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This article was originally published as:

Original article available here:
10.1007/s12020-021-02771-5

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Patients’ attitudes and intentions towards taking medical advice for type 2 diabetes mellitus: a theory of planned behavior analysis.

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Word count: 3612
Tables: 4
Figures: 1
Abstract

Purpose: A key component of effective diabetes care is understanding patients’ perceptions about diabetes management. Patients’ attitudes and intentions towards taking medical advice may predict the outcomes for effective diabetes care. This study aims to measure participants’ attitudes, beliefs and intentions towards following medical advice to manage their diabetes using the Theory of Planned Behaviour (TPB). The domains of the TPB are correlated with clinical measures of diabetes to determine if these attitudes and intentions are predictive of better diabetes control.

Methods: A pilot study was conducted. A 34-item survey was designed using the Theory of Planned Behavior (TPB) framework and administered via mail by four general practice clinics. Included participants (N=104; response rate 29.5%) had a diagnosis of type 2 diabetes and were taking medication for glycaemic control. Scores for each domain of the TPB survey were correlated with participants’ clinical indicators for diabetes: HbA1c, blood pressure, lipid profile, cholesterol, and kidney health (eGFR and albumin: creatinine ratio) and BMI.

Results: Participants surveyed generally reported positive attitudes and intention to follow medical advice. Medical advice was perceived to be beneficial and useful by the majority. However, in general there was no correlation between positive intentions and improved clinical indicators of disease. Clinical indicators did not improve with duration of illness. The burden of illness is likely a mitigating factor for positive intention as participants perceive medical advice as difficult and inconvenient to follow.

Conclusion: Patients’ individual capacity to implement medical advice should be addressed in shared-decision making models to potentially improve patient outcomes towards therapeutic targets.

Keywords: diabetes management, medical adherence, patient perspectives, primary health care, T2DM, theory of planned behaviour.
Introduction

Management of diabetes in general practice continues to be extremely challenging. With a drive towards a shared decision making model [1] physicians are commonly balancing care needs around multi-morbidity, poly-pharmacy and an unforgiving cycle for the patient of daily monitoring, specialist referral and attendance, and ongoing review and assessment. Inherent in the implementation of a shared decision making model is a requirement for understanding each patient’s perspective and capacity regarding self-efficacy, health literacy and the impact of the physical, emotional and social burden of this chronic illness. While optimal therapeutic goals for diabetes management are suggested in guidelines [2], current evidence shows that adherence to lifestyle advice and medication compliance rates continue to be poor [3] and these therapeutic targets are often not met.

The contributing factors to low rates of glycaemic control are complex, extensive and varied. There is an acknowledgement that broader factors such as demographics, socioeconomics, equity, access and health system barriers play a role [3]. However, there are further potentially modifiable factors impacting adherence to advice that continue to be extensively studied in efforts to improve health outcomes for patients. Studies have shown that psychosocial factors [4], patient beliefs about illness and treatment [5], treatment complexity [6], diabetes distress [7], and the strength and dynamic of the doctor-patient therapeutic relationship [8-10] can influence glycaemic control.

Qualitative literature from the patient point of view illustrates some of the significant quality of life impacts of living with diabetes from the daily challenges of self-care and complex treatment regimens to the emotional burden of diabetes distress, social isolation and personal relationship and work impacts [11-13]. Challenges and tensions can also arise from differences in perspectives between practitioner and patient particularly around achievement and maintenance of therapeutic targets [14] in the shared decision making process.

Given the complex context that underlies a shared decision making approach, we aimed to investigate patients’ perspectives on medical advice about managing their diabetes. In particular we aimed to
explore what patients perceived the advice to be, whether they felt it to be beneficial, and if they intended to follow it. We employed the Theory of Planned Behaviour (TPB) to evaluate attitude and intention [15]. The TPB is a widely used behavioural change theory that has shown to be effective in the prediction of health intentions and related behaviours [16] The theory purports that behavioural intention is a product of an individual attitude towards the behavior, the subjective norms of significant others and wider society in relation to the behaviour, and the perception of the amount of control an individual feels they have over the behavior [15]. The TPB has been used previously in aspects of diabetes self-care such as medication adherence and physical activity [17-19]. We hypothesised that positive intention, attitude and control beliefs about following medical advice would be predictive of improved glycaemic control. Here we aimed to correlate the intention to follow medical advice as measured by the TPB with key diabetes indicators to determine if attitude and intention correlated with improved diabetes control.

**Methods**

*Study design*

A pilot study was conducted. Potential participants were identified from the diabetes register at each participating practice by a practice nurse. Participants were consented and prospectively surveyed. Participants survey results were correlated with the most recent clinical indicators recorded in the patient file.

*Recruitment of participants and practices*

The TBP survey was conducted across four GP clinics in three Australian states. One clinic each in Tasmania and Western Australia (WA) and two in Victoria. Clinics were recruited through the networks of the research team. Potential participants were identified from the diabetes register at each participating practice by a practice nurse. Included participants were over 18 years, had a diagnosis of T2DM, and were taking glucose lowering medication. Potential participants who had gestational diabetes were excluded. Participants who had T2DM treated with insulin were also excluded because we wished to focus on the cohort of patients where lifestyle advice, due to obesity, was the focus of...
treatment and management. Four hundred invitations were mailed out: one hundred invitations from each of the four practices. Surveys were individually coded and invitations included the participant information sheet, survey, research team contacts, return reply paid envelope, and a letter of invitation from their GP. No name-identifying information or personal contact details were collected by the research team. The identity of participants was known only to the practice nurses who de-identified and coded the returned surveys before providing them to the research team. Return of the survey to the practice was considered informed consent. All participants were attending general practices to manage their diabetes.

