three of the six charts. For reliability, the proportion of non-consulters whose scores were unchanged ranged from 56% to 73%. For those whose scores changed, the differences were small and evenly balanced. For sensitivity to change, the proportion of consultants whose scores altered ranged from 45% to 59% with mean changes all indicating improvements in health. There were larger changes for patients consulting about acute problems than for those with chronic problems.

Conclusion. It appears that the charts were acceptable, with reasonable distributions of scores and evidence of construct validity. Moderate levels of reliability and sensitivity to change were demonstrated. This study suggests that the COOP–WONCA charts are suitable for measuring functional health status in primary care in the UK.

Keywords: health status measurement; questionnaires; outcome measures; attitude to health.

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Introduction

INCREASING attention is being paid to outcome measures in primary care.^{1–4} It seems important to study health status since its improvement is the prime aim of health care. Health status is, however, difficult to measure comprehensively — as a result, attention has focused on measures of functional health status.⁵ The COOP–WONCA charts, so called because of their development by the Dartmouth COOP Functional Health Assessment Project and their subsequent promotion by the World Organization of Family Doctors (WONCA), are one such functional health status measure intended for use in primary care.^{6,7}

These charts were developed from existing, longer scales and tested in the United States of America.⁶ The intention was to produce a brief, generic profile for use in practice settings. They are considered to be useful for screening, assessing and monitoring patients and may improve doctor–patient communication.^{7,8} There has been international recognition of their importance and much interest expressed in their psychometric properties;⁷ however, they have not been formally assessed in the United Kingdom.

The charts consist of six single-item measures: physical fitness, feelings (mental well-being), daily activities, social activities, change in health and overall health. The charts are usually self-administered and subjects are asked to use the time scale of the past two weeks. The categories chosen are scored from one (good functional status) to five (poor functional status). For example, the physical fitness chart asks what was the hardest physical activity the patient could do for at least two minutes: very heavy activity, for example run at a fast pace; heavy, for example jog at a slow pace; moderate, for example walk at a fast pace; light, for example walk at a medium pace; or very light, for example walk at a slow pace or not be able to walk at all.

The properties to be considered when evaluating a health status instrument are acceptability, validity, reliability, and sensitivity to change.^{3,9–11} Questionnaires are commonly required to discriminate between individuals or groups. Preferably, scores should exhibit reasonable variance and not be too highly skewed.

For measures such as the COOP–WONCA charts, test–retest reliability is important.¹² This is determined by repeating measurements after a period of time sufficient for subjects to be unlikely to remember their original answers. In addition, the sample used should be one where the responses, while not necessarily constant for every individual, would not be expected to shift systematically. In contrast, sensitivity to change represents the degree to which the instrument detects changes, an aspect often overlooked.^{11,13} This change may be the result of an intervention or the product of natural history.

International evidence for the acceptability, validity and reliability of the charts is encouraging.^{6–8} The aim was of this present study was to test the psychometric properties of the charts in a UK general practice population. In particular, the study aimed to: examine the distribution of scores within each of two groups, patients consulting for new episodes of care and non-consulting age–sex matched individuals; compare the distributions of scores

between these two groups — for construct validity it was anticipated that consulters would have higher scores (that is, be less functionally able); assess reliability by following up the non-consulters over a two week interval; and measure sensitivity to change by following up the consulters over the same interval, anticipating that those consulting for acute problems would improve more than those consulting for chronic problems.

Method

The study was carried out in August 1992. The consulters consisted of 100 consecutive patients, aged 16 years and over, attending for consultations in one general practice in Cardiff. The practice population is predominantly social classes 3 and 4. New episodes of illness were obtained by excluding patients who had consulted in the previous four weeks. Individually age–sex matched, non-consulting individuals were identified from the practice register. Their medical records were searched to ensure that these individuals had not consulted in the previous four weeks, that is, they appeared to be in stable health.

Initially, the consulters were given a questionnaire containing the six charts before their consultation and the non-consulters were posted the questionnaire. Non-respondents were sent a single reminder. For the consulters, the general practitioners recorded the main reason for consulting as acute, chronic, acute and chronic, or administrative. As a proxy measure of background health, information was extracted from medical records on the number of consultations in the previous year and whether the subjects were on regular medication.

Two weeks later, the respondents from both groups were posted a second questionnaire. A repeat record search ascertained whether any non-consulters had consulted in the meantime. Changes in score were calculated by subtraction, positive changes indicating an improvement in health. To be consistent with a claim of reliability and sensitivity to change, the values of the change scores should be lower among the non-consulters than the consulters.

