Diabetes and the use of primary care provider services in rural, remote and metropolitan Australia

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ABSTRACT:

Introduction: Public health agencies around the world are concerned about an ever-increasing burden of type 2 diabetes and related disability. Access to primary care providers (PCPs) can support early diagnosis and management. However, there is limited literature on how frequently older people with diabetes access PCPs, and their levels of access in rural Australia relative to metropolitan areas.

Methods: In this research, patterns of PCP use among those with diagnosed diabetes and those without diagnosed diabetes (referred to as 'healthy' individuals) were compared using a large survey of more than 230 000 people aged 45 years and older from New South Wales, Australia. A published model to study the PCP access patterns of a group of individuals with diabetes risk was used.

Results: Annual visits to PCPs among people aged 45 years or more with diabetes in rural areas, while higher than for healthy rural residents, were significantly lower than their metropolitan counterparts, mirroring similar disparities in PCP use across the rural–urban divide in the healthy population. Similar patterns were present in the high–risk population. Nevertheless, people with diabetes visited PCPs around four times a year, which is around the recommended number of annual visits, although some groups (eg those with comorbidities) may need more visits.

Conclusion: Patterns of PCP use among rural residents, while significantly less frequent than their metropolitan counterparts, are at the recommended level for people with diabetes.

Keywords:

FULL ARTICLE:

Introduction

Primary care providers (PCPs) or general practitioners (GPs), along with other primary care practitioners such as nurses, provide the bulk of care for people with diabetes in developed countries with large rural hinterlands like the USA, Canada and Australia. A limited number of studies have investigated access to PCP services among people with diabetes in rural areas in these countries, and few have addressed how individuals at high risk of diabetes access PCP services across the rural–urban divide[1].

The goal of the research reported here was to investigate use of PCP services among people with diabetes and people at risk of diabetes using a large survey of people aged 45 years or more (referred to herein as 'older' people) linked to PCP use data. Our primary research question asked 'How different are the access patterns (number of PCP visits) of older people with diabetes and older people at high risk of diabetes in rural Australia from their 'healthy' (without or at risk of diabetes) and metropolitan counterparts?'

Methods

Data

Data were from the 45 and Up Study, a baseline survey of more than 267 112 people aged 45 years or more from New South

Wales (NSW), Australia. The survey, mostly administered around 2008, by the Sax Institute, randomly sampled approximately 10.9% of the older population in NSW using the Department of Human Services enrolment database, which provides near-complete coverage of the population[2]. People aged 80 years or more and residents of regional and remote areas were oversampled by a factor of two. These survey data were linked by the Sax Institute using a unique Department of Human Services identifier to Medicare Benefits Schedule PCP administrative claims data (number of PCP visits made by respondents) and subset to a 6 month window before and after the survey date.

Information was obtained about each survey respondent's postcode of residence, age, sex, country of birth, highest qualification, whether they were ever told by a doctor that they had hypertension or high cholesterol, whether they had familial heart diseases, the hours they spent sitting or sleeping, their body mass index and smoking patterns (Tables 1, 2). Diabetes status was inferred from the survey question 'Has a doctor ever told you that you have diabetes?', which has been previously validated against external diabetes data[3]. The postcode was attached to Australian Statistical Geographic Standard rurality codes, which divide the land mass of Australia into five categories with increasing degrees of rurality: metropolitan, inner regional, outer regional, remote and very remote. Of 267 112 respondents, 35 117 were missing various covariates, resulting in a sample of 231 995 (Tables 1, 2).

Table 1: Basic demographic information for study population

Characteristic	n (%)[†]	Missing
Sex		
Female	143 205 (53.61)	0
Male	123 907 (46.39)	
Age group (years)		
45–59	123 440 (46.21)	12
≥60	142 806 (53.46)	
Country of birth		
English speaking country	234 684 (87.86)	2579
Europe	15 119 (5.66)	
Middle East	1501 (0.56)	
Asia	9087 (3.40)	
Other	4142 (1.55)	
Highest education		
University or higher	61 569 (23.05)	
High school/technical and further education/diploma	110 955 (41.54)	4476
<10 years	90 112 (33.74)	
Index of relative socioeconomic disadvantage		
5th quintile (least disadvantaged)	52 608 (19.70)	70
4th quintile	52 110 (19.51)	
3rd quintile	53 889 (20.17)	
2nd quintile	54 447 (20.39)	
1st quintile (most disadvantaged)	53 988 (20.21)	

[†] Excludes missing values.

