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Research

Utilisation of general practitioner services and achievement of guideline targets by people with diabetes who joined a peer-support program in Victoria, Australia

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Abstract. This paper describes the use of general practitioner (GP) services and achievement of guideline targets by 285 adults with type 2 diabetes in urban and regional areas of Victoria, Australia. Anthropometric and biomedical measures and responses to a self-administered questionnaire were collected. Findings indicate that almost all participants had visited a GP and had had their hypoglycated haemoglobin (HbA1c) measured in the past 6 months; less than one-third had visited a practice nurse. Fifty per cent achieved a HbA1c target of $\leq$7.0%; 40%, a total cholesterol $\leq$4.00 mmol/L; 39%, BP Systolic $\leq$130 mmHg; 51%, BP Diastolic $\leq$80 mmHg; 15%, body mass index $\leq$25 kg/m^2; and 34% reported a moderately intense level of physical activity, that is, $\geq$30 min, 5 days a week. However, 39% of individuals achieved at least two targets and 18% achieved at least three of these guideline targets. Regional participants were more likely to report having a management plan and having visited a practice nurse, but they were less likely to have visited other health professionals. Therefore, a more sustained effort that also includes collaborative care approaches is required to improve the management of diabetes in Australia.

Additional keywords: diabetes management, regional, urban.

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Introduction

Diabetes is now a major public health problem worldwide, including in Australia (International Diabetes Federation 2011; Australian Bureau of Statistics 2013). It has a significant negative impact on health and quality of life, and leads to an increased risk of disability and reduced life expectancy (International Diabetes Federation 2011; Williams *et al*. 2012). It is also responsible for enormous economic loss (Sicree *et al*. 2009). In order to curb the rapidly increasing problem of diabetes and its related complications, greater attention needs to be given to providing resources and support for the management of diabetes (Diabetes Australia and The Royal Australian College of General Practitioners 2011). Several international and national guidelines have been developed in order to improve delivery of diabetes care and to promote more effective self-management of diabetes and other related chronic conditions (Australian Diabetes Educators Association 2003; IDF Clinical Guidelines Task Force 2005; National Heart Foundation of Australia and the Cardiac Society of Australia and New Zealand 2005; Colagiuri *et al*. 2009*a*; Diabetes Australia and The Royal Australian College of General Practitioners 2011; American Diabetes Association 2012).

In Australia, The Royal Australian College of General Practitioners (RACGP) guidelines for management of type 2 diabetes mellitus (T2DM) in the general practitioner (GP) care setting have been widely disseminated and are updated annually (Zwar *et al*. 2007; Harris 2008; Diabetes Australia and The Royal Australian College of General Practitioners 2011). They

What is known about the topic?

- Diabetes is a major public health challenge in Australia and several guidelines, including those developed by the Royal Australian College of General Practitioners, are available to guide delivery of care and assist people with diabetes.

What does this paper add?

- Despite recent initiatives in Australia to improve the provision of services and care to people with diabetes, more effort is required to promote collaborative care for helping them to achieve clinical targets and improve diabetes management.

emphasise the importance of glycaemic control and the involvement of GPs, diabetes educators, and allied health professionals in diabetes care. Research findings suggest that people with diabetes (PWD) are currently not utilising and/or receiving adequate care from GPs and other available health professionals in order to achieve recommended clinical targets (Bryant *et al*. 2006; Yong *et al*. 2007; Roughead *et al*. 2008; Reddy *et al*. 2010; Zhang *et al*. 2010; Carne *et al*. 2011; Speight *et al*. 2011; Unger *et al*. 2011). Several Australian studies have also suggested that there is a wide variation in the access to and utilisation of GP care for T2DM management by geographical locations in Australia (Overland *et al*. 2001; Australian Institute of Health and Welfare 2010; Speight *et al*. 2011; Unger *et al*. 2011). For example, people with T2DM in rural and regional Australia have been shown to have reduced access to and use of GPs services, outpatient hospital care, specialists and allied health-care services (Overland *et al*. 2001; Unger *et al*. 2011; Skinner *et al*. 2013).

