Measuring symptom change in patients with Parkinson’s disease

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Abstract

Background: the 39-item Parkinson’s disease questionnaire (PDQ-39) is more sensitive to functional change than other measures of health and disability.

Aim: to determine the ability of this scale to change over time and the concurrent validity of some of its subscales.

Methods: we assessed a cohort of 67 Parkinson’s patients for 18 months, using the PDQ-39, the GHQ-28 general health questionnaire and the Office of Population and Census Surveys disability instrument.

Results: the Office of Population and Census Surveys disability instrument and GHQ-28 recorded no significant change, but the PDQ-39 showed marked changes in levels of functioning. We also analysed changes on the PDQ-39 subscales as well as concurrent validity data for several subscales. This showed concurrent validity with the Beck depression and anxiety inventories, the Barthel index and the Royal Postgraduate Medical School severity scale. There was a high level of concurrent validity for all comparisons except for the Barthel index.

Conclusion: the PDQ-39 is a sensitive tool for monitoring change in patients with Parkinson’s disease. It has high levels of concurrent validity with established measures of mood and motor function.

Keywords: activities of daily living, anxiety, depression, GHQ-28, general health questionnaire, PDQ-39, Parkinson’s disease, Parkinson’s disease questionnaire

Introduction

Patients with Parkinson’s disease may have cognitive, emotional and psychosocial difficulties, all of which can affect quality of life. Established assessment measures such as the Unified Parkinson’s Disease Rating Scale [1] do not tend to cover these aspects in great detail. While scales of neurological dysfunction (e.g. those of Webster [2] or Hoehn and Yahr [3]), psychiatric instruments (e.g. the Beck depression inventory [4]) and generic functional disability questionnaires—e.g. the Office of Population and Census Surveys (OPCS) disability instrument [5] and the Barthel index [6]—are available, no scale has accommodated the assessment of the diverse signs and symptoms of Parkinson’s disease or their impact on quality of life.

The 39-item Parkinson’s disease questionnaire (PDQ-39) [7] attempts to characterize a wide range of parkinsonian signs and symptoms. It is a sensitive [8], valid and reliable [9] index of performance in several aspects of Parkinson’s disease. The scale might be useful for examining the efficacy of pharmacological, surgical and psychological interventions.

The PDQ-39 can be completed by most patients in about 10 min. Most of the subscales have few items and it would be comforting to know that scores achieved on these correlate with longer, well-established tests.

We have compared the relative sensitivity to change of the PDQ-39, the OPCS disability instrument and the GHQ-28 general health questionnaire in Parkinsonian patients, with the hypothesis that the PDQ-39 would have the greatest sensitivity. We have also assessed the validity of elements of the PDQ-39 by testing patients concurrently on established measures of disease severity, depression and anxiety.

Methods

Design

Patients were assessed at baseline and then at 6, 12 and 18 months. To determine the concurrent validity of the PDQ-39 subscales, we administered tests of symptom severity, depression and anxiety as part of the baseline assessment.
Measures

PDQ-39

This is a self-administered questionnaire which yields a single index of a subject's level of function. It has eight subscales designed to probe levels of mobility (10 items), activities of daily living (six items), emotional well-being (six items), stigma (four items), social support (three items), cognition (four items), communication (three items) and bodily discomfort (three items). Each of the 39 items requires the subject to respond to questions such as 'due to having Parkinson's disease, how often during the last month have you had difficulty dressing yourself?'. Subjects are asked to tick the appropriate response from 'never', 'occasionally', 'sometimes', 'often' and 'always/cannot do'. Items were scored on a scale of 1 for an 'always/cannot do' reply.

Barthel index

The Barthel index contains 14 items, each of which relate to a different activity, such as ‘drinking from a cup’, ‘dressing lower body’ and ‘walking 50 yards on the level’. We used the scoring scheme of Granger et al. [10] in which individuals are rated for each item on a three-point scale of ‘unable’, ‘needs help’ or ‘independent’.

Beck anxiety inventory

The Beck anxiety inventory evaluates the signs and symptoms of anxiety in adults [11]. It has 21 items, each of which asks subjects to evaluate how much they have been bothered by a symptom during the past week. Responses are on a four-point scale of ‘not at all’, ‘mildly’, ‘moderately’ and ‘severely’. A score of 0 was given to ‘not at all’ responses, 1 for mild, 2 for moderate and 3 for severe.

Beck depression inventory

Studies of the prevalence of depression in parkinsonism have yielded inconsistent outcomes. Given the known effects of depression upon neuropsychological test performance [4], we measured depression using the Beck depression inventory. In spite of fears that somatic items on the inventory might resemble parkinsonian signs, the Beck depression inventory remains a robust and useful assessment of depression in parkinsonian patients [12].

