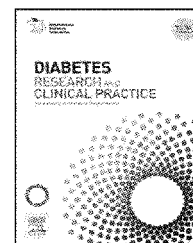




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Hospital admissions, emergency department utilisation and patient activation for self-management among people with diabetes

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ABSTRACT

Aims: To assess the relationship between patient activation for self-management and admissions to hospital or attendances at emergency departments among people with diabetes, after controlling for other known associations.

Methods: Patients were randomly selected from Australia's National Diabetes Services Scheme and invited to participate in the Living with Diabetes Study, which is a longitudinal survey providing a comprehensive examination of health care utilisation, well-being and disease progression. Data was collected for 3951 participants.

Results: Outcome events were defined as 1 or more hospitalization and 1 or more visits to an emergency department in the preceding 12 months. Logistic regression analyses showed six variables remained significantly associated with both outcomes: age, income, disease duration and severity, current depression and PAM stage. Patients at PAM stage 1 were 1.4 times more likely to be hospitalised ($p = 0.023$) and 1.3 times more likely to have visited emergency ($p = 0.049$) compared to those at stage 4.

Conclusions: Low levels of activation are associated with higher utilisation of hospital resources even after controlling for relevant factors such as disease severity and co-morbid depression. Most will be gained by moving patients from PAM stage 1 to a higher level of activation.

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1. Introduction

The prevalence of chronic disease, and particularly diabetes, is increasing worldwide, thereby intensifying the demand for health services, including inpatient care [1]. The economic consequences of both the high use of medical services for diabetes treatment, and the growing number of patients with the condition, will be substantial. Patients with diabetes are at higher risk of hospitalization, longer stay in hospital, and greater total inpatient costs than the general population [2–5]. In Australia, where this research is based, hospital admission for any diagnosis of diabetes mellitus increased by 35%

between 2000–2001 and 2004–2005 [6]. Elsewhere, it has been reported that patients with diabetes are hospitalised up to three times more often than those without the condition, and diabetes patients are likely to stay in hospital 30% longer [4,5]. Low income backgrounds, longer disease duration, disease severity and co-morbid depression are all important determinants of hospital resource utilisation for people with diabetes [7–10].

The hospitalization of people with diabetes is commonly precipitated by conditions like heart disease, which may or may not be the result of their diabetes [11]. Frequently in these situations, the management of diabetes becomes secondary to that of the primary diagnosis. Poor glycaemic control is

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therefore common among hospital inpatients with diabetes, particularly those treated with insulin. Both length of stay in hospital and the number of readmissions may increase when symptoms of hypoglycaemia develop [12]. Likewise, improved glycaemic control is associated with fewer inpatient admissions and fewer emergency department visits [13–15]. Furthermore, intensive glycaemic control has been shown not to result in increased emergency department visits for hypoglycaemia [16].

Patient self-management of diabetes has been widely recognised as an important contributor to improved health outcomes [17]. Improved self-management of diabetes may prevent short-term complications like hypoglycaemic episodes, infections, and electrolyte disturbances; as well as decrease the risk of long-term complications of diabetes [14,18]. However, the evidence supporting the value of self-management education for diabetes is mixed [19]. In one systematic review, no studies demonstrated that self-management training improved cardiovascular disease outcomes [19] and of those studies that examined health service utilisation, most failed to demonstrate improvements [19]. Furthermore, lay-led self-management education programs did not reduce time spent in hospital by people with chronic health conditions [20].

It is likely that the success of self-management education programs is dependent on the patient. Hibbard and colleagues developed the Patient Activation Measure (PAM), which assesses a person's beliefs about, motivation for, and action for self-care [21]. Diabetes patients with higher levels of activation for self-management enjoy better health outcomes than those with lower scores [22–24]. The levels of patient activation are important because engaged, informed, confident, and skilled patients are more likely to perform activities that will promote their own health, and are more likely to have their health care needs met [25].

Retrospective analysis of secondary data has revealed that PAM scores are predictive of all-cause hospitalizations among patients with diabetes [24]. In this paper we use cross-sectional data from a large cohort of patients diagnosed with either type 1 or type 2 diabetes to further explore the relationship between patient activation for self-management and two outcomes of interest: (i) hospitalization for diabetes-related conditions and (ii) emergency department presentations for diabetic patients. The study is of sufficient magnitude to control for known risk factors such as disease duration and disease severity, and in multivariate models.