Statistical analysis

MINITAB software (release 7.1) was used. The charts provide ordinal data on which it is usual to apply non-parametric tests.⁸ However, in this study when considering reliability and sensitivity to change, the distributions of the changes in scores for both groups were not particularly skewed and, in addition, the sample sizes were relatively large. In these circumstances, it was felt reasonable to use parametric methods. Although the charts are intended as independent measures, their results could be seen as multiple hypothesis testing, for which a Bonferroni correction might be applied.¹⁴ Although conservative, to keep the 'experiment-wise' significance level at 5%, the *P* values for each of six individual charts should be considered significant only if below the 'test-wise' level of 0.008.

Effect size has been proposed as a numerical representation of sensitivity to change.¹⁵ It is calculated by dividing the mean change by the standard deviation at any particular time point, hence allowing for background variation.¹³ Cohen proposed an effect size of 0.20 as small, 0.50 as moderate and 0.80 as large.¹⁶

Results

Response rates and demographic data

While recruiting the 100 consulters, four additional individuals refused or were unable to complete the charts. Each of the 100 completed all six charts satisfactorily. Seventy four of the 100 non-consulters returned the questionnaire but two failed to complete one chart each.

The age and sex distributions of the subjects are summarized

in Table 1. Differences between the consulters and the responding non-consulters were minor. As a result, it was felt that any unpaired comparison between the two groups of respondents (that is, using all the data and ignoring the original matching) would not be confounded by age or sex. Background health is also shown in Table 1. For medication, there were only minor differences between the consulters and responding non-consulters. For consultations, for which the practice average was four per year, the consulters were more likely to have had an above average number of consultations than the responding non-consulters (50% versus 28%; $\chi^2 = 8.6$, 1 degree of freedom, $P < 0.01$). To allow for this, further analysis of the scores included an element of stratification by number of consultations.

Sixty eight of the 100 consulters and 57 of the 74 non-consulters (77%) responded at follow up. Although the non-responding consulters were younger than the responding consulters at follow up, there were no statistically significant or notable differences through time in the distributions of age, sex, reason for consulting or background health between the respective groups of responding consulters and non-consulters.

Initial comparison of consulters and non-consulters

The initial chart scores are shown in Table 2. The responses of the consulters were distributed across the five possible categories in various patterns: the scores for physical fitness, mental well-being and overall health were well spread but the scores for daily activities and social activities were relatively clustered towards the end of the scale denoting functionally able. For each of these charts the scores of the non-consulters were more shifted to the functionally able end of the scale compared with those of the consulters. The chart for change in health produced a different distribution again, with the majority of both groups rating their health 'about the same'. The median scores are also presented in Table 2. Using the Bonferroni corrected level of significance, differences between consulters and non-consulters reached significance for three of the charts when the Mann Whitney test was applied: physical fitness, $P = 0.0011$, daily activities, $P = 0.0019$, and overall health $P = 0.0005$.

The differences between men and women respondents were small and approached statistical significance only for the consult-

Table 1. Age, sex distribution and background health of the consulters and non-consulters.

	% of subjects		
	Consulters (<i>n</i> = 100)	Respondents (<i>n</i> = 74)	Non-respondents (<i>n</i> = 26)
<i>Age (years)</i>			
16–35	49	51	46
36–55	34	28	42
>55	17	20	12
<i>Men</i>	26	22	38
<i>On regular medication</i>	45	35	31
<i>No. of consultations in past year^a</i>			
0–4	50	72	76
5+	50	28	24

n = number of subjects in group. ^aInformation on consultations not available for two non-consulters.

Table 2. Initial distribution of scores on each of the six COOP-WONCA charts for the consulters and non-consulters.

	% of subjects scoring ^a					Median score
	1	2	3	4	5	
<i>Physical fitness^b</i>						
Consulters (n = 100)	14	17	36	25	8	3
Non-consulters (n = 73)	36	19	29	11	7	2
<i>Mental well-being^c</i>						
Consulters (n = 100)	16	27	17	24	16	3
Non-consulters (n = 74)	22	32	15	23	8	2
<i>Daily activities^d</i>						
Consulters (n = 100)	34	29	24	11	2	2
Non-consulters (n = 73)	60	15	19	5	0	1
<i>Social activities^e</i>						
Consulters (n = 100)	41	23	16	14	6	2
Non-consulters (n = 74)	59	22	7	8	4	1
<i>Change in health^f</i>						
Consulters (n = 100)	7	14	58	15	6	3
Non-consulters (n = 74)	8	7	82	3	0	3
<i>Overall health^g</i>						
Consulters (n = 100)	7	18	29	38	8	3
Non-consulters (n = 74)	15	36	23	22	4	2

n = number of subjects in group. ^aScores of functional status: 1 = good, through to 5 = poor. Rating: ^bhardest physical activity which could be done for at least 2 minutes, from very heavy to very light; ^cextent of being bothered by emotional problems, from not at all to extremely; ^dextent of difficulties in doing usual activities, from no difficulty to could not be done; ^eextent to which social activity limited by physical and emotional health, from not at all to extremely; ^foverall health compared with two weeks ago, from much better to much worse; ^ggeneral health, from excellent to poor.

ers on the social activities chart where men scored significantly higher (Mann Whitney $P < 0.05$).

