Influence of patient-assessed quality of chronic illness care and patient activation on health-related quality of life

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Abstract

Objective: To examine the association of the Patient Assessment of Chronic Illness Care (PACIC) with health-related quality of life (HRQoL) and the modulating effect of patient activation on this association.

Design and participants: A population-based prospective cohort study of people with Type 2 diabetes in Queensland, Australia, using data from self-report questionnaires, collected annually from 2008 (n = 3761) to 2010 (n = 3040).

Main Outcome Measures: Predictors were the 20-item PACIC (dichotomized at the score of 3), and the 13-item Patient Activation Measure (PAM), dichotomized into activation Levels 1 and 2 versus Levels 3 and 4. Analyses were restricted to participants whose PACIC and PAM categories did not change over 2 years of follow-up. Outcome variables were EQ-5D index and EQ VAS dichotomized at the uppermost quartile, and EQ-5D index also dichotomized at the median.

Statistical analyses: An inverse probability weighted Poisson regression with a log-link function and a binary response variable for each outcome was used to obtain risk ratios (RRs), and the interaction between PACIC and PAM was statistically modelled, taking into consideration patient characteristics and the respective baseline outcome variable.

Results: The positive association between the PACIC and EQ VAS was seen only in participants with low activation (adjusted RR: 3.91; 95% CI: 1.40–10.95; P = 0.009), and not in those with high activation, indicating the non-synergistic interaction effect of the PACIC and PAM. This association was not found with EQ-5D index.

Conclusions: Chronic care received consistently over time can positively affect health status, and benefit patients with low activation.

Key words: PACIC, patient activation, EQ-5D, health-related quality of life, chronic illness care
Introduction

Health-related quality of life (HRQoL) is commonly influenced by chronic illness care, and is now well-recognized as a meaningful patient-reported outcome measure for determining the effectiveness of chronic care delivery [1]. Patient-reported HRQoL is also influenced by psychosocial characteristics, a key aspect of which is patient activation (defined as the patients’ ability to take an active role in managing their health) [2]. The interplay between patients’ social circumstances and their psychological capacity to cope with chronic illnesses is reflected in their ability (knowledge, skills and confidence) for self-management, which is important in behavioural dimensions of chronic disease management, such as healthy lifestyle (diet and exercise), self-care and medication adherence [2, 3]. Type 2 diabetes mellitus is one of the most common chronic illnesses, and there is a paucity of data on the effects of incorporating psychosocial characteristics into diabetes management as a means towards improving quality of life [4]. In this study, we therefore examine the effect of patient activation on the association between patient-assessed quality of chronic illness care and HRQoL for people with Type 2 diabetes mellitus.

Methods

The study

Data were obtained from the Living with Diabetes Study conducted annually in Queensland, Australia, from 2008 to 2011. Details of the study design and data acquisition have been published [5]. The study was approved by The University of Queensland’s Behavioral and Social Sciences Ethical Review Committee. Self-administered questionnaires (with consent forms) were mailed to 14 439 adult registrants of the National Diabetes Services Scheme, with 29% response rate at baseline (3951 respondents with either Type 1 or Type 2 diabetes). The respondents showed similar characteristics to non-respondents, except that they were older and less likely to be of Indigenous origin [6]. The present study used data reported by respondents with Type 2 diabetes only in 2008 (n = 3761), 2009 (n = 3209) and 2010 (n = 3040). Thus, the follow-up rate from baseline to 2009 was 86% and from baseline to 2010 was 81%.

We used the 20-item Patient Assessment of Chronic Illness Care (PACIC) instrument to measure the quality of chronic illness care from patient perspectives [7], and the 13-item Patient Activation Measure (PAM) to assess patient activation [8]. Only cases with more than 10 PACIC items answered in all 3 years were included in the analyses. As for outcome measures, we used the EuroQol Group’s EQ-5D index score and visual analogue scale (EQ VAS) as generic HRQoL measures, reported by the participants in 2010. Previous studies supported validity and reliability of all these measures in people with diabetes [1, 8, 9]. All these measures were dichotomized to allow the estimation of risk ratios (RRs) which can then be interpreted in a clinically useful fashion. Description of these main measures is presented in Table 1. Analyses for this study were restricted to patients with Type 2 diabetes only in 2008 (n = 3761), 2009 (n = 3209) and 2010 (n = 3040).