The Australian Government has introduced several national initiatives to improve the management of T2DM in recent years (Vagholkar *et al*. 2007; Diabetes Australia and The Royal Australian College of General Practitioners 2011; Australian Government Department of Health and Ageing 2012). These initiatives have included the promotion and funding of the use of multidisciplinary care plans (MDCP), GP management plans (GPMP) and team care arrangements (TCA). Despite these initiatives, the evidence suggests that around half of all of PWD are still not achieving recommended clinical and behavioural targets (Reddy *et al*. 2010; Unger *et al*. 2011; Skinner *et al*. 2013). The aim of the study was to examine the proportion of people with diabetes from a study in Victoria, Australia, using GP services, achieving guideline targets and also to describe any differences between metropolitan and rural participants.

Methods

Study design and sample

The data for this study were collected as part of the Australasian Peers for Progress Study, which is being conducted in the state of Victoria, Australia, and described previously (Riddell *et al*. 2012). The Australian National Diabetes Service Scheme (NDSS) database (Diabetes Australia 2011) was used to identify and recruit participants for the study from 24 locations in 8 regions of the state of Victoria, Australia, as defined by the Victorian Department of Health (Department of Human Services Victoria Australia 2011), between June and November 2010. Altogether, 7576 people with type 2 diabetes registered with the NDSS andwere invited by mail to participate in the study. Incorrect address details or deceased addressees resulted in the return of 294 letters of invitation. Expressions of interest to participate in the study were received from 501 persons (response rate = 6.9% (501/7282)). Of these, 151 declined to participate after receiving further study requirement details. Written informed consent was obtained from 290 persons (65.7% (290/441) of eligible respondents); however, 17 of these participants subsequently withdrew before the start of the intervention.

Measures

Anthropometric and biochemical measures were taken at baseline and participants completed a self-administered questionnaire. Among other general, demographic and self-care questions, a 27-item questionnaire on utilisation of GP and related services for T2DM management was developed, based on RACGP guidelines and other survey tools, to assess access to health care, use of health services, participation in health insurance schemes, and cost as a barrier to access and use of health services. In addition, knowledge of diabetes was assessed using a 14-item diabetes knowledge test (DKT) questionnaire (Fitzgerald *et al*. 1998). The details of the collection of anthropometric and biomedical measures have been described elsewhere (Riddell *et al*. 2012). In brief, anthropometric measures were collected by trained research assistants; blood and urine samples were collected at pathology centres convenient to participants in the selected study locations and the tests were carried out by the National Association of Testing Authorities, Australia (NATA)-accredited pathology laboratories (National Association of Testing Authorities, Australia 2011).

Geographical classification

Geographical classification of study locations was based on the Australian Standard Geographical Classification - Remoteness Areas (ASGC-RA) (Australian Institute of Health and Welfare 2004). The ASGC-RA categorises localities into: (1) Major city; (2) Inner regional; (3) Outer regional; (4) Remote; (5) Very remote; and (6) Migratory, based on the Accessibility/Remoteness Index of Australia (ARIA). Each class summarises locality size as well as accessibility to health services. The ASGC-RA class was determined using the table describing ASGC-RA and the online Queensland Health Workforce postcode search tool (Health Workforce Queensland 2011). Hence, study locations were classified as Major cities ($n = 14$), Inner regional ($n = 9$) and Outer regional ($n = 1$). Locations classified as Major cities are henceforth referred to as 'metropolitan' and the Inner and Outer regional locations combined are referred to as 'regional'.

RACGP recommended standard diabetes care

The RACGP guidelines for management of T2DM in general practice are summarised in Table 1.