2. Patients and methods

2.1. Study design

The Living with Diabetes Study (LWDS) is a prospective cohort study which aims to provide a comprehensive examination of temporal trends in satisfaction with care, quality of life, health care utilisation and disease progression in people with diabetes living in Queensland, Australia. It is contributing to a large scale evaluation of the state-wide Queensland Strategy for Chronic Disease 2005–2015 program, designed to improve the care of major chronic diseases, including diabetes [26]. The LWDS sampling scheme oversampled in three areas of policy

interest to this Strategy: an outer metropolitan area, a new suburban development and a coastal agricultural community. Participants were recruited to the study through Australia's National Diabetes Services Scheme (NDSS), an initiative of the Australian Government which is administered by Diabetes Australia. It is estimated that the scheme covers 80–90% of the Australian population diagnosed with diabetes [27].

Data for the LWDS is collected annually and the first wave of surveys was completed in 2008. Results from the baseline survey are examined in this report. Ethics approval for the study was granted by the University of Queensland's Behavioural and Social Sciences Ethical Review Committee.

2.2. Participants

People were eligible to participate in the LWDS if they: were registered with the NDSS; living in Queensland; aged 18 years or older; had been diagnosed with type 1 or type 2 diabetes (gestational diabetes was excluded); had a valid postal address recorded with the NDSS; and indicated on their NDSS registration that they were interested in opportunities to participate in research. The final criterion reduced the population available for sampling by about one third. At baseline, 3951 participants returned the completed questionnaire, yielding a participation rate of 29%. We were able to use aggregated NDSS data to compare participants with non-participants, and the findings showed that individuals were less likely to participate if they were: under the age of 50 years; were in the lowest socio-economic tertile; or if they identified themselves as indigenous Australians.

2.3. Measures

2.3.1. Health care utilisation

Outcome events examined in this report are (i) 1 or more hospital admissions in the previous 12 months and (ii) 1 or more emergency department visits in the previous 12 months. Respondents were asked "In the last 12 months, how many times have you been admitted to hospital overnight?" and "In the last 12 months, how many times have you presented to an emergency department of a hospital?" Respondents who reported a hospital admission were provided with a list of common reasons for diabetes hospitalizations and asked to indicate the number of times they had been admitted for each, as well as how many nights they were admitted. Reasons for emergency department visits were not recorded. Participants were also asked how many times they had seen a range of health professionals in the last 12 months. These included general practitioner or family doctor, diabetes specialist, endocrinologist or physician, and a number of other allied health professionals or medical specialists.

2.3.2. Socio-demographic factors

Participants responded to questions about socio-demographic characteristics, including gender, age, marital status, level of educational attainment and household income.

2.3.3. Disease factors

Two disease factors were included: disease duration and disease severity. Disease duration was defined by the length of

time since diagnosis and was categorised into three periods. Recently diagnosed participants included those diagnosed in the previous 2 years, the intermediate category included those diagnosed between 2 and 10 years previously and the third group included those diagnosed more than 10 years ago. Participants with diabetes were categorised as having severe disease if they required oral medications or insulin injections for their condition, and mild disease if their condition was managed by lifestyle measures alone.

2.3.4. Current depression

Current depression was measured using the Center for Epidemiological Studies-Depression (CES-D) scale [28]. The scale yields a score that varies between 0 and 60 with higher scores indicating more symptoms of depression. CES-D scores of 16–26 are considered indicative of mild depression and scores of 27 or more indicative of major depression [29,30]. Zich et al. [30] found the stringent cut-off score of 27 more useful for screening medical patients for depression than the standard cut-off score of 16. In this paper we use a score of 27 or more to define current depressive symptoms.

2.3.5. Patient activation for self-management

The 13-item Patient Activation Measure (PAM) is an interval level unidimensional Guttman-like measure of participant's knowledge, skills and confidence in managing their health that has been explained in detail elsewhere [31]. The psychometric properties of the short-form PAM are similar to those of the original 22-item measure. Respondents indicate their level of agreement with the statements on a four point scale (strongly disagree to strongly agree) and responses are added to provide a raw score. Based on an iterative Rasch psychometric analysis, the raw score is converted to an activation score between 0 and 100 (the higher the score the higher the level of activation). This is then used to classify respondents into one of four activation levels based on cut off points provided as part of the PAM scoring methodology. The four levels are: stage 1, at which people do not feel confident enough to play an active role in their own health and tend to be passive recipients of care; at stage 2, they lack confidence and an understanding of their own health or recommended regimen; those at stage 3 have the key facts and are beginning to take action but may lack confidence and the skill to support their behaviours; and at stage 4, people have knowledge, skills and confidence to play a significant role in their care, and have adopted new healthy behaviours, although they may not be able to maintain them in the face of stress or health crises [21].