Table 2: Health and behavioural characteristics of study population

Characteristic	n (%)[†]	Missing
Sex		
Female	143 205 (53.61)	0
Male	123 907 (46.39)	
Age group (years)		
45–59	123 440 (46.21)	12
≥60	142 806 (53.46)	
Country of birth		
English speaking country	234 684 (87.86)	2579
Europe	15 119 (5.66)	
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1st quintile (most disadvantaged)	53 988 (20.21)	

[†] Excludes missing values.

Categorising respondents

The authors tabulated the average number of PCP visits by metropolitan, regional (both inner and outer) and remote/very remote across three mutually exclusive categories: people with diabetes, healthy respondents and those with diabetes risk factors. The methods of identifying the group with risk factors of diabetes, utilising a previously published model[4] are described in Appendix I.

Ethics approval

The Sax Institute's 45 and Up Study was approved by the University of NSW Human Research Ethics Committee. The project was approved by the NSW Population and Health Services Research Ethics Committee (HREC/13/CI/CIPHS/8).

Results

People with diabetes in regional areas made significantly fewer PCP visits than people with diabetes in metropolitan areas (Fig1), although they visited PCPs more regularly than their healthy counterparts in regional areas. Thus, while regional people with diabetes made an average of 0.6 fewer visits annually than their metropolitan counterparts they also made 1.6 more visits annually than healthy individuals in regional areas. People with diabetes in metropolitan areas, in contrast, made 1.75 more visits annually than their healthy counterparts. Indeed, across the board, people in metropolitan areas made more visits, reflecting better access. Those at high risk of diabetes made an intermediate (between healthy people and people with diabetes) number of visits. Large confidence intervals for summary statistics, owing to small numbers from remote/very remote areas, made inferences difficult.
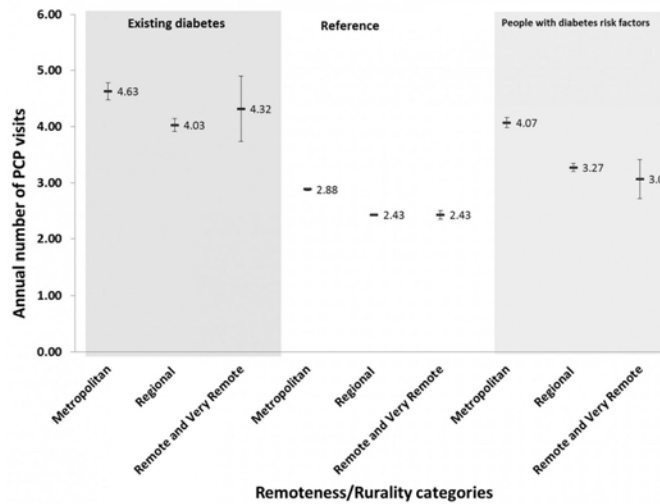
Figure 1: Primary care provider visits among the reference population, people with diabetes and people with undiagnosed diabetes across rurality and socioeconomic gradients.

Discussion

Access to health services in regional and remote areas is a problem. This study investigated PCP access in older rural people with diabetes – an especially vulnerable group – using data from a large survey from NSW, Australia. The authors found that while people with diabetes living in rural areas visit PCPs less often than comparable groups, they still make about four visits each year, the recommended number for people with diabetes[5-7], although it is not known whether the visits are diabetes-related. Older people with diabetes may have comorbid conditions requiring more than the recommended four annual visits. Guidelines regarding recommended number of visits for specific groups – such as older people in rural areas with diabetes – are sparse, and it is likely that they may need more than four visits a year.

A group identified as having many of the risk factors of diabetes visited PCPs relatively often (about four visits each year). This may be because of existing illnesses – some of which (eg high blood pressure) are incorporated in the risk index, and some of which are associated with other risk factors – but again shows similar urban–rural gradient of access, with rural residents making around one fewer visit each year than their metropolitan counterparts. Thus, even if this model of diabetes risk prediction is not accurate, the fact that individuals in rural Australia may be less able to access PCP support to help in the management of their risk factors is a cause for concern.

The authors were unable to find any studies that investigated patterns of PCP use among people at risk of diabetes, but some studies have investigated patterns of PCP use among people with diabetes, reporting rates of use similar to the ones reported here.

A study from the USA reported that, in 2011, approximately half of all people with diabetes had six or more office-based physician (who may include specialists) visits annually[8]. A study from Western Australia reported PCP usage levels among people with diabetes that range from around 2 visits in 10 months to 8 visits in 40 days[9]. The present results are somewhere between these extremes reported in the Western Australia study.