Table 1. Summary of RACGP-recommended standard diabetes care and targets of clinical outcomes
BMI, body mass index; BP, blood pressure; HbA1, hypoglycated haemoglobin; HDL-C, high-density lipoprotein cholesterol; LDL-C, low-density lipoprotein cholesterol; RACGP, Royal Australian College of General Practitioners

Standard diabetes care	Goals for optimum diabetes management
Health care for diabetes	
Assess diabetes control by measuring HbA1c	At least once every 6 months
Eye examination	At least every 2 years
Calculate BMI, measure BP, examine feet	At least once every 6 months
Measure lipids	At least once a year
Test for microalbuminuria	At least once a year
See a Diabetes Educator	Initially, then as considered necessary by patient, doctor or Diabetes Educator
Dietary review with a dietitian	Initially, then as considered necessary by patient, doctor or dietitian
Check smoking status, review physical activity level and medication	At least once a year
Clinical and behavioural outcomes	
HbA1c	≤7%
Fasting plasma glucose	6.1–8.0 mmol/L (fasting)
Total cholesterol	<4.0 mmol/L
LDL-C	<2.5 mmol/L
HDL-C	>1.0 mmol/L
Triglycerides	<1.5 mmol/L
Blood pressure	≤130/80 mmHg
BMI	<25 kg/m^2 where appropriate
Urinary micro albumin	<20 mg/L
Albumin creatinine ratio	Women: <3.5 mg/mmol, men: <2.5 mg/mmol
Cigarette consumption	Zero
Alcohol intake	≤2 standard drinks (20 g) per day for men and women
Physical activity	At least 30 min walking (or equivalent) 5 or more days/week (Total ≥150 min/week)

Source: RACGP Guidelines for Diabetes Management in General Practice, Guideline for Type 2 Diabetes, 2010/11 (Diabetes Australia and The Royal Australian College of General Practitioners 2011).

Data analysis

Data analysis was conducted with Stata statistical software, version 10 (StataCorp 2007). Summary statistics of utilisation of GP and related services with 95% confidence intervals (CI) were used to compare against the RACGP recommended standard care. Univariate comparison of metropolitan and regional locations in the utilisation of GP and related services for T2DM management used Pearson's χ^2 test for categorical variables, and either an independent sample *t*-test or a Mann–Whitney *U*-test for continuous variables, as appropriate.

Logistic regression models (a separate model for each of the four dichotomous outcomes considered to describe utilisation of GP and related services in this study: visit to GP in the past 6 months; HbA1c test done in the past 6 months; visit to a practice nurse in the past 6 months and visit to other health professionals in the past 6 months) were used to determine if utilisation of GP and related care differed by locations when adjusting for factors that could affect this utilisation. The first model was unadjusted, that is, univariate analysis. In the second model, the following demographic variables were adjusted for: country of birth, education level, annual income, and cost as a barrier to access and use of diabetes services. The third model was additionally adjusted for: having GPMP, having a DM annual cycle of care, getting an appointment with a GP and average waiting time at a GP clinic. Statistical significance was considered as $P < 0.05$

Ethics

Ethics approval was obtained from the Monash University Human Research Ethics Committee (MUHREC) Project number CF09/1692 – 2009000920. Participants were given a detailed participant information sheet after which signed informed consent from all participants was obtained.

Results

Demographic characteristics of participants

Altogether, 285 people with T2DM were recruited, $n = 169$ (59%) from metropolitan and $n = 116$ (41%) from more regional locations. Two hundred and seventy-eight (98%) completed the survey questionnaire, 261 (92%) completed anthropometric measures and 277 (97%) completed biomedical measures. The median age of participants was 62 years (metropolitan: 62, regional: 63) and the median duration of having had T2DM was 8 years (metropolitan: 7, regional: 8). A higher proportion of participants in regional areas reported having a GPMP (71% *v.* 55%, $P = 0.01$) or a DM annual cycle of care (87% *v.* 69%, $P < 0.001$) compared with metropolitan participants. Just below half (49%) of the participants reported that they usually experienced waiting one day or less to get an appointment with the GP (metropolitan 60% *v.* regional 33%, $P < 0.001$), with 16% of participants (metropolitan 11% *v.* regional 22%, $P = 0.01$) having to wait for more than 7 days (Table 2).

