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*Published in:*  
Patient Education and Counseling

*DOI:*  
[10.1016/j.pec.2010.04.035](https://doi.org/10.1016/j.pec.2010.04.035)

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*Document Version*  
Publisher's PDF, also known as Version of record

*Publication date:*  
2011

[Link to publication in University of Groningen/UMCG research database](#)

*Citation for published version (APA):*

Kollen, B. J., Groenier, K. H., & Berendsen, A. J. (2011). Patients' experiences with continuum of care across hospitals. A multilevel analysis of Consumer Quality Index Continuum of Care. *Patient Education and Counseling*, 83(2), 269-272. DOI: 10.1016/j.pec.2010.04.035

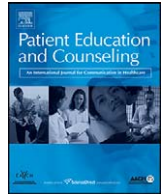
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## Short communication

# Patients' experiences with continuum of care across hospitals. A multilevel analysis of Consumer Quality Index Continuum of Care

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## ARTICLE INFO

## Article history:

Received 27 January 2010

Received in revised form 27 March 2010

Accepted 28 April 2010

## Keywords:

Questionnaire

Continuum of care

Patients' perspective

## ABSTRACT

**Objective:** Communication between professionals is essential because it contributes to an optimal continuum of care. Whether patients experience adequate continuum of care is uncertain. To address this, a questionnaire was developed to elucidate this care process from a patients' perspective. In this study, the instrument's ability to measure differences in "Consumer Quality Index Continuum of Care" scores between hospitals was investigated.

**Methods:** The questionnaire was mailed to a random sample of 2159 patients and comprised of 22 items divided over four domains, GP approach, GP referral, specialist and collaboration. Multilevel analysis was conducted to identify case-mix and determine this questionnaire's ability to measure differences in domain scores between hospitals.

**Results:** Based on a 65% response rate, 1404 questionnaires were available for analysis. Case-mix of patient characteristics across hospitals could not be demonstrated. Some differences in scores between hospitals were observed. At most two in eight hospitals showed different domain scores.

**Conclusion:** The ability of this questionnaire to measure differences in continuum of care scores between hospitals is limited. The outcome of this survey suggests that hospitals provide a similar level of continuum of care from a patient's perspective.

**Practical implications:** This questionnaire is especially useful for measuring differences between patients.

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## 1. Introduction

Patients often receive care from several health care professionals. Communication among these professionals is considered essential for an adequate continuum of care. The need for close collaboration is acknowledged by all professionals [1]. However, we showed that improvements are still necessary in the Continuum of Care [2].

Whether adequate continuum of care actually materialized from a patient's perspective is uncertain. In order to address this issue and obtain insight in the patient's experience with the quality of continuum of care, a questionnaire was developed. This "Consumer Quality Index Continuum of Care" (CQI-CC) measures patients' experiences with the collaboration between general practitioners and medical specialists. Face, content and construct validity has already been established for this ques-

tionnaire. The next step in the development of this questionnaire is to demonstrate its ability to measure differences at a hospital level.

Survey outcomes of this instrument can be used to compare the quality of continuum of care between general practitioners and medical specialists from different hospitals. Because patient characteristics can affect the way survey questions are scored, it is important to examine whether patient characteristics differ across hospitals. A difference in patient characteristics among hospitals is referred to as case-mix [3]. For this study individual characteristics of patients were selected as potential case-mix adjusters and analyzed to estimate the contribution of each characteristic to the model. This will help to understand individual variations in patient characteristics and to determine whether these adjusters are not distributed randomly across hospitals. In that event, it becomes necessary to adjust for differences in patient mix when making comparisons between hospitals.

In this study we investigated the presence of case-mix and its impact on hospital ratings. Subsequently, the questionnaire's ability to measure differences in continuum of care between hospitals in the Netherlands was analyzed.

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## 2. Methods

For this study, patients over 18 years of age were surveyed who had been referred to and consulted a medical specialist in the hospital; for more details see Berendsen et al. [2,4]. Based on the literature potential variables were selected for case-mix analysis, i.e. age, education, self-reported health, language spoken at home and gender [3,5,6] in addition to stressed and stable scale scores.

### 2.1. Statistical analyses

Mean scores were calculated for each domain. To facilitate interpretation, two variables were dichotomized: education in low (no or primary education) and high (other education) and ethnicity in Frisian/Dutch and other languages [5].