Table 1 Description of main measures in this study

<table>
<thead>
<tr>
<th>What the instrument measures</th>
<th>PACIC</th>
<th>PAM</th>
<th>EQ-SD Index</th>
<th>EQ VAS</th>
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<tbody>
<tr>
<td>How it is scored</td>
<td>Patient-assessed quality of chronic illness care</td>
<td>Patient activation</td>
<td>Generic health-related quality of life</td>
<td>Generic health-related quality of life</td>
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<tr>
<td>How the total score is obtained</td>
<td>Each of the 20 items was scored on a five-point scale, ranging from 1 (none of the time) to 5 (always), with higher scores indicating better patient-assessed quality of care [7]</td>
<td>Each of the 13 item was scored on a four-point scale, ranging from 1 (strongly disagree) to 4 (strongly agree), yielding a total raw score between 13 and 52 [8]</td>
<td>EQ-5D has five dimensions (mobility, self-care, usual activities, pain/discomfort and anxiety/depression), each of which was reported in one of three levels: no problem, some/moderate problems and extreme problems [18]</td>
<td>The EQ VAS score ranges from 0 (worst imaginable health state) to 100 (best imaginable health state)</td>
</tr>
<tr>
<td>How it was dichotomized</td>
<td>The overall PACIC score is the mean of all items answered</td>
<td>The raw score was converted to an activation score ranging from 0 to 100 according to the scoring instructions for the PAM (2008). Each respondent was then assigned into one of four patient activation levels, with Level 1 being ‘least activated’ to Level 4 being ‘most activated’</td>
<td>The responses were converted into a single summary index (EQ-5D index) using the time trade-off valuation set for Australia [19]. EQ-5D index score ranges from 0 (dead) to 1 (full health), with possible negative values for states worse than death</td>
<td>The EQ VAS score ranges from 0 (worst imaginable health state) to 100 (best imaginable health state)</td>
</tr>
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</table>

PACIC, Patient Assessment of Chronic Illness Care; PAM, Patient Activation Measure; EQ-5D, EQ-5 Dimensions; EQ VAS, EQ Visual Analogue Scale.
participants whose PACIC and PAM categories did not change over 2 years of follow up, based on the underlying concept that consistency in chronic illness care over time is important for effectiveness of care and so is the consistency in patient activation.

Patient characteristics related to predictor and outcome variables were identified from the literature. Those selected as covariates were guided through the use of a directed acyclic graph [10]. Selected patient characteristics included age, gender, education, employment, marital status, number of comorbidities in the lifetime, BMI and depression in 2010 (Fig. 1). Depression was measured using the 20-item Center for Epidemiologic Studies Depression Scale (CES-D Scale), with each item scored on a four-point scale from 0 to 3 and a higher total score indicating more severe depression (range 0–60).

Statistical analyses

Descriptive analyses were undertaken to provide frequencies, proportions, means and standard deviations for participant characteristics in 2010. We used Poisson regression with a log-link function to model the dichotomized binary response variable for each outcome: EQ-5D index and EQ VAS. This allowed us to generate adjusted relative risks. Interaction of the PACIC and PAM measures was considered during regression modelling. The unadjusted and adjusted analyses from this multivariable model were reported. The Poisson regression was inverse probability weighted, and this was done to adjust for drop-outs in any or both follow-up years (2009 and 2010). The conditional probability ($P$) of complete follow-up for each participant was calculated as a function of baseline patient characteristics using logistic regression and its inverse was used as a sampling weight after replacing the low and high outliers with the 1st and 99th percentile values, respectively. All analyses were performed using Stata version 13.1 (Stata Corp, College Station, TX, USA). Significance was considered at $P < 0.05$.

Results

The entire sample in 2010 ($n = 3040$) had a mean age of 64.6 ± 10.36 years, and was comprised of 45% women ($n = 1379$), 2% Aboriginal or Torres Strait Islander ($n = 43$), and 72% married/partnered participants ($n = 2164$). Proportions for education attainment were 47% without high school completion ($n = 1368$), 10% with high school completion ($n = 300$), 15% with certificates/diplomas ($n = 453$), 14% with completed trade/apprenticeship ($n = 415$) and 14% with university degrees ($n = 397$). Retirees comprised 52% of the sample ($n = 1511$), employed 33% ($n = 963$), unemployed 8% ($n = 239$) and those unable to work 7% ($n = 188$). Median number of comorbidities in the lifetime was 2 (IQR: 1–3), the mean BMI 31.1 ± 6.55; and the mean CES-D score 13.2 ± 10.79. The proportions of participants at patient activation levels of 1, 2, 3 and 4 were 10% ($n = 315$), 17% ($n = 501$), 35% ($n = 1065$) and 38% ($n = 1136$), respectively. The median (IQR) of EQ-5D index score was 0.649 (0.4–1) and that of EQ VAS was 75 (60–85) in 2010.