2.4. Statistical analysis

A cross-sectional analysis of the baseline data is reported. Descriptive statistics weighted for oversampling in the three policy areas summarise the characteristics of the LWDS participants. Participants who had been hospitalised or visited the emergency department in the preceding 12 months were compared with those who had not been hospitalised, nor visited the emergency department, using likelihood ratios, chi square test and logistic regression analysis. Unadjusted odds ratio and chi square test were used to identify individual factors associated with diabetes related hospital admissions

and emergency department visits, separately. Univariate odds ratios (95% CI) were calculated for all variables of interest. Factors having a *p*-value equal to or less than 0.15 in the univariate analyses were included in a stepwise multivariate logistic regression analysis. For each iteration the criteria for variables to enter or remain in the model were $p \leq 0.15$ and $p \leq 0.05$, respectively. For both hospitalization and emergency department visits, six factors remained in the final logistic regression model, namely: age, income, disease duration, disease severity, current depressive symptoms and PAM activation level. All analyses were conducted using STATA version 11 (Statacorp, College Station, USA).

3. Results

3.1. Description of the sample

The mean age of the LWDS participants at baseline was 62 years; 55.1% ($n = 2175$) of participants were male. Of the total participants, 95.2% ($n = 3761$) reported that they were diagnosed with type 2 diabetes, 24.4% ($n = 928$) required regular insulin, and the mean duration since diagnosis was 8 years. The vast majority of respondents (97.3%, $n = 3797$) had visited a general practitioner (GP) at least once in the previous 12 months and the median number of primary care/GP visits was six in the previous 12 months. About one third of participants (32.4%) had been seen by an endocrinologist in the previous year. The overall mean of the PAM activation score was 62.7 (range: 0–100) and the median was 60 (inter-quartile range: 52.9–73.1). Older participants (mean score = 59.8) and those from households with a lower income (mean score = 61.4) reported statistically significantly poorer activation scores ($p = 0.003$; $p < 0.001$, respectively). Of the total participants, 69.9% ($n = 2739$) had patient activation levels of 3 or 4.

3.2. Number of and reasons for admissions to hospital

Overall, 20.5% ($n = 783$) of individuals had at least 1 diabetes-related admission to hospital for at least 1 night and 21.6% ($n = 844$) had presented to an emergency department. The main reason for admission to hospital was for a heart problem or heart disease (23.6%, $n = 185$), followed by poor glycaemic control (e.g., hypoglycaemia/hyperglycaemia) 12.5% ($n = 98$). Table 1 shows patients' average number of visits for a list of common reasons for admission to hospital as well as the average length of stay, Table 2 presents the proportion of hospital admissions by reason and age.

3.3. Associations with hospitalization and emergency department visits

In the univariate analysis, six variables were significant predictors of hospital admission, including being older (75+ years), having a lower household income, time since diagnosis (longer than 10 years), diabetes requiring pharmaceutical management (disease severity), current depressive symptoms and PAM stage 1. A similar pattern of association was found for emergency department visits, with the addition that being secondarily single (that is, either widowed, divorced or

Table 1 – Reason for hospitalization, average number of admission and length of stay in hospital.

Reason for admission	Hospitalizations (n = 783)		
	n (%)	Average number of admissions to hospital	Average number of nights stay per admission
Glycaemic control (i.e., hypoglycaemia/hyperglycaemia)	98 (12.5)	1.9	3.8
Vascular/circulation problems	65 (8.3)	1.5	5.2
Foot ulcer/wounds/infections	47 (6.0)	1.5	8.3
Other type of infection (e.g., chest)	85 (10.9)	1.6	6.2
Eye disease or eye operation	31 (4.0)	1.5	1.6
Kidney problems or kidney disease	48 (6.1)	1.8	3.8
Heart problems or heart disease	185 (23.6)	1.6	3.7
Medication error	16 (2.0)	1.2	3.0
Falls	36 (4.6)	1.8	6.9
Others	326 (41.6)	1.5	4.6

For hospitalization, n = 783 (136 overlap).

Table 2 – Reason for hospitalization by age group: n (%).