Multilevel analysis (MLA) was performed using MLwiN software. In our data, individual patients (level 1) are nested within hospitals (level 2). Multilevel analysis (MLA) was used to determine the effects of case-mix adjusters on each domain score based on MLA's property to partition the total variation in variation due to differences between patients and variation due to differences between hospitals [7]. By allowing random effects in the regression model the observed relationship is considered to differ between patients with certain characteristics and between hospitals.

We presumed that the experiences of patients with continuum of care partly depend on the hospital in which these patients consulted the medical specialists. If this is the case, patients within the same hospital should agree more on experiences with quality of continuum of care than patients from different hospitals.

Multilevel models are hierarchical systems that estimate regression coefficients and their hospital and patient related variance components. Two models were fitted. The first model constitutes a random intercept model without any explanatory variables. The intercept of this model represents the overall mean scores of patients. In the second model, case-mix adjusters were added to the model. The models estimate the variance that is explained at patient and hospital level before (model 1) and after correcting for case-mix (model 2) and investigate whether survey results are influenced by factors that are not randomly distributed across hospitals.

The Intra-class Correlation Coefficient (ICC) was used to measure the extent of dependency or clustering of information within a hospital. ICC is an index of the ratio of the within-hospital variation and the between-hospital variation [8]. Basically, it is a measure of the degree of influence of hospitals on the patients' scores. Higher ICCs correspond with more influence. An ICC of zero indicates that the variance in patients' experience of continuum of care cannot be explained by the hospital in which they received treatment, while an ICC of one indicates that all the variance is due to the hospital. It is computed using the formula  $\sigma_{u0}^2 / (\sigma_{u0}^2 + \sigma_{e0}^2)^{-1}$ .

Proportional change in variance (PCV) is the absolute difference of the total variance of the null model and the total variance of the model with all characteristics included, divided by the total variance of the model with all characteristics included [9]. PCV evaluates how much of the total variance in the first model is attributable to differences in individual characteristics [10]. A large PCV indicates that the characteristic is associated with relatively large alterations in the total variance between hospitals. In that case, quality rankings of hospitals are moving, and the particular adjuster is relevant.

Multilevel analysis was used to determine this questionnaires' ability to measure differences in CQI-CC scores between hospitals. Such analyses are conducted on hierarchically structured data with the outcome variable measured at patient and hospital level, intercept at patient (and hospital) level and hospital at fixed level.

A random intercept is included in case of a significant  $-2$  loglikelihood test. Significance of the beta coefficient is based on the Wald test.

## 3. Results

In total, 1404 questionnaires were available for analysis representing a response rate of 65% (Table 1). Table 2 displays the mean survey scores.

### 3.1. Case-mix analysis

Models 1 and 2 demonstrate that the variance of patients differed significantly from zero in all domains (Table 3). This variance decreased after inclusion of case-mix adjusters to the model. Adding case-mix adjusters to the model did not change the variance of hospitals, which did not differ significantly from zero in all models and domains. ICCs varied between  $<0.0001$  (GP referral) and 0.007 (specialist), while PCVs ranged from 4.1% (specialist) to 9.6% (collaboration). The patient related variance was partly explained by age, self-reported health and scores on the stable scale in GP approach and also gender in Specialist. In GP referral, age and stable explained the variance partly, while in Collaboration the variance was partly explained by age and self-reported health.

### 3.2. Discriminant analysis

Overall, at most two hospitals differed from the remaining hospitals in CQI-CC scores (Table 4). Within two domains only one hospital scored significantly different (lower) from the rest, i.e. "other hospitals" in GP referral and "DL" in specialist. The scores of two hospitals differed significantly from the other hospitals in the remaining domains. "BZH" scored higher and "DL" lower for items related to GP approach, while in collaboration the scores of "RZL" were higher and those of "UMC-1" lower compared to the remaining hospitals.

