Patients’ Evaluation of the Quality of Diabetes Care (PEQD): development and validation of a new instrument

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ORIGINAL ARTICLE

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Objective. To develop a brief measure of patients’ evaluation of the quality of diabetes care and to study predictors of consumers’ rating of the quality of diabetes care.

Design. A prospective design.

Subjects. 176 adults with type 1 (39%) or type 2 (61%) diabetes.

Main measures. Demographic variables, HbA1c, number of diabetes complications, satisfaction with diabetes care, diabetes related distress, and fear of hypoglycaemia were assessed by self-report. In addition, satisfaction with diabetes care and evaluations about quality of the care were measured at 16 month follow up. Statistical analysis comprised principal component analyses, Cronbach’s alpha, t tests, Pearson’s correlation, and linear regression analyses.

Results. Results in the literature were used to develop the 14 items of the Patients’ Evaluation of the Quality of Diabetes Care (PEQD) scale, assessing the most important aspects of the quality of diabetes care as delivered by the specialist in internal medicine (internist) and the diabetes nurse specialist (DNS). Two principal components analyses (internist/DNS) both yielded one 14 item factor with a high internal consistency. Satisfaction with diabetes care, fewer diabetes related complications, fewer treatment related problems, and a low level of worries about hypoglycaemia were predictors of a more positive evaluation of diabetes care delivered by the internist. Sociodemographic variables were not related to the patients’ evaluations of the quality of diabetes care.

Conclusions. The PEQD comprises different aspects of quality of diabetes care and can be regarded as a suitable instrument for evaluating patients’ judgments about the quality of their care.

It has been shown in different patient groups that dissatisfaction with medical care is associated with non-compliance of the treatment regimen and discontinuation of care. Consumers satisfaction and the perceptions of patients with regard to the quality of their medical care can therefore be considered as important outcomes of health care and as essential elements of quality assessment and improvement.

In patients with diabetes, discontinuation of care was found to be associated with worse glycaemic control and an increased risk of complications. In the new guidelines for quality diabetes care the European Diabetes Policy Group recently recommended provision of a system of quality development using feedback from diabetic patients on service performance with regular review.

One method of obtaining patients’ views on the quality of diabetes care is by the use of a validated self-report questionnaire. With such a standardised questionnaire, aspects of care that do not meet the expectations of patients can be detected by clinicians for internal quality improvement. This instrument would also be useful for researchers assessing patients’ evaluations of the quality of their diabetes care.

Patients’ evaluation of the quality of their diabetes care was planned to be one of the primary outcomes in a recent randomised controlled trial in which we tested the hypothesis that monitoring and discussion of psychological wellbeing by diabetes nurse specialists (DNSs) leads to improved outcomes of diabetes care.

We searched Medline (1966–96) and PsycLit (1970–96) for an instrument that could be used in the trial to measure patients’ evaluation of the quality of diabetes care using the words “consumer satisfaction”, “treatment satisfaction”, “diabetes”, and “psychometrics”. The literature search yielded two measures. The first was used to rate the performance of four professionals (hospital doctor, practice nurse, general practitioner, or diabetes liaison sister) in relation to seven aspects of diabetes care covering knowledge, communication, convenience, and accessibility. However, the development of the items of the instrument was not fully described. Moreover, a psychometric evaluation of the validity and reliability of this instrument was not provided. In the second study the literature and in-depth interviews with 16 patients with diabetes and four diabetologists were used to develop a list of nine items associated with quality of diabetes care. Using this instrument, diabetes patients ranked statements about quality aspects of diabetes care to obtain a priority list. However, this instrument assesses the patients’ evaluations of diabetes care priorities, and cannot be used to quantify the patients’ rating of the quality of diabetes care.

We concluded that there was no brief validated instrument available to assess patients’ evaluations of the quality of their diabetes care and therefore aimed to develop and validate a new questionnaire, the Patients’ Evaluation of the Quality of Diabetes Care (PEQD). In this study we investigate the factor structure as well as the internal consistency and the convergent and discriminant validity of this new measure.