Conclusion

The strength of this study is that it utilises linked data from a large survey. A weakness of this study is that the survey did not include any clinical data, which may have been used for better risk prediction and analysis and for identifying specifically diabetes-related visits. Nevertheless, it is hoped that this study will stimulate research on PCP access for people with diabetes in rural areas with better quality data.

Acknowledgements

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Method of identifying a group with risk factors of diabetes

Many known risk factors of diabetes exist. Our first goal was to summarize these factors in a single score using a model calibrated on a population similar to the one in this study. This is a difficult since: - a) The 45 and Up Survey did not collect clinical or measured parameters such as waist circumference which are integral to most published and validated diabetes risk scores; b) it is difficult to find a study that has sampled the same population as our study. However, we were able to utilise a previously published study using the 45 and Up Survey data that yielded one of the few measures of diabetes incidence in Australia [1]. Note that while most prediction models predict *prevalence* this model by contrast predicts *incidence*. The prediction model used in that study was calibrated by the previous researchers on a subset of 60,000 of the same data (45 and Up) linked to a follow-up survey. Our current project did not have access to either the identifiers of these 60,000 individuals or any of the follow-up data used by the previous researchers. We only had access to the cross section of 231,995 individuals. A drawback of the previous study was that it did not publish measures of sensitivity or specificity, but by virtue of being calibrated on the same dataset is the best model for the purposes of this study. We applied the regression coefficients from the published model to the covariates in our data, and generated a composite score that summarizes each individual's diabetes risk. This score is the predicted probability in a Generalized Linear Model. Table A1 below describes the weights applied to the covariates in our data to calculate the composite risk score for individuals

Once the summary diabetes risk factor score is calculated from above a second goal is to identify an appropriate threshold beyond which individuals may be considered to have 'too many' risk factors. To achieve this, we first searched the published literature for estimates of prevalence of undiagnosed diabetes relative to diagnosed diabetes in the general population. Between 14 to 23.8 % of the true T2D population (diagnosed and undiagnosed) and around 22% of the 45 years and older true T2D population are undiagnosed [2-4]. There were 17,142 cases of diagnosed diabetes in our data so we would expect around 3,500 people with the highest risk to actually be people with undiagnosed diabetes. We thus considered the top two percentiles of risk score, comprising 4,215 people after excluding those with diagnosed diabetes, as those with high risk. Table A4 below compares the characteristics of the population with high diabetes risk factors with the healthy and diagnosed diabetic population. As may be expected, this group has a greater prevalence of many of the risk factors of diabetes, in addition to 91% having some chronic condition.

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Table A1: Weights of the various risk factors of diabetes used in the model

Diabetes Risk Factor	Weight
Intercept	-14.213
Male Sex	0.53
Age in Years	0
Index of Relative Socio-economic disadvantage (Quintiles) Ref: First Quintile	0.53,0.26,0.41,0.47
Region of Birth :English Speaking country, Europe, Middle East, Asia, Other Ref: English Speaking Country	0.18,-0.11,0.83,0.69
Highest Education (University and higher, High school/TAFE/diploma, Less than 10 years) Ref: University and higher	0.47,0.47
High blood pressure (Yes)	0.69
High cholesterol level (Yes)	0.34
Family history of heart disease (Yes)	0.74
Smoking (Yes)	0.47
Hours of sleep per day: 8- < 11 hours, ≥11 hours Ref: <8 hours of sleep per day	-0.11,0.34
Body weight: Underweight, overweight, obese Ref: Healthy weight	-0.92,0.64,1.43
High/very high psychological distress Ref: None/low/moderate psychological distress	0.41

Table A2: Exploring characteristics of people with risk factors of diabetes, diagnosed diabetes and everyone else (reference)

	People with risk factors of diabetes	People with Diagnosed Diabetes	Reference population
Risk Factors in Model			
Percent with High Blood Pressure	87.61	61.13	32.98
Percent with High Cholesterol	94.02	31.63	13.44
Mean Body Mass Index	27.43	29.36	26.69
Mean number of alcoholic drinks per week	6.3	5.41	7.14
Median Income Group	$20,000-$29,999	$30,000-$39,999	$40,000-$49,999
Not Risk Factors in model			
Median Self-Rated Health	Good	Good	Very Good
Percent with Major illness	91.0	82.71	62.4