OPCS disability instrument

This instrument is designed to give a single measure of disability. It is more sensitive to changes in health status than traditional measures such as the Barthel index [13]. Subjects are asked to consider several statements and mark if they are applicable. Functional areas covered include locomotion, intellectual functioning, personal care, communication and dexterity. Each section contains statements ranked in order of severity. For example, the ‘locomotion’ subscale ranges from ‘cannot walk 400 yards without stopping or severe discomfort’ to ‘cannot walk at all’. To obtain an overall severity score, the three highest scores are inserted into the following equation:

\[
\text{Worst score} + 0.4(\text{2nd worst}) + 0.3(\text{3rd worst}) = \text{overall severity score}
\]

GHQ-28

The GHQ-28 was introduced as a self-administered screening test to detect psychiatric disorder [14]. It has been widely used with subjects considered to be at risk of psychiatric disorder, including patients with parkinsonism (e.g. [15]). The version we used has 28 questions which the subject evaluates and then selects one of four possible responses. For example, item B1 asks whether the subject has recently lost much sleep over worry. Possible responses are ‘not at all’, ‘no more than usual’, ‘rather more than usual’ and ‘much more than usual’. We adopted the score method suggested by the test authors of scoring each item with 0 for ‘not at all’ to 3 for responses made at the top of the scale.

We also included a measure of disease severity (Appendix 1), for which assessments on a 0–3 scale were made on several primary and secondary signs. This scale has been used by the Royal Postgraduate Medical School in previous studies of parkinsonian patients.

Subjects

We recruited 67 patients with Parkinson’s disease from the outpatient clinics of hospitals within the Ealing, Hammersmith and Hounslow Regional Health Authority. Details of the group’s composition by age, sex and disease duration are in Table 1.

Table 1. Gender and age of subjects and duration of Parkinson’s disease

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>Mean (years)</th>
<th>SD</th>
<th>Mean (years)</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>41</td>
<td>69.3</td>
<td>7.8</td>
<td>5.5</td>
<td>5.0</td>
</tr>
<tr>
<td>Women</td>
<td>26</td>
<td>71.6</td>
<td>8.0</td>
<td>7.4</td>
<td>6.0</td>
</tr>
<tr>
<td>Total</td>
<td>67</td>
<td>70.2</td>
<td>7.9</td>
<td>6.2</td>
<td>5.5</td>
</tr>
</tbody>
</table>

SD, standard deviation.
**Procedure**

One of us (S.P.) assessed all patients during a home visit and asked patients to complete, under supervision, the selected measures during a single session. The mean duration for the entire assessment at baseline was 87 min (SD = 34.2). Time taken did not correlate with age, disease duration or any other measure.

**Results**

We calculated descriptive statistics for our sample on the selected outcome measures. These data are reported in Table 2 and suggest that our sample were mainly in the mild stages of the disease.

To test the sensitivity to change of the PDQ-39, GHQ-28 and OPCS disability instrument, we carried out one-factor repeated measures analysis of variance (ANOVA) of the data for each test, at baseline, 6, 12 and 18 months. Both the OPCS disability instrument [F (3, 57) = 0.37, P = 0.77] and the GHQ-28 [F (3, 57) = 0.46, P = 0.71] failed to show a significant effect of decline over the 18 months. In contrast, assessments gained using the PDQ-39 showed a highly significant decline [F (3, 61) = 9.0, P < 0.0001]. The mean performance of our sample at each time point for each of these measures is shown in Figure 1.

Having established the superior sensitivity of the PDQ-39 to change, we then proceeded to an analysis of change on each of the PDQ-39 subscales. The mean performance on each subscale at each time point, as shown in Figure 2, reveals that all subscales (except emotion and bodily discomfort) show progressive, linear worsening. To establish this statistically, we subjected each subscale score at each time point to one-factor repeated measures ANOVA, testing at an α = 0.01 to correct for multiple comparisons. This analysis showed significant declines for scores on the mobility [F (3, 61) = 6.5, P = 0.0003], activities of daily living [F (3, 61) = 8.4, P < 0.0001], stigma [F (3, 61) = 4.0, P = 0.0087] and social [F (3, 61) = 7.1, P = 0.0001] subscales. The change on the communications subscale was not quite significant [F (3, 61) = 2.84, P = 0.04]. Change on the emotion [F (3, 61) = 1.85, P = 0.14], cognition [F (3, 61) = 1.9, P = 0.127] and bodily discomfort [F (3, 61) = 0.37, P = 0.77] subscales failed to show significant effects.