Reason for admission	Age in years			Total
	18–49	50–74	75+	
Glycaemic control (i.e., hypoglycaemia/hyperglycaemia)	37 (30.6)	50 (9.5)	11 (8.2)	98 (12.5)
Vascular/circulation problems	8 (6.1)	41 (7.8)	16 (11.8)	65 (8.3)
Foot ulcer/wounds/infections	13 (10.7)	27 (5.1)	7 (5.2)	47 (6.0)
Other type of infection (e.g., chest)	17 (14.0)	56 (10.6)	12 (8.9)	85 (10.9)
Eye disease or eye operation	0	20 (3.8)	11 (8.1)	31 (4.0)
Kidney problems or kidney disease	7 (5.8)	30 (5.7)	11 (8.1)	48 (6.1)
Heart problems or heart disease	15 (12.4)	131 (24.9)	39 (28.9)	185 (23.6)
Medication error	3 (2.5)	11 (2.1)	2 (1.5)	16 (2.0)
Falls	2 (1.6)	18 (3.4)	16 (11.8)	36 (4.6)
Others	53 (43.8)	230 (43.6)	43 (31.8)	326 (41.6)

For hospitalization, n = 783 (136 overlap).

separated) was also a significant predictor. Table 3 shows the associations of hospital admissions and emergency department visits separately, with each of the variables of interest. There was no significant association between gender or educational attainment and hospitalization or emergency department visits. Participants at PAM stage 1 were more likely to have been hospitalised (OR = 1.7; 95% CI: 1.3–2.2; $p < 0.001$) or to have visited the emergency department (OR = 1.8; 95% CI: 1.4–2.2; $p < 0.001$) than were participants at PAM stage 4.

3.4. Logistic regression analysis

For both hospital admissions and emergency department visits, six of seven variables entered into the stepwise logistic regression model remained in the final step. These were: age, household income, disease duration, disease severity, current depressive symptoms, and PAM stage [see Table 4]. Only marital status was not statistically significant.

Very high current depressive symptoms increased the likelihood of hospitalization of diabetes patients 1.8 times, and of an emergency department visit two fold. Participants who had been diagnosed more than 10 years ago were 1.6 (95% CI: 1.3–2.0) times more likely to be admitted to hospital and 1.3 times more likely to visit an emergency department than those who were diagnosed recently (less than two years). While older participants (75+ years) were 1.5 (95% CI: 1.0–2.1) times more likely to be admitted to hospital than participants

in the younger age groups, a different pattern emerged for emergency department visits. Here, participants in the 50–74 year old age group were less likely to visit the emergency department when compared to the younger age group (18–49 years). Disease severity was also found to be an important predictor for hospital admission or emergency department visits. More precisely, participants who required regular insulin or oral hypoglycaemic medications (more severe) were 1.3 times more likely to be hospitalised or to attend an emergency department than participants whose diabetes was managed with diet and lifestyle measures alone (less severe). Participants with an annual household income of greater than \$40,000 were less likely to be hospitalised or to attend the emergency department compared to those with an income less than or equal to \$40,000 per year. Finally, participants at PAM stage 1 were 1.4 times more likely to be hospitalised and 1.3 times more likely to visit an emergency department compared to individuals at PAM stage 4.

4. Discussion

Our study has reinforced the findings of other studies showing that low income backgrounds, longer disease duration, disease severity and co-morbid depression are all important determinants of hospital resource utilisation for people with diabetes [7–10]. The patterns of associations for the two outcomes of interest were highly consistent. Indeed, there was

Table 3 – Factors associated with hospitalization and emergency department visits.