Table 2. Participants' characteristics, overall and compared by location (metropolitan *v.* regional)
DM, diabetes mellitus; GP, general practitioner; NDSS, National Diabetes Services Scheme

Participants' characteristics	Total *n* (%)	Metropolitan *n* (%)	Regional *n* (%)	*P*-value
Total participants	285 (100)	169 (59)	116 (41)	
Demographic information				
Male	148 (52)	94 (56)	54 (47)	0.13
Born in Australia	168 (63)	80 (53)	88 (77)	<0.001
English language as means of communication at home	239 (90)	127 (84)	112 (98)	<0.001
Living with family/relatives	211 (77)	128 (80)	83 (72)	0.13
Education >12 years	160 (58)	96 (60)	64 (56)	0.43
Annual income less than A$20 000	86 (36)	48 (36)	38 (36)	0.99
Provision of care				
NDSS registrant	249 (95)	141 (93)	108 (96)	0.28
DM annual cycle of care	210 (76)	110 (69)	100 (87)	<0.001
Have GP management plan	161 (62)	83 (55)	78 (71)	0.01
Has private health insurance	146 (53)	91 (57)	55 (48)	0.14
Private health insurance coverage for ancillary and hospital cost	103 (73)	59 (69)	44 (80)	0.32
Access to GP services				
Have own GP	270 (99)	157 (99)	113 (98)	0.39
Always visit same general practice	239 (91)	136 (90)	103 (91)	0.77
Always see the same doctor	173 (68)	99 (68)	74 (68)	0.95
Getting appointment with GP ≤1 day	127 (49)	90 (60)	37 (33)	<0.001
Getting appointment with GP >7 days	42 (16)	16 (11)	25 (22)	0.01
Waiting time at the GP clinic ≤15 min	70 (26)	33 (22)	37 (33)	0.04
Cost was not a barrier to access and use diabetes care services	244 (89)	135 (84)	109 (95)	0.01

Health behaviour, patterns of utilisation of GP and related services, and achievement of RACGP-recommended standard diabetes care

Eight per cent (95% CI: 5–12%) of participants reported that they were current smokers and a higher proportion of smokers were in the metropolitan region (11% *v.* regional 3%; $P = 0.02$) (Table 3). One-third of participants (34%, 95% CI: 28–40%) reported that they achieved the recommended physical activity (PA) levels, and 82% (95% CI: 76–87%) reported that they had consumed alcohol at below the recommended levels. The mean total DKT score was 10.5 ± 2.2 (range: 0–14), with similar mean knowledge levels among metropolitan participants (10.3 ± 2.4) and regional participants (10.7 ± 1.8). Furthermore, there was no difference in the level of knowledge between those participants who reported that they had visited a GP or those who had seen a practice nurse in the past 6 months.

Almost all participants reported that they had visited their GP (92%, 95% CI: 88–94%) and reported at least one HbA1c test performed in the past 6 months (92%, 95% CI: 88–95%). Less than one-third of participants (29%, 95% CI: 24–35%) reported that they consulted practice nurses during the same period. Sixty per cent of participants (95% CI: 54–66%) reported that they consulted other health professionals, such as a podiatrist (23%), an ophthalmologist/optometrist (22%), a diabetes educator (14%), an endocrinologist (12%) and a dietitian (7%) during the same period. One-third (33%) of participants reported that they had an electrocardiogram examination in the past 12 months with metropolitan participants (30%) and regional participants (36%), $P = 0.33$.