We then determined the concurrent validity of emotion, activities of daily living and subscales measuring motor difficulty:

1. For baseline PDQ-39 ‘emotion’ and Beck depression inventory scores, correlation using Pearson’s r yielded a coefficient = 0.73 (P < 0.0001). This level of correlation strongly suggests that both tests are measuring the same ‘mood’ construct.

2. For baseline PDQ-39 ‘activities of daily living’ and Barthel index, as 63% of the sample scored at ceiling on the Barthel, we calculated Spearman’s ρ to examine the relationship between these two variables. This yielded a significant value of ρ = 0.3 (P < 0.02).

We had expected baseline symptom severity, as measured using the Royal Postgraduate Medical School severity scale, to correlate highly with the ‘mobility’,

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### Table 2. Baseline test mean, standard deviation, standard error and range

<table>
<thead>
<tr>
<th>Test item</th>
<th>Barthel</th>
<th>OPCS-DI</th>
<th>BDI</th>
<th>BAI</th>
<th>GHQ-28</th>
<th>PDQ-39</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>85.5</td>
<td>7.2</td>
<td>11.25</td>
<td>12.7</td>
<td>22.9</td>
<td>85.8</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>15</td>
<td>5.1</td>
<td>8.24</td>
<td>9.6</td>
<td>11.8</td>
<td>28.8</td>
</tr>
<tr>
<td>Standard error</td>
<td>1.83</td>
<td>0.62</td>
<td>1.01</td>
<td>1.17</td>
<td>1.45</td>
<td>3.51</td>
</tr>
<tr>
<td>Range</td>
<td>40–94</td>
<td>0–20</td>
<td>0–35</td>
<td>0–39</td>
<td>8–64</td>
<td>39–158</td>
</tr>
</tbody>
</table>

OPCS-DI, Office of Population and Census Surveys disability instrument; BDI, Beck depression inventory; BAI, Beck anxiety inventory; GHQ-28, general health questionnaire; PDQ-39, 39-item Parkinson’s disease questionnaire.

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Figure 1. Scores on the 39-item Parkinson’s disease questionnaire (□), Office of Population and Census Surveys disability instrument (○) and GHQ-28 general health questionnaire (▲) by timepoint (error bars indicate one standard error).
The results shown in Figure 2 suggest that for most of the PDQ-39 subscales decline is linear. Thus, the required efficacy of anti-parkinsonian compounds can be specified \textit{a priori}, and studies powered to allow for detection of clinically relevant levels of effectiveness and efficacy. The same would hold true when testing the efficacy of surgical interventions, such as fetal graft or pallidotomy.

The PDQ-39 appears to be a useful and sensitive index of function in parkinsonism and reflects health-related quality of life. The administration of both the Unified Parkinson's Disease Rating Scale and the PDQ-39 could provide a cohesive and broad analysis of patients' difficulties. There is some overlap between the scales in the assessment of motor signs. Some scales of signs and symptoms and of activities of daily living are highly intercorrelated, despite differences in their composition [16]: for example, the motor examination and activities of daily living scales of the Unified Parkinson's Disease Rating Scale can be shortened without loss of reliability or validity [17]. The next step is therefore to shorten these scales so that they can be administered in less time.

**Acknowledgement**

The authors wish to thank the Parkinson's Disease Society for their financial support of this study.

**Key points**

- The 39-item Parkinson’s disease questionnaire is a sensitive tool for monitoring change in patients with Parkinson’s disease.
- It is particularly useful for detecting changes in mobility, activities of daily living, social support and stigma.
- It has high levels of concurrent validity with established measures of mood and motor function.

**References**


Appendix 1. Royal Postgraduate Medical School Parkinson’s disease severity index

Rate each of the following symptoms (0 = absent, 1 = slight, 2 = moderate, 3 = severe problem)

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tremor</td>
<td></td>
</tr>
<tr>
<td>Slowness of movement</td>
<td></td>
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<tr>
<td>Dizziness</td>
<td></td>
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<tr>
<td>Loss of balance</td>
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<tr>
<td>Confusion</td>
<td></td>
</tr>
<tr>
<td>Memory loss</td>
<td></td>
</tr>
<tr>
<td>Difficulty in swallowing</td>
<td></td>
</tr>
<tr>
<td>Dribbling</td>
<td></td>
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<tr>
<td>Nausea</td>
<td></td>
</tr>
<tr>
<td>Vomiting</td>
<td></td>
</tr>
<tr>
<td>Difficulty with speech</td>
<td></td>
</tr>
<tr>
<td>Urine problems</td>
<td></td>
</tr>
<tr>
<td>Worry/anxiety</td>
<td></td>
</tr>
</tbody>
</table>

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