The number of participants who reported an unchanged PACIC category over the follow-up years was 1478 (with 1170 in the low

Figure 1 Directed acyclic graph (DAG) on association between the PACIC and health-related quality of life.
PACIC group and 308 in the high PACIC group), and an unchanged PAM category was 1857 (with 349 in the low activation group and 1508 in the high activation group). Overall, there were 933 participants within both an unchanged PACIC category and an unchanged PAM category over the 2 years from 2008 to 2010.

Results of Poisson regression showed neither a significant main effect for the EQ-5D index score when dichotomized at the uppermost quartile or the median (data not shown) nor a significant interaction effect with the PAM when dichotomized at the median (adjusted $P = 0.336$) (Table 2). However, in the analysis with the EQ-VAS as the outcome, a significant interaction between the PACIC and the PAM on the EQ-VAS was observed (adjusted $P = 0.011$), with a higher PACIC predicting better EQ-VAS only in patients with low activation (Table 2).

**Discussion**

Our results demonstrate that both patient-assessed quality of chronic illness care and patient activation affect patients’ rating of their health status, when measured using the EQ VAS. The interaction observed between the PACIC and the PAM was not synergistic as health status, when measured using the EQ VAS, the effect of care designed to activate patients (for example, interventions such as motivational interviewing) can have greater benefits, such as easily understandable and simplified presentation of effect size and practical significance (rather than $P$-value significance) and the feasibility of studying interaction effects in this manner, can outweigh its disadvantages, especially in this study in which the predictor and outcome variables of interest are not normally distributed. Had we used continuous modelling, we would have had to transform the HRQoL outcomes to achieve normality, and this would have created problems in interpretation of results. In addition, the optimal cut-off points were selected for dichotomization based on the spread of the HRQoL values, and these can serve as useful thresholds for translation into health care practice. As our study is population-based, it is likely that our study population is healthier than older population such as registrants from the Department of Veterans’ Affairs, patients who were prescribed with one or more diabetes-related drugs, and health-facility-based samples. Thus, it is expected that the number of comorbidities would be lower in our study population compared with others. In addition, it is possible that the invited NDSS registrants who were severely ill or had high numbers of comorbidities declined to participate in our study. However, selection bias is unlikely because the predictor and outcome variables do not collide on the comorbidity variable as the latter is not a common effect of the predictor/outcome variables.

We conclude that chronic care received consistently over time can positively affect health status. Specifically, adequate chronic care, which comprises components of self-management support, care

<table>
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<th>Table 2</th>
<th>Interaction between the PAM and the PACIC on their association with EQ-5D index and EQ VAS scores (2010)</th>
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<tbody>
<tr>
<td>PAM</td>
<td>PACIC</td>
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<tr>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>High</td>
<td>Low</td>
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</table>

*Subset of participants with consistent values over all years: high PAM (Levels 3 and 4); low PAM (Levels 1 and 2); high PACIC (mean score $\geq$3); low PACIC (mean score $<3$).

*When adjusted for age, gender, education attainment, employment status, marital status, BMI, number of comorbidities in the life time and CES-D score in 2010 and EQ-5D index score at baseline, measure of interaction between the PACIC and PAM on multiplicative scale: ratio of adjusted RRs (95% CI) was 2.06 (0.47-8.99), $P = 0.336$.

RR for PAM in participants with low PACIC (95% CI) $= 1.11$ (0.95-1.31); $P = 0.182$.

*When adjusted for the above patient characteristics in 2010 and EQ VAS score at baseline, measure of interaction between the PACIC and PAM on multiplicative scale: ratio of adjusted RRs (95% CI) was 0.25 (0.09-0.72); $P = 0.011$.

RR for PAM in participants with low PACIC (95% CI) $= 1.98$ (1.13-3.46); $P = 0.016$.
coordination and patient follow-up, can be beneficial for patients with low activation. Alternatively, improving patient activation may improve health status, and further research is needed on effective interventions to improve activation. Overall, the findings also add to the evidence base regarding the utility of the PACIC in care quality assessments by demonstrating its longitudinal association with EQ VAS.

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