To account for differences in background health, further comparisons were made after stratifying by the number of consultations (four or fewer, or five or more consultations). Not surprisingly, those with higher levels of consulting in the past (whether current consulters or non-consulters) showed relatively lower levels of functional status. More importantly, within each stratum the differences apparent in Table 2 between the consulters and non-consulters were maintained for all the charts except for the daily activities and social activities charts. For these, the differences were diminished.

Reliability

Of the 57 non-consulters who responded on both occasions seven consulted a general practitioner during the study and information was not available for two individuals. There remained 48 subjects in apparent stable health, of whom one failed to complete the daily activities chart. The distribution of the changes in scores for these non-consulters are presented in Table 3. For the six charts, the proportion scoring exactly the same on both occasions ranged from 56% to 73%, and changes were fairly evenly distributed between improvements and deteriorations. The mean differences through time were small and for none of the charts did they reach statistical significance using the paired *t*-test.

Sensitivity to change

Of the 68 consulters who responded on both occasions, one failed to complete the physical fitness chart. The distributions of the changes in score are also presented on Table 3. For the six charts, the proportion scoring the same on both occasions ranged from 41% to 55%. Among those whose scores changed, there was a shift towards an improvement in function for all charts,

with mean differences ranging from 0.25 to 0.44. Again this could be seen as an example of multiple hypothesis testing and the appropriate 'test-wise' significance level is 0.008. Using this conservative procedure, the changes for two of the charts reached statistical significance: change in health, $P = 0.0013$, and overall health, $P = 0.0015$ (Mann Whitney test). As anticipated, the means and standard deviations of the differences were larger for the consulters than the non-consulters for each chart. The effect sizes ranged from 0.22 for mental well-being, through 0.23 for daily activities, 0.25 for social activities, 0.28 for physical fitness and 0.44 for overall health to 0.46 for change in health.

Of the 68 consulters, 31 attended for acute problems, 24 for chronic problems and the remaining 13 for a mixture of acute and chronic or administrative problems. The mean differences, *P* values for the paired *t*-test and effect sizes for acute and chronic patients are shown in Table 4. Patients consulting for acute problems showed larger changes than those with chronic problems. The exception, the overall health chart, resulted from the particularly small standard deviation among chronic consulters.

Discussion

The charts were acceptable to consulting patients and to those who were sent them in the form of a postal questionnaire. For the consulters the charts produced scores well spread across the possible range. As expected, the non-consulters were more clustered but still exhibited reasonable variation. In primary care studies, health status scores are commonly heavily shifted to the end of the scale indicating functionally able. This causes difficulties since subjects then cannot, in measurement terms, get any better.¹¹ The differences in scores were all in the anticipated direction with the non-consulters scoring themselves as being more functionally able than the consulters. This is encouraging evidence of construct validity. The interest here was to study undifferentiated patient groups; however, since not all consulters

Table 3. Distribution of changes in scores on each of the six COOP-WONCA charts, for the consulters and non-consulters, showing reliability and sensitivity.

	% of subjects with score change ^a								Mean difference (SD)
	-3	-2	-1	0	1	2	3	4	
<i>Physical fitness</i>									
Consulters (n = 67)	0	1	12	55	21	7	3	0	0.30 (0.94)
Non-consulters (n = 48)	0	6	13	65	13	4	0	0	-0.04 (0.82)
<i>Mental well-being</i>									
Consulters (n = 68)	0	6	18	41	21	9	4	1	0.28 (1.24)
Non-consulters (n = 48)	2	6	12	56	19	4	0	0	-0.04 (0.97)
<i>Daily activities</i>									
Consulters (n = 68)	0	4	16	43	29	3	3	1	0.25 (1.10)
Non-consulters (n = 47)	0	0	19	62	11	9	0	0	0.09 (0.80)
<i>Social activities</i>									
Consulters (n = 68)	0	4	10	54	19	7	1	3	0.31 (1.14)
Non-consulters (n = 48)	0	8	19	56	8	6	0	2	-0.06 (1.10)
<i>Change in health</i>									
Consulters (n = 68)	0	3	7	53	24	9	4	0	0.41 (1.10)
Non-consulters (n = 48)	2	6	6	73	6	6	0	0	-0.06 (0.91)
<i>Overall health</i>									
Consulters (n = 68)	0	3	10	47	25	10	3	1	0.44 (1.10)
Non-consulters (n = 48)	0	2	19	62	15	2	0	0	-0.04 (0.71)

n = number of subjects in group. SD = standard deviation. ^aA positive score indicates an improvement in health, a negative score indicates a deterioration in health.