**Table 1**  
Characteristics of respondents.

	n = 1404 Respondents (%)	n = 712 Non-respondents (%)
<b>Age</b>		
18–34	13	31
35–64	58	55
65 or over	29	14
<b>Gender</b>		
Female	60	55
<i>Statistics Netherlands (%)</i>		
<b>Education</b>		
Primary education	27	29
Secondary education	19	43
A-levels	27	
College/university	27	28
<b>Type of illness</b>		
Chronic illness	18	
Treatable condition	36	
MUPS	2	
Cancer	3	
Other	41	
<b>Self-reported health</b>		
Excellent	9	
Very good	16	
Good	55	
Fair	18	
Poor	2	

A-levels=Advanced Level General Certificate of Education, MUPS=medically unexplained physical symptoms.

**Table 2**  
CQI Continuum of Care questionnaire mean scores.

Domains and items	Mean scores (S.D.)
<i>GP approach</i>	3.7 (0.4)
My GP listened to me carefully	3.8 (0.5)
My GP gave me enough time	3.7 (0.5)
My GP took me seriously	3.8 (0.5)
My GP explained matters to me in a logical manner	3.7 (0.6)
I have confidence in my GP's medical expertise	3.6 (0.6)
I have noticed my GP is bothered when I stand up for myself	1.2 (0.5)
<i>GP referral</i>	1.4 (0.3)
My GP gave me sufficient information about my illness/treatment	3.6 (0.6)
My GP included me in the decision on the referral <sup>a</sup>	0.8 (0.4)
My GP made clear why I was being referred <sup>a</sup>	0.9 (0.3)
My GP referred me on time <sup>a</sup>	0.8 (0.4)
I think my GP gave the specialist all necessary information when he/she referred me <sup>a</sup>	0.7 (0.4)
<i>Specialist</i>	3.2 (0.6)
My specialist listened to me carefully	3.6 (0.7)
My specialist gave me enough time	3.5 (0.7)
My specialist took me seriously	3.6 (0.6)
My specialist explained matters to me in a logical manner	3.6 (0.7)
My specialist(s) gave me sufficient information on my illness	3.5 (0.8)
My specialist(s) gave me sufficient information on my treatment	3.5 (0.8)
I have confidence in my specialist's medical expertise	3.6 (0.6)
Were you satisfied with your specialist? <sup>a</sup>	0.8 (0.4)
I have noticed my specialist is bothered when I stand up for myself	1.3 (0.6)
<i>Collaboration</i>	5.9 (1.2)
I experienced the collaboration between GPs and specialists as follows (good/very good)	3.0 (0.5)
Score the entire referral process from GP to specialist(s) and back again (0–10)	8.7 (1.5)

<sup>a</sup> Binary questions (yes/no). All other questions except the last question (0–10) are scored on a 4-point scale. S.D. = standard deviation.

**4. Discussion**

We studied the ability of the CQI-CC questionnaire to measure differences between hospitals. In order to demonstrate this ability, first the presence of case-mix requiring adjustment was investigated. The results showed that case-mix adjustment was not necessary. Our analyses also showed that hospitals had very little influence on the CQI-CC scores of patients. Low ICCs and PCVs indicate that the quality of continuum of care as experienced by the patients is not dependent on the hospital in which they received treatment.

Furthermore, the ability of this questionnaire to measure differences between hospitals in the Netherlands is limited. At most, the CQI-CC scores of two hospitals differed significantly from those of the remaining six hospitals. However, it remains uncertain whether the questionnaire is not sensitive enough to pick up differences between hospitals or that it is sensitive but is unable to discriminate between hospitals because the quality of continuum of hospital care is too uniform.

Some factors may contribute to the observed absence of differences between patient characteristics and modest differences in patient outcome scores between hospitals in this study. From a patient's perspective, hospitals may look very similar. Patients evaluated the collaboration between their general physician and specialist. However, this may render insufficient information to properly assess this collaboration at a hospital level. Hence, subtle differences in continuum of care processes at a hospital level may remain unnoticed.