Clinical outcomes for diabetes management and adherence to the RACGP-recommended standard diabetes care

Achievement of RACGP-recommended targets for clinical outcomes ranged from 39% (95% CI: 33–45%) for systolic BP ≤130 mmHg to 73% (95% CI: 67–78%) for high-density lipoprotein cholesterol >1.0 mmol/L. Still, a considerable proportion of participants did not achieve the recommended target levels of other clinical outcomes, including HbA1c, total cholesterol and body mass index (BMI) (Table 4). For example, 39% of participants achieved a maximum of two targets and 18% achieved three recommended clinical targets. Further analysis determined that the achievement of clinical RACGP targets was not associated with those who had received care in accordance with the guidelines.

Differences in utilisation of GP and related services between metropolitan and regional locations

After adjusting for demographic and other potential predictors of utilisation of GP and related services, there was no statistically significant association between the likelihood of having visited the GP or having had a HbA1c test in the past 6 months and geographical locations. The regional participants were more likely to have reported consulting a practice nurse during the same period (adjusted OR: 2.52, 95% CI: 1.27–5.01, $P = 0.01$) compared with their metropolitan counterparts. However, they were less likely to have reported consultation with other health professionals (adjusted OR = 0.55, 95% CI: 0.30–0.10, $P = 0.05$) compared with their metropolitan participants (Table 5).

Table 3. Health behaviour and patterns of utilisation of health services for T2DM self-management and adherence to the RACGP-recommended standard diabetes care

CI, confidence interval; GP, general practitioner; HbA1c, hypoglycated haemoglobin; RACGP, Royal Australian College of General Practitioners; s.d., standard deviation; T2DM, type 2 diabetes mellitus

Health care	Total *n* (%)	95% CI	Metropolitan *n* (%)	Regional *n* (%)	*P*-value
Health-related behaviours					
Non-smoker	252 (92)	88–95	141 (89)	111 (97)	0.02
Never smoked in the past	147 (56)	50–62	88 (58)	59 (53)	0.44
Non-smoker at the time of diagnosis of T2DM	152 (75)	69–81	89 (74)	63 (77)	0.67
Drink alcohol <2 standard drinks (20 g) per occasion	160 (82)	76–87	91 (84)	69 (80)	0.46
Physical activity (self-report) ≥150 min walking (or equivalent) 5 days or more/week	91 (34)	28–40	49 (31)	42 (39)	0.19
Use of health services					
Current use of medication	255 (97)	94–98	146 (94)	109 (100)	0.01
Visited GP in the past 6 months	249 (92)	88–95	140 (89)	109 (96)	0.04
Seen practice nurse in the past 6 months	76 (29)	24–35	30 (20)	46 (41)	<0.001
At least one HbA1c test done in the past 6 months	226 (92)	87–94	124 (90)	102 (94)	0.30
Seen other health professionals in the past 6 months	159 (60)	54–67	96 (63)	63 (56)	0.22
Vaccination					
Seasonal influenza vaccine in the past 12 months	179 (69)	63–75	93 (63)	86 (77)	0.02
Diabetes knowledge test (DKT)					
DKT scores (no. and mean ± s.d.) (range 0–14)	266 10.5 ± 2.2		152 10.3 ± 2.4	114 10.7 ± 1.8	0.13

Table 4. Proportion of participants who achieved RACGP-recommended targets of clinical outcomes

BMI, body mass index (weight in kg/height in m^2); BP, blood pressure; CI, confidence interval; FPG, fasting plasma glucose; HbA1c, hypoglycated haemoglobin; HDL-C, high-density lipoprotein cholesterol; LDL-C, low-density lipoprotein cholesterol; RACGP, Royal Australian College of General Practitioners