Variables	N	Hospitalization (n = 783)			Emergency department visit (n = 844)		
		n (%)	LR and p-value	Crude odds (95% CI)	n (%)	LR and p-value	Crude odds (95% CI)
Sex							
Male	2175	430 (20.5)	0.03, <i>p</i> = 0.874	1.0	461 (21.5)	0.07, <i>p</i> = 0.797	1.0
Female	1776	353 (20.7)		1.0 (0.9–1.2)	383 (21.8)		1.0 (0.9–1.2)
Age							
18–49 years	604	121 (20.6)	25.2, <i>p</i> = 0.000	1.0	153 (25.5)	17.3, <i>p</i> = 0.000	1.0
50–74 years	2864	527 (19.0)		0.9 (0.7–1.1)	565 (19.9)		0.7 (0.6–0.9)*
75+ years	483	135 (29.7)		1.6 (1.2–2.1)	126 (26.9)		1.1 (0.8–1.4)
Marital status							
Co-habiting	2752	539 (20.1)	4.20, <i>p</i> = 0.123	1.0	551 (20.2)	10.0, <i>p</i> = 0.007	1.0
Secondarily single	866	189 (23.0)		1.2 (1.0–1.4)	214 (25.1)		1.3 (1.1–1.6)*
Never married	269	47 (18.2)		0.9 (0.6–1.2)	64 (24.1)		1.2 (0.9–1.7)
Level of education							
Bachelor or higher	499	97 (19.9)	0.42, <i>p</i> = 0.812	1.0	105 (21.2)	0.56, <i>p</i> = 0.755	1.0
Completed senior school	1249	237 (19.5)		1.0 (0.7–1.3)	257 (20.7)		1.0 (0.8–1.3)
Early school leavers	1770	348 (20.5)		1.0 (0.8–1.3)	381 (21.9)		1.0 (0.8–1.3)
Income							
≤\$40,000	2013	444 (22.9)	21.37, <i>p</i> = 0.000	1.0	489 (24.6)	35.01, <i>p</i> = 0.000	1.0
>\$40,000	1433	232 (16.5)		0.7 (0.6–0.8)*	232 (16.3)		0.6 (0.5–0.7)*
Disease duration							
>10 years	809	221 (28.7)	39.09, <i>p</i> = 0.000	1.8 (1.5–2.2)*	219 (27.7)	21.49, <i>p</i> = 0.000	1.6 (1.3–1.9)*
2–10 years	2517	438 (18.0)		1.0	492 (19.8)		1.0
<2 years	536	102 (19.7)		1.1 (0.9–1.4)	110 (20.7)		1.1 (0.8–1.3)
Disease severity							
Less severe	830	128 (16.0)	12.90, <i>p</i> = 0.000	1.0	140 (17.1)	12.69, <i>p</i> = 0.000	1.0
More severe	3112	650 (21.6)		1.4 (1.2–1.8)*	701 (22.8)		1.4 (1.2–1.7)*
Current depression							
None to mild	3195	594 (19.1)	31.56, <i>p</i> = 0.000	1.0	613 (19.3)	56.28, <i>p</i> = 0.000	1.0
Very high	478	141 (31.0)		1.9 (1.5–2.4)*	167 (35.3)		2.3 (1.8–2.8)*
PAM levels							
Level 4	1337	250 (19.2)	23.65, <i>p</i> = 0.000	1.0	271 (20.4)	31.61, <i>p</i> = 0.000	1.0
Level 3	1402	251 (18.7)		1.0 (0.8–1.2)	268 (19.4)		0.9 (0.8–1.1)
Level 2	671	133 (20.6)		1.1 (0.9–1.4)	138 (20.8)		1.0 (0.8–1.3)
Level 1	508	142 (28.9)		1.7 (1.3–2.2)	158 (31.4)		1.8 (1.4–2.2)

* Significance at 5% level.

only one difference of any significance. Patients in the 75+ age group were more likely to be admitted to hospital than patients in the 18–49 year age group; whereas patients in the 50–74 year age group were less likely to present to an emergency department than the youngest age group. In relation to the former finding, even when diabetes is well controlled and appropriate lifestyle measures are taken, the disease may still progress to a stage requiring insulin, alone or as part of combined treatment, and may eventually lead to complications. It may also be possible that increasing frailty in the older age group influences the ability to cope with comorbidity and contributes to the increased frequency of admission [32], although a literature review by de Boer et al. [8] indicates significant variability in study findings regarding the effect of age on hospital utilisation by chronically ill patients. The greater likelihood of the younger group presenting to the emergency department may be the result of several influences. For example, the data show that admissions to hospital following poor glycaemic control (i.e., hypoglycaemia/hyperglycaemia) were most frequent in the 18–49 year age group (30.6%). A significant proportion of these are likely to have been admitted via the emergency department. Data from the US National Health Interview Survey reported higher emergency department utilisation among younger adults than

older adults with diabetes [33]. This may reflect generational differences in attitudes towards use of emergency services as the British General Household Survey also identified that casualty utilisation in the general population was highest among children, teenagers and young adults [34].

The main issue of interest in this paper, however, was whether higher levels of patient activation for self-management were associated with fewer hospital admissions and/or emergency department visits for people with diabetes, after controlling for other known risk factors. The day to day management of diabetes can be both physically and emotionally demanding and requires high level self-management and decision-making skills. Patients who are more engaged or activated are more knowledgeable, skilled and confident in managing their health, are better able to manage their own care, promote their own health and make better decisions affecting their condition [22,23]. Fostering activated patients who are prepared to take on a meaningful role in their own care is central to improving quality of care and health outcomes. Overall, respondents in our study reported a high level of activation. We found that people with diabetes who scored at the highest activation stage were less likely to be hospitalized when compared to those at the lowest stage. There is little to discriminate patients at PAM stages 4 through

Table 4 – Logistic regression analyses for determinants of hospitalization and emergency department visits.