METHODS
Development of the PEQD

Perhaps the greatest challenge facing us in the assessment of patient experiences with health care is focusing assessments on the most relevant unit of analysis. Some services (e.g. parking, cleanliness) are prominent in satisfaction questionnaires, but are seen as distinct from quality of care by most patients. Other issues such as “being involved in treatment decisions” and “being treated with respect” are fundamental issues for patients, yet these topics are frequently not included in satisfaction measures. Furthermore, studies suggest that the very concept of “satisfaction” is not adequate. Satisfaction only implies that expectations have been met. Patients can be
satisfied with low quality care or can be dissatisfied with high quality care. Thus, in the construction of the PEQD, we have built upon the results of two studies that have investigated the health care priorities for diabetes. The following aspects of diabetes care were found to be valued the most in a sample of patients with type 2 diabetes (not on insulin): “getting clear information”, “health care provider knowledgeable about your problems with diabetes” and “easy to get hold of”, “easy to talk to”, “knowledgeable about diabetes”, “good at listening”. The second study reported that patients with type 1 or type 2 diabetes rated “treatment has favourable effect on diabetes” as the most important aspect of diabetes care, followed by “seeing same health care provider”, “getting all information needed”, “knowledgeable”, “enough time for the patient”, “provider tries to understand patient”, “patient can visit doctor soon after making appointment”, “patient can make choices between different types of treatment”. We used the results of both studies and a meta-analysis of the treatment satisfaction literature in general to develop 14 items (see Appendix). Subjects were requested to evaluate the quality of diabetes care provided by their doctor as well as their DNS during the past 12 months using two separate 14 item scales. A 5 point evaluation scale (poor to excellent) was used.

Subjects
A group of 176 patients with diabetes who had participated in a larger study in 1997 were invited to complete an additional set of questions in 1998. All subjects were patients of the Dutch Diabetes Association (DVN, Diabetes Vereniging Nederland) and formed a heterogeneous sample who received medical treatment from different healthcare providers across the Netherlands. The subjects were matched to the experimental group of the aforementioned randomised clinical trial on sex, age, type of diabetes, and income. The study protocol was approved by the ethics committee of the Vrije Universiteit Medical Center.

Other measures
At baseline (1997) in the earlier study, subjects had already completed questions regarding demographic data, medical and diabetes related emotional distress. Satisfaction with diabetes care was assessed at both interviews using the item: “How satisfied are you in general with your diabetes care?” This question could be responded to on a 5 point Likert scale ranging from “very satisfied” to “very dissatisfied”. Subjects also completed the Problem Areas in Diabetes (PAID) survey, a 20 item measure of complications of diabetes. Satisfaction with diabetes care was assessed at both interviews using the item: “How satisfied are you in general with your diabetes care?” This question could be responded to on a 5 point Likert scale ranging from “very satisfied” to “very dissatisfied”. Subjects also completed the Problem Areas in Diabetes (PAID) survey, a 20 item measure of complications of diabetes.

RESULTS
All 176 subjects had already completed the baseline assessment and 155 (88%) of them returned the second follow up questionnaire a mean (SD) of 15.6 (0.7) months after the baseline assessment. The mean (SD) age was 55 (14) years; most of the patients were women and most had type 2 diabetes (treated with insulin, see table 1). One hundred and twenty four subjects completed all 14 questions regarding the treatment by their internist; 18 subjects had 1–3 missing values (12%) and 13 had more than three missing values. For the DNS items, 84 subjects had no missing values, 13 had 1–3 missing values (12%), and 10 had more than three missing values. Forty eight subjects did not complete the items evaluating the DNS because they did not visit a DNS during the previous 12 months.