Measurements/outcomes	Total *n* (%)	95% CI	Metropolitan *n* (%)	Regional *n* (%)	*P*-value
Recommended standard levels					
BP systolic ≤130 mmHg	102 (39)	33–45	64 (43)	38 (34)	0.17
BP diastolic ≤80 mmHg	132 (51)	44–57	81 (54)	51 (46)	0.20
BMI ≤25 kg/m^2	37 (15)	10–19	28 (19)	9 (8)	0.01
HbA1c levels ≤7%	138 (50)	44–56	81 (50)	57 (50)	0.90
FPG ≤ 8.0 mmol/L	155 (59)	53–64	88 (58)	67 (60)	0.75
Total cholesterol levels ≤4.00 mmol/L	109 (40)	34–46	63 (40)	46 (40)	0.90
LDL-C <2.5 mmol/L	157 (59)	53–65	94 (61)	63 (56)	0.43
HDL-C >1.0 mmol/L	197 (73)	67–78	113 (72)	84 (74)	0.76
Triglycerides <1.5 mmol/L	126 (47)	41–53	73 (47)	53 (47)	0.94
Urinary M Albumin <20 mg/L	187 (70)	64–77	98 (63)	89 (79)	0.01

Table 5. Associations between utilisation of four specific health care services and achievement of guideline targets for T2DM management and metropolitan/regional location

GP, general practitioner; HbA1c, hypoglycated haemoglobin; OR, odds ratio

Health care used[A]	Unadjusted association			Adjusted association model 1[B]			Adjusted association model 2[C]		
	OR	95% CI	*P*-value	OR	95% CI	*P*-value	OR	95% CI	*P*-value
Visited GP in the past 6 months	2.80	1.91–7.79	0.05	2.99	0.92–9.73	0.07	2.53	0.71–9.05	0.15
Had HbA1c test done at least once in the past 6 months	1.65	0.64–4.23	0.30	1.25	0.45–3.53	0.67	1.18	0.30–3.55	0.77
Visited a practice nurse in the past 6 months	2.77	1.60–4.80	<0.001	4.58	2.33–9.01	<0.001	2.52	1.27–5.01	0.01
Visited other health professionals in the past 6 months	0.74	0.45–1.21	0.22	0.76	0.44–1.31	0.33	0.55	0.30–1.00	0.05

[A]Each row contains results taken from three separate logistic regression models for utilisation of the specified services.
[B]Adjusted for demographic variables (county of birth, education level, annual income and cost to access diabetes care).
[C]Adjusted for demographic variables and potential predictors of utilisation of GP services (GP management plan, diabetes mellitus annual cycle of care, ease of getting appointment with a GP and average waiting time at a GP clinic).

Discussion

The findings describe utilisation of GP services and achievement of guideline targets by people with T2DM in urban and regional areas of Victoria, Australia. Similar to previous studies (Beilby and Furler 2005; Unger *et al*. 2011; Australian Bureau of Statistics 2013), we found that the majority of study participants (92%) had visited their GPs in the past 6 months and had had their HbA1c test performed at least once during the same period (92%). Less than one-third (29%) of participants reported having seen a practice nurse and ~60% of participants visited other health professionals for management of T2DM and related health problems.