Table 4. Changes in score on each of the six COOP-WONCA charts over the two week interval for consulters with acute and chronic problems.

	Mean difference ^a	P value ^b	Effect size
<i>Physical fitness</i>			
Acute (n = 30)	0.40	0.037	0.38
Chronic (n = 24)	0.21	0.20	0.24
<i>Mental well-being</i>			
Acute (n = 31)	0.65	0.0064	0.51
Chronic (n = 24)	-0.21	0.31	-0.17
<i>Daily activities</i>			
Acute (n = 31)	0.74	0.0015	0.62
Chronic (n = 24)	-0.21	0.23	-0.22
<i>Social activities</i>			
Acute (n = 31)	0.55	0.0089	0.40
Chronic (n = 24)	0.08	0.68	0.07
<i>Change in health</i>			
Acute (n = 31)	0.61	0.0081	0.57
Chronic (n = 24)	0.25	0.16	0.35
<i>Overall health</i>			
Acute (n = 31)	0.58	0.029	0.46
Chronic (n = 24)	0.42	0.0019	0.64

n = number of patients in group. ^aPositive difference indicates an improvement in health. ^bThese should be interpreted using the Bonferroni corrected significance level of 0.008.

are ill, the differences described here would be likely to be larger if only clearly ill patients were studied.

The differences between consulters and non-consulters were maintained when background health was taken into account. This

supports the contention that the charts measure health over the recent past. Notwithstanding, for some charts frequent consulters scored higher than infrequent consulters. This suggests that there is some benefit from recording details of background health.

For the change in health chart, most of the consulters initially rated their health as being about the same and a proportion better, even though they were consulting the doctor. On the evidence here, this chart may not be of value for cross-sectional comparisons; however, perhaps not surprisingly, it is useful for considering change over time.

At follow up, the main feature of the results is the contrast of the changes between the non-consulters and the consulters. For each chart a larger proportion of the non-consulters scored no change over the two week interval. Among the non-consulters, change scores were fairly evenly balanced between improvements and deteriorations, whereas among the consulters, change scores were more likely to show an improvement than a deterioration. Since functional health status is likely to show some day-to-day variation, it is not surprising that some non-consulters changed their score but it is encouraging that these changes were both balanced and relatively small. Comparison with other reports of reliability is difficult since a variety of different statistics have been presented. Nevertheless, the conclusions reached here are similar to other reports on the charts.¹⁷⁻¹⁹

Mean differences over the two week interval were between three and 11 times greater for the consulters than non-consulters. Assuming the background variability in health status is the same, this suggests that these changes are documenting a real improvement in functional health status.

Levels of effect size have not been reported previously for the COOP-WONCA charts. The moderate changes demonstrated here have to be interpreted in the context of the evidence that only about 50% of patients are likely to feel better at two to four weeks after primary care consultations.^{20,21} This does not necessarily indicate a lack of effectiveness of primary care interventions since not all would be expected to produce an immediate

improvement in functional status. In addition, since consecutive consulting patients were studied, not all the patients were ill at the time of their consultation. The effect sizes are, therefore, a product not only of the charts themselves but also of the context in which they are used. This is demonstrated here by the finding that there was a more marked improvement if only those patients presenting acute problems were considered. The levels of effect size achieved for acute problems are comparable to those demonstrated for longer, disease-specific instruments.¹⁰

As single item scales the COOP-WONCA charts may be considered to be taking a fairly simplistic approach to the concept of functional health. In particular, the physical fitness chart which asks only about walking ability appears to take a particularly narrow view. Multi-item measures, which ask several questions about each concept, are likely to have greater validity and higher levels of reliability and sensitivity.³ The COOP-WONCA charts, however, have been specifically designed to be brief, enabling everyday use in primary care settings and their straightforward design is likely to improve response rates. Since there is a trade off to be made between simplicity and sensitivity,³ it is likely that no single instrument will combine high levels of reliability and sensitivity to change.²² The short form 36 item health survey questionnaire has received attention as a functional health status instrument for use with patients with chronic illnesses.²³⁻²⁶ However, it appears unsuitable for use with acute episodes of minor illness seen in primary care. This is because it focuses on health status over a four week period and has some questions which consider health over the past year.

Those wishing to measure functional health status have to make a choice based on the evidence for the psychometric properties of the available instruments and the circumstances in which the measurements are to be made. No single instrument is likely to be optimal for all psychometric properties,¹¹ and consensus over measurement instruments is difficult to achieve.²⁷ The choice for researchers is to match the instrument to their needs. The evidence presented here of the acceptability, distribution of scores, validity, reliability and sensitivity to change of the COOP-WONCA charts goes some way to demonstrating their suitability as a functional health status measure for use in primary care settings in the UK.

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