### Table 1 Characteristics of study sample (n=155)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>90 (58)</td>
</tr>
<tr>
<td>Mean (SD) Hba1c (%)</td>
<td>7.6 (1.1)</td>
</tr>
<tr>
<td>Type of diabetes</td>
<td></td>
</tr>
<tr>
<td>Type 1</td>
<td>60 (39)</td>
</tr>
<tr>
<td>Type 2</td>
<td>10 (7)</td>
</tr>
<tr>
<td>Type 2 (insulin)</td>
<td>84 (54)</td>
</tr>
<tr>
<td>Duration of diabetes (years)</td>
<td></td>
</tr>
<tr>
<td>1–9</td>
<td>48 (31)</td>
</tr>
<tr>
<td>10–19</td>
<td>52 (34)</td>
</tr>
<tr>
<td>20–29</td>
<td>32 (21)</td>
</tr>
<tr>
<td>30 or more</td>
<td>23 (14)</td>
</tr>
<tr>
<td>Number of complications</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>80 (53)</td>
</tr>
<tr>
<td>1</td>
<td>32 (21)</td>
</tr>
<tr>
<td>2 or more</td>
<td>40 (26)</td>
</tr>
<tr>
<td>Diabetes complications</td>
<td></td>
</tr>
<tr>
<td>Retinopathy</td>
<td>40 (26)</td>
</tr>
<tr>
<td>Nephropathy</td>
<td>9 (6)</td>
</tr>
<tr>
<td>Cardiovascular</td>
<td>26 (17)</td>
</tr>
<tr>
<td>Diabetic foot</td>
<td>27 (18)</td>
</tr>
<tr>
<td>Neuropathy</td>
<td>24 (16)</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
</tr>
<tr>
<td>Married/living together</td>
<td>113 (73)</td>
</tr>
<tr>
<td>Not married</td>
<td>22 (14)</td>
</tr>
<tr>
<td>Widowed</td>
<td>12 (8)</td>
</tr>
<tr>
<td>Divorced</td>
<td>8 (5)</td>
</tr>
<tr>
<td>Highest completed education</td>
<td></td>
</tr>
<tr>
<td>Primary school</td>
<td>16 (11)</td>
</tr>
<tr>
<td>Lower vocational</td>
<td>31 (21)</td>
</tr>
<tr>
<td>General secondary</td>
<td>53 (37)</td>
</tr>
<tr>
<td>Senior (general) secondary</td>
<td>16 (11)</td>
</tr>
<tr>
<td>Higher vocational/university</td>
<td>29 (20)</td>
</tr>
<tr>
<td>Occupational status</td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td>43 (28)</td>
</tr>
<tr>
<td>Registered unemployed</td>
<td>2 (1)</td>
</tr>
<tr>
<td>Housewife</td>
<td>36 (23)</td>
</tr>
<tr>
<td>Retired</td>
<td>36 (23)</td>
</tr>
<tr>
<td>Disabled</td>
<td>32 (21)</td>
</tr>
<tr>
<td>Student</td>
<td>5 (3)</td>
</tr>
</tbody>
</table>

Data are n (%). Mean (SD) values. Note: numbers do not add up to 155 due to missing values.

The Kaiser-Guttman criterion (eigenvalue >1) was used to decide on the number of factors to be retained. Homogeneity of these factors was determined by calculating item total correlations and internal consistency by Cronbach’s alpha. Evidence of construct validity was sought by calculating Pearson’s correlation coefficients between PEQD and overall satisfaction with diabetes care, age, and years of education. In case of skewed distribution, Spearman rank correlation was used. Stepwise linear regression analyses (with forward selection) were conducted to explore the relationship between baseline satisfaction with diabetes care, physical and psychological wellbeing, and the patients’ evaluations of the quality of diabetes care at follow up.
Subjects who had visited the DNS during the 12 months preceding the follow-up assessment were significantly younger than those who did not visit the DNS during this period (50 (15) years versus 59 (14) years, p<0.001). t tests and χ² tests did not yield significant differences between the two groups in terms of sex, type of diabetes, number of complications, HbA1c, years of education, or satisfaction with diabetes care at follow-up.