Variables	Hospitalization			Emergency visit		
	Adjusted odds	Significance (p-value)	95% CI for odds	Adjusted odds	Significance (p-value)	95% CI for odds
Age						
18–49 years ^r						
50–74 years	0.84	0.196	0.65–1.09	0.65	0.001	0.51–0.83
75+ years	1.45	0.039	1.02–2.06	0.78	0.166	0.54–1.11
Income						
≤\$40,000 ^r						
>\$40,000	0.74	0.003	0.61–0.90	0.59	0.000	0.49–0.72
Disease duration						
>10 years	1.60	0.000	1.29–1.98	1.33	0.010	1.07–1.65
2–10 years ^r						
< 2 years	1.16	0.266	0.89–1.52	0.98	0.859	0.75–1.27
Disease severity						
Less severe ^r						
More severe	1.30	0.036	1.02–1.65	1.23	0.083	0.97–1.56
Current depression						
None to mild ^r						
Very High	1.78	0.000	1.38–2.27	1.98	0.000	1.55–2.51
PAM levels						
Level 4 ^r						
Level 3	0.91	0.426	0.73–1.14	0.88	0.268	0.71–1.10
Level 2	0.96	0.798	0.74–1.26	0.84	0.189	0.64–1.09
Level 1	1.38	0.023	1.04–1.81	1.31	0.049	1.00–1.71

r, Reference category.

2. Indeed these comparisons were not significant in univariate or multivariate analyses suggesting that it is patients at PAM stage 1 who are at elevated risk for higher hospital resource usage. Previous cross-sectional survey data has identified that adults with a range of chronic conditions with stage 1 PAM scores are more likely to report extremely low physical and mental health functioning and that the lowest PAM scores are reported by older patients from more disadvantaged backgrounds [23], findings consistent with the current study.

Targeting patient groups with very low activation for self-management and addressing their perceptions of their role in the management of their own health could have the effect of decreasing current and future costs of the disease by reducing hospital and emergency department visits. While the value of patient self-management of chronic disease has been recognised among many [19,35], the challenge of moving individuals from a stage where they are “not prepared to play an active role in their own health” [24] is likely to be difficult to address. Whether individuals are not prepared as a result of low health literacy, or due to an inherent acceptance of the doctor–patient power differential, or indeed as a consequence of dealing with other, to them more important socioeconomic pressures, may be difficult to define and to some extent limits the ability to apply a “one size fits all” approach to self-management support.

The importance of self-determination and perceived competence in patients achieving clinical goals has been a significant focus for one research group [36] who also highlight the importance of “autonomy supportive” practitioners. However, despite increasing evidence of the efficacy of patient activation for self-management, engagement of health care professionals in relevant activities remains a challenge [37]. Health care professionals have been found to hold doubts

about the efficacy of self-management approaches, as well as to be reluctant to refer patients to self-management programs [38]. Recent research suggests that few clinicians receive formal training in self-management approaches [39]. The research reported here further strengthens the argument for improving the understanding of the benefits of patient activation for self-management (including improvements in health outcomes such as hospital utilisation) among health care professionals, in order to ensure that those people who would benefit most from improved self-management skills receive the necessary support from their health care providers. The importance of trust in the physician as a mediator to improving patient activation has been discussed elsewhere [40].

The limitations of the study should be acknowledged. Importantly, the cross-sectional nature of the data inhibits statements about causality. Findings are also limited by the fact that hospital utilisation data were self-reported and therefore reliant on recall. Furthermore, respondents were not asked to provide reasons for their emergency department visits therefore a more in-depth assessment of the reasons for this outcome of interest was not possible. The response rate for participants consenting to participate in research was low, yet consistent with research showing that participation rates in large cohort studies appear to be decreasing. For example, it is estimated that rates have declined from about 80% to 30 or 40% over the past several decades [41]. Countering, at least to some extent, any potential bias of the low participation rate was the finding that there were few differences between participants and non-participants. Analyses showed that individuals were less likely to participate if they were aged less than 50 years, lived in lower socio-economic areas, or if they identified themselves as indigenous Australians, there-

fore generalizing findings from this study to these populations must be undertaken with caution. Research shows that diabetes is more common among Indigenous Australians [42,43]. Research with the Australian Indigenous population that addresses both prevention as well as attributes of high quality health care and management for diabetes should be an imperative.

In conclusion, we have used cross-sectional data from a large representative sample of Australians with diabetes to demonstrate the importance of patient activation for self-management in relation to hospital stays and emergency department utilisation, independent of other recognised influences. The most pressing need is for interventions to motivate and encourage patients with diabetes who do not feel that they are able to contribute to the management of their own health.