It is now well established that achievement of the clinical target measures listed in Table 1 is very important for managing diabetes effectively and for preventing the progression of complications due to the disease (Gore and McGuire 2009). Approximately half of our study participants were not achieving the majority of targets. Fifty per cent of participants had a HbA1c >7.0%, 41% had a fasting plasma glucose >8.0 mmol/L and 60% had a total cholesterol >4.0 mmol/L. In addition, 61% had a BP systolic >130 mmHg, 49% had a BP diastolic >80 mmHg and 85% had a BMI >25 kg/m^2. The findings from our study are comparable with the findings of previous studies (Longstreet *et al*. 2005; Bryant *et al*. 2006; Yong *et al*. 2007; MacIsaac *et al*. 2009; Reddy *et al*. 2010). For example, a study of participants drawn from GP diabetes registers in Victoria, Australia reported that just over half (59%) achieved the recommended HbA1c target of ≤7.0% (Reddy *et al*. 2010). Similarly, another study that reviewed the pharmacy claims in the Department of Veterans' Affairs database reported that 63% of veterans with T2DM had at least one HbA1c test claim (Roughead *et al*. 2008). In other studies in Australia, approximately half (46%, Yong *et al*. 2007; 48%, MacIsaac *et al*. 2009) achieved the recommended HbA1c target of ≤7.0%. Furthermore, in a study sample drawn from a diabetes clinic reported that less than one-third (30%) achieved the HbA1c recommended target of ≤7.0% and that one-third (34%) had a HbA1c >8% (Bryant *et al*. 2006). Our findings related to the achievement of other clinical outcomes are consistent with findings of previous studies. For example, the proportion of people with T2DM who achieved cholesterol levels ≤4.0 mmol/L ranged from 15% (Yong *et al*. 2007) to 40% (Reddy *et al*. 2010). In addition, the proportion of participants who achieved a BP ≤130/80 mmHg ranged from 29% (Yong *et al*. 2007) to 43% (Reddy *et al*. 2010) and those achieving a BMI ≤25 kg/m^2 ranged from 4% (Flack JR for the National Association of Diabetes Centres 2007) to 11% (Bryant *et al*. 2006).

The majority of our study participants had quite a good level of diabetes knowledge (overall, the mean DKT score was 10.5 ± 2.2 (range: 0–14)), with no difference between those from metropolitan and regional areas. Evidence suggests that those people with T2DM who have an increased level of diabetes knowledge are more likely to effectively manage their diabetes-related conditions (Persell *et al*. 2004). However, many of our study participants were not utilising health services adequately and also not achieving the guideline targets required for the effective management of T2DM. Health literacy is also an important factor for diabetes management (Powell *et al*. 2007) and an important prerequisite for behavioural change leading to improved diabetes management (Colagiuri *et al*. 2009*b*). Support from different sources including health-care providers, family members and relatives and also from peers might help to strengthen the level of knowledge and also to translate knowledge into practise for the effective management of diabetes.

Despite a variety of initiatives already being in place in Australia to improve the provision of services and care to PWD in recent years, our findings suggest that there is still a need for more effort to improve the uptake and delivery of GP services and to increase the number of patients achieving clinical targets. Other authors suggest there is also a need for a more collaborative approach between patients and health-care providers for the improvement in chronic disease management including diabetes (Furler *et al*. 2008; Katon *et al*. 2010; Higgins *et al*. 2012; Morgan *et al*. 2013). Indeed, the Australian Government has recently announced coordinated care as a pilot program for diabetes management in general practices (Pritchard 2011). This model is based on pre-paid funding to the practices to yield better health outcomes using consumer-orientated coordinated care. It enables care facilitators to promote the integrated care approach as well as education and training programs for consumers and health-care providers (Scott and Harris 2012).

In this study, the provision of diabetes care and the achievement of target outcomes were not significantly different between regional and metropolitan participants. Regional participants were more likely to report having care plans and were twice as likely to report visiting a practice nurse. The latter finding is consistent with greater availability of practice nurses in regional areas compared with metropolitan areas. Current data indicates that 55.1% of practices in major cities employ at least one nurse, compared with 83.6% in inner regional and 86.6% in other rural and remote areas (Australian Medicare Local Alliance 2012). Our findings showed that, as well as being more likely to report consulting a practice nurse, participants in regional areas also reported a slightly higher rate of consulting GPs (although both were high). This suggests that nurses are complementing rather than substituting for GPs in the care of diabetes patients. Longer waiting times for GPs occurred in regional areas compared with metropolitan areas. For example, 22% of regional participants waited >7 days, which was half for those in metropolitan areas (11%) ($P = 0.01$). This does suggest some issues with accessibility to GPs in regional areas. However, despite the additional services little difference was observed between metropolitan and regional participants' level of achievement for clinical targets.

The anthropometric measures were collected by trained research assistants, and biomedical measures were taken at pathology centres. Indeed, there was very little missing data in our study, with only 2% missing data from survey questionnaires, 8% from anthropometric measures and 3% from biomedical measures.