**Principal components analyses**

Principal components analyses of the 14 items of both scales yielded eigenvalues of 9.1 (PEQD-I) and 8.7 (PEQD-DNS), respectively. Other eigenvalues were <1.0, suggesting a one factor solution for both scales. Both one factor solutions yielded eigenvalues of 9.1 (PEQD-I) and 8.7 (PEQD-DNS), respectively. The factor loadings ranged from 0.34 to 0.90 for the items regarding the internist’s care and from 0.52 to 0.88 for the items evaluating the care of the DNS (table 2).

**Patients’ evaluations of diabetes care**

Paired t tests indicated that respondents had a significantly more positive evaluation of the care delivered by the DNS than that delivered by the internist with regard to the following topics: waiting times, duration of consultations, clarity of information, amount and usefulness of information, opportunity to ask questions, and emotional support (table 2).

**Homogeneity, internal consistency, and distribution of both scales**

For the PEQD-I, Cronbach’s alpha was 0.96 and the mean item total correlation was 0.77 (range 0.31–0.88); for the PEQD-DNS, Cronbach’s alpha was 0.95 and the mean item total correlation was 0.74 (range 0.48–0.85). The 14 items were summed for both scales. Total scale scores were then transformed to a 0–100 scale using the formula: [(actual raw score – 14)/56] × 100.

The mean total score was significantly lower for the PEQD-I than for the PEQD-DNS (54.8 (20.7) versus 59.9 (18.8),

### Table 2 Mean (SD) item scores (not transformed) and factor loadings of the 14 PEQD items for the internist and the diabetes nurse specialist (DNS) after principal component analysis

<table>
<thead>
<tr>
<th>Shortened item content</th>
<th>Item means (SD)</th>
<th>Factor loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internalist</td>
<td>DNS</td>
<td>Internalist</td>
</tr>
<tr>
<td>1. Waiting times</td>
<td>3.7 (1.1)</td>
<td>4.1 (0.6)**</td>
</tr>
<tr>
<td>2. Duration of consultations</td>
<td>2.9 (1.1)</td>
<td>3.3 (1.0)**</td>
</tr>
<tr>
<td>3. Time between appointments</td>
<td>3.1 (1.0)</td>
<td>3.1 (1.0)</td>
</tr>
<tr>
<td>4. Clarity of information</td>
<td>3.1 (1.1)</td>
<td>3.4 (1.0)**</td>
</tr>
<tr>
<td>5. Amount of information</td>
<td>3.0 (1.1)</td>
<td>3.3 (1.0)**</td>
</tr>
<tr>
<td>6. Usefulness of information</td>
<td>3.7 (1.0)</td>
<td>3.9 (1.1)*</td>
</tr>
<tr>
<td>7. Opportunity to ask questions</td>
<td>3.1 (1.2)</td>
<td>3.5 (1.1)**</td>
</tr>
<tr>
<td>8. Emotional support</td>
<td>3.1 (1.1)</td>
<td>3.4 (1.0)**</td>
</tr>
<tr>
<td>9. Medicotechnical competence</td>
<td>3.2 (0.9)</td>
<td>3.4 (0.9)</td>
</tr>
<tr>
<td>10. Continuity of diabetes care</td>
<td>3.1 (1.0)</td>
<td>3.2 (1.0)</td>
</tr>
<tr>
<td>11. Integration of care</td>
<td>3.0 (1.0)</td>
<td>3.0 (0.9)</td>
</tr>
<tr>
<td>12. Co-decide on diabetes treatment</td>
<td>3.2 (1.1)</td>
<td>3.4 (1.0)</td>
</tr>
<tr>
<td>13. Ease of getting appointments</td>
<td>3.3 (1.0)</td>
<td>3.4 (1.0)</td>
</tr>
<tr>
<td>14. Overall quality of diabetes care</td>
<td>3.2 (1.1)</td>
<td>3.4 (0.9)</td>
</tr>
</tbody>
</table>

Note: n ranged from 143–148 for items regarding the internist and from 98–106 for items concerning the DNS.