5. Participants

We confirm all participant/personal identifiers have been removed or disguised so the participant/person(s) described are not identifiable and cannot be identified through the story.

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Conflict of interest

The authors declare that they have no conflict of interest.

REFERENCES

- [1] Shaw JE, Sicree RA, Zimmet PZ. Global estimates of the prevalence of diabetes for 2010 and 2030. *Diabetes Res Clin Pract* 2010;87:4–14.
- [2] Ringborg A, Martinell M, Ståhlhammar J, Yin DD, Lindgren P. Resource use and costs of type 2 diabetes in Sweden – estimates from population-based register data. *Int J Clin Pract* 2008;62:708–16.
- [3] Tomlin AM, Tilyard MW, Dovey SM, Dawson AG. Hospital admissions in diabetic and non-diabetic patients: a case-control study. *Diabetes Res Clin Pract* 2006;73:260–7.
- [4] Aubert RE, Geiss LS, Ballard DJ, Cocanougher B, Herman WH. Diabetes-related hospitalization and hospital utilization. In: Harris MI CC, Reiber G, editors. *Diabetes in America*, Vol. NIH Publication No. 95-1468. Washington, DC: US Government Printing Office; 1995. p. 553–69.
- [5] Hirsch I, Paauw D, Brunzell J. Inpatient management of adults with diabetes. *Diabetes Care* 1995;18:870–8.
- [6] AIHW. Diabetes: Australian facts 2008. In: AIHW, editor. *Cat. No. CVD 40 (Diabetes Series No. 8)*. Canberra: AIHW; 2008.
- [7] Gillian LB, Janet EH. Relationship between avoidable hospitalizations for diabetes mellitus and income level. *Arch Intern Med* 2003;163:101–6.
- [8] de Boer AG, Wijker W, de Haes HC. Predictors of health care utilization in the chronically ill: a review of the literature. *Health Policy* 1997;42:101–15.
- [9] Nour El-Din MM, Al-Mulhim NA, Abdel Gawwad ES. Factors associated with hospitalization for type2 diabetic patients at a teaching hospital in Saudi Arabia. *J Egypt Public Health Assoc* 2009;84:1–9.
- [10] Wild SH, McKnight JA, McConnachie A, Lindsay RS. Socioeconomic status and diabetes-related hospital admissions: a cross-sectional study of people with diagnosed diabetes. *J Epidemiol Community Health* 2010;64:1022–4.
- [11] Ahmann A. Comprehensive management of the hospitalized patient with diabetes. *Endocrinologist* 1998;8:250–9.
- [12] Leite SA, Locatelli SB, Niece SP, Oliveira AR, Tockus D, Tosin T. Impact of hyperglycemia on morbidity and mortality, length of hospitalization and rates of re-hospitalization in a general hospital setting in Brazil. *Diabetol Metab Syndr* 2010;2.
- [13] Wagner EH, Sandhu N, Newton KM, McCulloch DK, Ramsey SD, Grothaus LC. Effect of improved glycemic control on health care costs and utilization. *JAMA* 2001;285:182–9.
- [14] Chiou S-J, Campbell C, Horswell R, Myers L, Culbertson R. Use of the emergency department for less-urgent care among type 2 diabetics under a disease management program. *Bio Med Central Health Serv Res* 2009;9.
- [15] Leese GP, Wang J, Broomhall J, Kelly P, Marsden A, Morrison W, et al. Frequency of severe hypoglycemia requiring emergency treatment in Type 1 and Type 2 diabetes. *Diabetes Care* 2003;26:1176–80.
- [16] Ginde AA, Espinola JA, Camargo CA. Trends and disparities in U.S. Emergency Department visits for hypoglycemia, 1993–2005. *Diabetes Care* 2008;31:511–3.
- [17] Funnell MM, Brown TL, Childs BP, Haas LB, Hosey GM, Jensen B, et al. National standards for diabetes self-management education. *Diabetes Care* 2009;32:S87–94.
- [18] Menzin J, Korn JR, Cohen J, Lobo F, Zhang B, Friedman M, et al. Relationship between glycemic control and diabetes-related hospital costs in patients with Type 1 or Type 2 diabetes mellitus. *J Managed Care Pharm* 2010;16:264–75.
- [19] Norris SL, Engelgau MM, Narayan KM. Effectiveness of self-management training in type 2 diabetes: a systematic review of randomized controlled trials. *Diabetes Care* 2001;24:561–87.
- [20] Foster G, Taylor S, Eldridge S, Ramsay J, Griffiths C. Self-management education programmes by lay leaders for people with chronic conditions (Review). *Cochrane Database Syst Rev* 2007. The Cochrane Collaboration.
- [21] Hibbard J, Stockard J, Mahoney ER, Tusler M. Development of the patient activation measure (PAM): conceptualizing and measuring activation in patients and consumers. *Health Serv Res* 2004;39:1005–26.
- [22] Hibbard J, Mahoney ER, Stock R, Tusler M. Do increases in patient activation result in improved self-management behaviors? *Health Serv Res* 2007;42:1443–63.
- [23] Mosen DM, Schmittiel J, Hibbard J, Sobel D, Remmers C, Bellows J. Is patient activation associated with outcomes of care for adults with chronic conditions? *J Ambul Care Manage* 2007;30:21–9.
- [24] Remmers C, Hibbard J, Mosen DM, Wagenfield M, Hoyer RE, Jones C. Is patient activation associated with future health outcomes and healthcare utilization among patients with diabetes? *J Ambul Care Manage* 2009;32:320–7.
- [25] Hibbard J, Cunningham J. How engaged are consumers in their health and health care and why does it matter? Research Brief, vol. 8. Washington: Center for Studying Health System Change; 2008.
- [26] Queensland Health. Queensland strategy for chronic disease 2005–2015. Brisbane, Australia: Queensland Health; 2005.