Limitations of the study

A potential limitation of this study relates to the collection of information concerning utilisation of GP services based on individuals' self-report over the previous 6 months. In our study, we did not specifically collect information regarding whether there was a practice nurse at each participant's general practice.

Therefore, for those who did not report consulting a practice nurse, it is unclear whether one was available at the practice they attended. As noted above, practice nurse employment is lower in metropolitan areas. This is likely to reflect availability of government subsidies. The Practice Incentive Payment for employment of a nurse in a general practice was introduced for rural practices in 2001–02 (Jolly 2007). This was only extended to metropolitan practices in 2012 (Australian Government Department of Human Services 2012). This suggests that the number of practice nurses in metropolitan practices is set to increase.

The annual cycle of care is a list of items that GPs carry out as part of a minimum level of routine care in order for them to claim a Medicare item number. Participants may have had this care completed but not have been aware of it. The potential generalisability of our study findings is another limitation of this study. Participants were recruited primarily from the NDSS registry in Victoria, Australia, which holds details of more than 269,000 PWD (Diabetes Australia 2013). Of over 7500 invitees, only 290 participants joined the peer support intervention, and of them, 285 completed the baseline survey. While the initial response to the study was low and the study was conducted only in Victoria, the generalisability of the study findings to the whole population with diabetes and the other parts of Australia may be limited. Previous studies have used a similar strategy for community-based participant recruitment (Unger *et al*. 2011; Speight *et al*. 2012); however, other studies have used pharmacy claim databases and GP registries to recruit PWD (Roughead *et al*. 2008; Reddy *et al*. 2010). It is possible that the participants enrolled in our study were more likely to be seeking support to manage their diabetes and related conditions, and/or more motivated to do so because they had volunteered to participate in our community-based peer support intervention trial. The moderate levels of achievement on clinical targets we found among this relatively motivated group suggests that achievement levels among the overall population of PWD are likely to be even lower. This further underlines the importance of understanding how best to support PWD to make the necessary changes in their lives to optimise management of their diabetes condition, and achieve health outcomes.

Conclusion

Despite a variety of initiatives already being in place in Australia to increase the proportion of PWD achieving guideline targets, our findings suggest that there is still a need for more resources and support being provided for patients to improve their diabetes care. Additional approaches for improving and enhancing the management of diabetes need to be considered. A Collaborative Care approach that includes care being provided collaboratively by nurses, primary care physicians, and allied health-care providers is regarded as being very important for individuals with chronic conditions such as diabetes (Davidson *et al*. 2006; Katon *et al*. 2010; Morgan *et al*. 2013). Study limitations notwithstanding, our study did not find any specific associations between receiving care from a practice nurse and improved clinical outcomes. Practice nurse consultations are likely to vary in terms of what they include and focus on (e.g. completing routine tests *v.* the provision of patient education). More information about how nurses can contribute to the required components of effective care would be useful to improve the achievement of clinical targets. Indeed, recent evidence from the US and Australia suggests that a Collaborative Care approach can result in more effective care being delivered by team members, particularly when the practice nurse is used as the identified case manager (Katon *et al*. 2010; Morgan *et al*. 2013).

Providing more effective resources and support for self-management by use of peer support might also be beneficial for improving patient outcomes. There is accumulating evidence that strategies for enhancing peer support through the use of both face-to-face and/or social media could be effective in improving health outcomes (Fisher *et al*. 2012). These approaches are now being used in many countries (Lorig *et al*. 2009; Dale *et al*. 2012; Fisher *et al*. 2012) and can assist PWD to understand more about their conditions while at the same time enhancing their skills for goal setting, maintaining healthy behaviour and using available resources from a variety of sources including health providers, community, family and friends (Fisher *et al*. 2005; Boothroyd and Fisher 2010).

Conflicts of interest

None declared.

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