***p<0.001, **p<0.01, *p<0.05.

### Table 3 Linear regression models using four blocks with baseline data (1997) to predict PEQD (internist and DNS scale) and overall satisfaction with diabetes care at follow up (1998)

<table>
<thead>
<tr>
<th>PEQD-Internist</th>
<th>PEQD-DNS</th>
<th>Satisfaction with diabetes care (1998)</th>
</tr>
</thead>
<tbody>
<tr>
<td>β</td>
<td>Semi-</td>
<td>R² change</td>
</tr>
<tr>
<td></td>
<td>partial</td>
<td>r</td>
</tr>
<tr>
<td>I Satisfactory diabetes care (1997)</td>
<td>0.23*</td>
<td>0.20</td>
</tr>
<tr>
<td>II HbA1c</td>
<td>-0.16</td>
<td>0.16</td>
</tr>
<tr>
<td>Negative wellbeing</td>
<td>-0.17</td>
<td>-0.15</td>
</tr>
<tr>
<td>Positive wellbeing</td>
<td>-0.07</td>
<td>-0.05</td>
</tr>
<tr>
<td>IV PAID: Emotional problems</td>
<td>0.29</td>
<td>0.15</td>
</tr>
<tr>
<td>PAID: Treatment problems</td>
<td>-0.32*</td>
<td>-0.23</td>
</tr>
<tr>
<td>PAID: Food problems</td>
<td>-0.04</td>
<td>-0.06</td>
</tr>
<tr>
<td>PAID: Social support problems</td>
<td>0.04</td>
<td>0.03</td>
</tr>
<tr>
<td>HFS: Worry about hypoglycaemia</td>
<td>-0.29*</td>
<td>-0.24</td>
</tr>
<tr>
<td>R²</td>
<td>32%</td>
<td>32%</td>
</tr>
</tbody>
</table>

*p<0.05, **p<0.01, ***p<0.001.
DNS. The patients' evaluation of the quality of diabetes care
with a more favourable evaluation of the care delivered by the
internist more negatively at follow up. However, neither vari-
baseline evaluated the quality of care delivered by their
significant (p=0.09).
comparable to the other models (β=0.31), and satisfaction with diabetes care at follow up
(β=0.43), explaining 11%, 8%, and 22% of the variance,
variables at follow up: PEQD-I (β=0.23), PEQD-DNS
(β=0.31), and satisfaction with diabetes care at follow up
(β=0.43), explaining 11%, 8%, and 22% of the variance,
respectively. The number of diabetes related complications
was significantly associated with PEQD-I and satisfaction
with diabetes care at follow up. With PEQD-DNS as the dependent
variable, the number of diabetes related complications was
comparable to the other models (β=-0.22) but was not significant
(p=0.09).

Patients who reported a higher level of treatment related
problems and/or worries about hypoglycaemic episodes at
baseline evaluated the quality of care delivered by their
internist more negatively at follow up. However, neither vari-
able was significantly related to PEQD-DNS or satisfaction
with diabetes care at follow up. A higher level of diabetes
related emotional problems at baseline was positively related
with a more favourable evaluation of the care delivered by the
DNS. The patients' evaluation of the quality of diabetes care
was not significantly associated with self-reported HbA1c.

**DISCUSSION**

The outcome of this research is a brief questionnaire assessing
the patients' judgement about the quality of his or her
diabetes care. This instrument appeared to have a clear struc-
ture. Analyses yielded a one factor solution with adequate
internal consistency. The outcomes of the PEQD scale were
significantly correlated with the other self-report scales.

**Key messages**

- There are no brief validated instruments available to assess
  patients' evaluations of the quality of diabetes care.
- A new instrument, the PEQD (Patient's Evaluations of the
  Quality of Diabetes Care), was developed using results in
  the literature regarding healthcare priorities of diabetic
  patients and diabetologists.
- The results of the present study support the validity and reli-
  ability of the PEQD.
- Further research is needed to evaluate the PEQD in different
  patient groups and healthcare settings.