- [27] Australian Institute of Health and Welfare. Diabetes prevalence in Australia: an assessment of national data sources. Diabetes series no 14, Canberra: AIHW; 2009.
- [28] Radloff LS. The CES-D scale: a self-report depression scale for research in the general population. *Appl Psychol Meas* 1977;1:385–401.
- [29] Ensel W. In: Nan Lin, Alfred Dean, Ensel WM, editors. Measuring depression: the CES-D scale. Social support, life events, and depression. New York: Academic Press; 1986.
- [30] Zich JM, Attkisson CC, Greenfield TK. Screening for depression in primary care clinics: the CES-D and the BDI. *Int J Psychiatry Med* 1990;20:259–77.
- [31] Hibbard JH, Mahoney ER, Stockard J, Tusler M. Development and testing of a short form of the patient activation measure. *Health Serv Res* 2005;40: 1918–30.
- [32] Jaafar AF, Heycock R, George J. Frailty – a clinical overview. *Rev Clin Gerontol* 2007;17:171–5.
- [33] Egede LE. Patterns and correlates of emergency department use by individuals with diabetes. *Diabetes Care* 2004;27:1748–50.
- [34] Shah SM, Cook DG. Socio-economic determinants of casualty and NHS Direct use. *J Public Health* 2008;30:75–81.
- [35] Bodenheimer T, Lorig K, Holman H, Grumbach K. Patient self-management of chronic disease in primary care. *JAMA* 2002;288:2469–75.
- [36] Williams GC, McGregor HA, Zeldman A, Freedman ZR, Deci EL. Testing a self-determination theory process model for promoting glycemic control through diabetes self-management. *Health Psychol* 2004;23:58–66.
- [37] Hibbard JH, Collins PA, Mahoney E, Baker LH. The development and testing of a measure assessing clinician beliefs about patient self-management. *Health Expect* 2010;13:65–72.
- [38] Blakeman T, Macdonald W, Bower P, Gately C, Chew-Graham C. A qualitative study of GPs' attitudes to self-management of chronic disease. *Br J Gen Pract* 2006;56:407–14.
- [39] Lake AJ, Staiger PK. Seeking the views of health professionals on translating chronic disease self-management models into practice. *Patient Educ Couns* 2010;79:62–8.
- [40] Becker ER, Roblin DW. Translating primary care practice climate into patient activation: the role of patient trust in physician. *Med Care* 2008;46:795–805. doi: 10.1097/MLR.0b013e31817919c0.
- [41] Nohr EA, Frydenberg M, Henriksen TB, Olsen J. Does low participation in cohort studies induce bias? *Epidemiology* 2006;17:413–8.
- [42] de Courten M, Hodge A, Dowsett G, Vickery J, Zimmet P. Review of the epidemiology, aetiology, pathogenesis and preventability of diabetes in aboriginal and torres strait islander populations. Canberra: DHFS; 1998.
- [43] Daniel M, Rowley KG, McDermott R, Mylvaganam A, O'Dea K. Diabetes incidence in an Australian aboriginal population. An 8-year follow-up study. *Diabetes Care* 1999;22:1993–8.