**Table 3**  
Multilevel model case-mix fitting results for the Consumer Quality Index Continuum of Care.

Domain	GP approach		GP referral		Specialist		Collaboration	
	1	2	1	2	1	2	1	2
Intercept	3.714 (0.015)*	3.539 (0.120)*	1.351 (0.009)*	1.067 (0.095)*	3.245 (0.020)*	3.254 (0.165)*	5.927 (0.044)*	5.971 (0.336)*
Case-mix adjusters								
β Age		0.030 (0.007)*		0.034 (0.006)*		0.037 (0.010)*		0.141 (0.021)*
β Education <sup>a</sup>		-0.003 (0.026)		-0.008 (0.020)		-0.055 (0.035)		-0.069 (0.072)
β Self-reported health		-0.055 (0.017)*		-0.016 (0.014)		-0.092 (0.024)*		-0.204 (0.049)*
β Language spoken at home <sup>a</sup>		0.000 (0.000)		0.000 (0.000)		0.000 (0.000)		0.000 (0.000)
β Gender <sup>a</sup>		-0.009 (0.022)		0.023 (0.018)		-0.087 (0.030)*		-0.034 (0.062)
β Stressed		-0.022 (0.032)		-0.023 (0.026)		0.006 (0.044)		-0.084 (0.091)
β Stable		0.088 (0.024)*		0.067 (0.019)*		0.105 (0.032)*		0.078 (0.066)
Variance								
Patients	0.165 (0.006)*	0.156 (0.006)*	0.103 (0.004)*	0.098 (0.004)*	0.306 (0.012)*	0.293 (0.011)*	1.321 (0.044)*	1.209 (0.047)*
Hospital	0.001 (0.001)	0.001 (0.001)	0.000 (0.000)	0.000 (0.000)	0.001 (0.002)	0.002 (0.002)	0.007 (0.007)	0.003 (0.005)
Total <sup>b</sup>	0.166	0.157	0.103	0.098	0.307	0.295	1.328	1.212
PCV <sup>c</sup>	Reference	5.7%	Reference	5.1%	Reference	4.1%	Reference	9.6%
ICC <sup>d</sup>	0.006	0.006	0	0	0.003	0.007	0.005	0.002

β = regression coefficient (standard error added in parentheses).

<sup>a</sup> Dichotomous case-mix adjusters use the following reference groups: education = low education, language spoken at home = Dutch/Frisian, gender = males.

<sup>b</sup> Total variance = variance patients + variance hospital.

<sup>c</sup> PCV (proportional change in variance) = (variance total model 1 - variance total model 2) / (variance total model 2) × 100%.

<sup>d</sup> ICC (intra-class correlation) = variance hospital / (variance hospital + variance patients).

\* p < 0.05.

**Table 4**  
Hospital specific differences from mean scores of other hospitals for the Consumer Quality Index Continuum of Care questionnaire.

Hospital	Domain			
	GP approach	GP referral	Specialist	Collaboration
UMC-1 n = 266	−0.001 (0.028)	−0.019 (0.022)	−0.054 (0.038)	−0.176 (0.079) <sup>*</sup>
MZG n = 211	0.051 (0.030)	0.001 (0.024)	0.022 (0.042)	−0.043 (0.087)
BZH n = 251	0.061 (0.028) <sup>*</sup>	0.041 (0.022)	0.016 (0.039)	0.029 (0.081)
DL n = 255	−0.064 (0.028) <sup>*</sup>	0.010 (0.022)	−0.094 (0.038) <sup>*</sup>	−0.010 (0.081)
RZL n = 171	−0.007 (0.033)	0.006 (0.026)	0.085 (0.045)	0.246 (0.095) <sup>*</sup>
RZAR n = 38	−0.044 (0.067)	−0.072 (0.053)	0.023 (0.091)	0.168 (0.195)
UMC-2 n = 114	0.008 (0.040)	0.019 (0.031)	0.009 (0.054)	0.156 (0.114)
Other <sup>a</sup> n = 95	−0.070 (0.043)	−0.076 (0.034) <sup>*</sup>	0.106 (0.059)	−0.193 (0.124)

Multilevel regression coefficients and their standard errors (in parentheses) are presented.

<sup>a</sup> Other refers to hospitals not listed.

<sup>\*</sup>  $p < 0.05$ .

It is also likely that specialists within a hospital may differ from each other just like their patients do. This may affect the CQI-CC scores within but not so much between hospitals. Moreover, we cannot rule out some non-response bias in this study.

Furthermore, mandatory health insurance in the Netherlands guarantees universal health care. Given this care provision, hospital populations may not differ enough to allow for a substantial differentiation in continuum of care. This assumption is supported by our observation that in our population patient characteristics did not differ between hospitals and hospitals did not differ en masse from each other in outcome scores. Evaluating this questionnaire's ability to discriminate between CQI-CC scores across hospitals in health care systems that are less uniform would help to clarify this issue.

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