**Associations with demographic characteristics**

No significant differences (p<0.01, t test) in mean scores were
seen in the PEQD items (internist or DNS) for the following
variables: sex, type of diabetes, type of treatment for type 2
diabetes (diet/medication versus insulin), marital status (having
a partner versus single), or employment status (employed versus unemployed). Likewise, neither PEQD scale had a sig-
nificant correlation with age or years of education.

**Associations with self-reported psychological and
biomedical variables**

The PEQD-I scale was significantly associated with the 20 item
overall scale of the PAID survey (β=-0.24, p=0.006) and its four
subscapes: diabetes related emotional problems (β=-0.21,
p=0.017), treatment related problems (β=-0.37, p=0.000), food
related problems (β=-0.18, p=0.041), and social support related
problems (β=-0.18, p=0.037) and -0.33 (p<0.001) with the HFS
worry scale. The correlations between the PEQD-DNS scale and
the PAID (sub)scales and the HFS worry scale did not exceed 0.15 and did not reach statistical significance.

Both PEQD scales had a moderate correlation with overall
satisfaction with diabetes care at follow up (internist 0.54,
DNS 0.44, p<0.001). Table 3 shows that baseline satisfaction
with diabetes care was positively associated with the following
variables at follow up: PEQD-I (β=0.23), PEQD-DNS
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  ability of the PEQD.
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  patient groups and healthcare settings.
**APPENDIX: PATIENTS’ EVALUATION OF THE QUALITY OF DIABETES CARE-INTERNIST VERSION (PEQD-I)**

Instructions: The following 14 questions cover different aspects of diabetes care. People with diabetes can use this questionnaire to express their opinion about the quality of their diabetes care by the internist. Please judge the diabetes care you have received during the past 12 months. Please try not to skip any questions. If you have been treated by two or more different internists during the past 12 months, please try to give “mean score” for this specialization.

1. The waiting time before consulting the internist:
   | poor | fair | good | very good | excellent |
   | 1    | 2    | 3    | 4         | 5         |

2. The duration of the consultation with the internist:
   | poor | fair | good | very good | excellent |
   | 1    | 2    | 3    | 4         | 5         |

3. The time I have to wait until my next appointment with the internist:
   | poor | fair | good | very good | excellent |
   | 1    | 2    | 3    | 4         | 5         |

4. The clarity of information I receive from the internist:
   | poor | fair | good | very good | excellent |
   | 1    | 2    | 3    | 4         | 5         |

5. The amount of information I receive from the internist:
   | poor | fair | good | very good | excellent |
   | 1    | 2    | 3    | 4         | 5         |

6. The usefulness of the information I receive from the internist:
   | poor | fair | good | very good | excellent |
   | 1    | 2    | 3    | 4         | 5         |

7. The opportunity to ask questions to the internist during the consultation:
   | poor | fair | good | very good | excellent |
   | 1    | 2    | 3    | 4         | 5         |

8. The emotional support given by the internist:
   | poor | fair | good | very good | excellent |
   | 1    | 2    | 3    | 4         | 5         |

9. The medico-technical competence of the internist (e.g. knowledge about diabetes, ability to maintain/achieve favourable effects on your diabetes):
   | poor | fair | good | very good | excellent |
   | 1    | 2    | 3    | 4         | 5         |

10. The extent to which the internist is informed about the (past) treatment of my diabetes:
    | poor | fair | good | very good | excellent |
    | 1    | 2    | 3    | 4         | 5         |

11. The extent to which the diabetes care provided by internist is integrated with the care of other health providers that I have visited (e.g. the diabetes nurse specialist or other medical specialists):
    | poor | fair | good | very good | excellent |
    | 1    | 2    | 3    | 4         | 5         |

12. The opportunity to share decisions with the internist about the treatment of my diabetes:
    | poor | fair | good | very good | excellent |
    | 1    | 2    | 3    | 4         | 5         |

13. The ease of making new appointments with the internist:
    | poor | fair | good | very good | excellent |
    | 1    | 2    | 3    | 4         | 5         |

14. The overall quality of my diabetes care by the internist is:
    | poor | fair | good | very good | excellent |
    | 1    | 2    | 3    | 4         | 5         |
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