*Patient medical information*

To maintain the privacy of participants’ medical records the research team did not access patient medical files. Instead, participants who had returned a survey were recorded by the practice nurse. The practice nurse extracted medical information from the patient files including: date of diagnosis, BMI, HbA1c, cholesterol, HDL, LDL, triglycerides, eGFR, creatinine, albumin (ACR). Not all patients had all biomedical indicators recorded. Participants were not excluded from the analysis on this basis. The most recently recorded biomedical indicators were extracted. The time interval between the recording of the biomedical indicators and the completion of the survey was variable for each participant but was no greater than 12 months.

*Survey design*

The survey consisted of 2 parts. *Part A* asked participants to identify what their doctor had advised them to do to manage their diabetes. Participants were asked to select any of: lose weight, exercise, change their diet, take medication, and attend review. There was an “other” option for participants to complete if required. Participants were also asked to identify when they had been diagnosed with diabetes. *Part B* consisted of the TPB survey which was developed by the research team using the manual developed by Francis et al. [20] The survey incorporated both direct and indirect measures. (supplementary file) The direct measures used the same stems outlined in the TPB manual for each
domain. Indirect measures were developed by conducting an extensive qualitative literature review and thematic analysis to inform the indirect measures to include for each domain.

The survey comprised 34 items in total with the following breakdown of items: intention statement (3); attitude domain direct measure (4); attitude domain indirect measure behavioural beliefs (3), outcome evaluation (3); subjective norms domain direct measure (3); subjective norms domain indirect measures normative beliefs (3), motivation to comply (3); perceived behavioural control domain direct measures self-efficacy (2), controllability (2); perceived behavioural control domain indirect measures strength of control belief [self-efficacy] [2], strength of control belief [controllability] (2); power of control belief [self-efficacy] (2), power of control belief [controllability] (2). Scoring for the instrument was conducted as outlined in the protocol [20]. The survey was pretested for face validity in a small sample of patients in the target population.

Data Analysis

Descriptive statistics and correlation analysis was conducted using IBM SPSSv26. As data was not normally distributed non-parametric statistical tests were used throughout. Calculations of Cronbach alpha were used as a measure of internal consistency for each domain of the TPB as per the protocol [20]. Spearman’s correlation analysis was used to explore relationships between domain scores of the TPB and each of the clinical indicators extracted from patient medical records: BMI, HbA1c, cholesterol, HDL, LDL, triglycerides, eGFR, creatinine, albumin (ACR). Individual item analysis of the TPB construct was also conducted. Analysis of biomedical data was stratified by duration of illness. We used a diabetes diagnosis of greater or less than ten years to assess disease progression as research suggests an appreciable portion of people living with diabetes are likely to experience adverse health outcomes by 10 years [21].

Results

Sample characteristics

A total of 118 survey responses were received (RR: 29.5%). Fifteen responses were invalid and excluded from the study due to missing data leaving a total of 104 surveys for analysis (Table 1).
Internal consistency is variable for the TPB survey

While both indirect and direct measures of each domain of the TPB survey were calculated as per the protocol [20], only direct measures are used in this correlation analysis and reported here. Indirect measures in general were found to be less reliable and internally consistent compared to the direct measures for each domain of the TPB. TPB analysis using only the direct measures is a common approach [16]. Despite applying the protocol as per the manual [20], the internal consistency of the direct measures for some domains of the TPB survey was also problematic. The generalised intention domain and the attitude domain have internal consistency (Cronbach alpha) scores in the acceptable range (> 0.6), however, subjective norms and perceived behavioural control have internal consistency that is sub-optimal (<0.6). For example, the subjective norms domain had a Cronbach alpha score in the negative meaning some participants were answering opposite responses to items that were meant to be internally consistent. If we look at these items, (14 to 16 for example): item 14 states: “Most people who are important to me think that I should/should not take medical advice to manage my diabetes.” Item 16 states: “I feel under social pressure to take medical advice about my diabetes.” It is plausible that participants might answer opposite for these item in the context of this study: that peers and family think they should take advice yet they don’t feel under social pressure to do so.

TPB domain scores were consistently high

Median scores of 4.0 represent a neutral response for scoring the TPB domains. Median scores for each domain of the TPB survey were high (Table 2) indicating a generally positive attitude, subjective norm and perceived control towards following medical advice. The generalised intention scores had a good internal consistency and were very positive (6.0; IQR 2.0) towards the intention to take medical advice. There was considerable variation in responses across the domains.

Patients’ biomedical indicators are outside the optimum range for a large portion of participants.

Medical information extracted from patient files showed variable levels of glycaemic control. Nearly all of the sample (90%) were overweight, and (42%) had suboptimal HbA1c (>7.0%). Blood pressure
and lipid profiles were also greater than the optimal reference ranges for many individuals (systolic BP >140mmHg; LDL > 2mmol/L; HDL <1.0mmol/L; triglycerides >2mmol/L; cholesterol > 4mmol/L) (Table 3). When stratifying the sample by the number of years since the participant had been diagnosed with diabetes, the proportions of participants with clinical indicators within optimal range are similar. Glycaemic control, blood pressure and lipid profiles do not significantly change for participants who have been managing their diabetes for ten years or longer. However cholesterol levels are lower in this subset of participants.

**TPB domain scores and behavioural intention does not correlate with biomedical indicators of diabetes control**

Spearman correlations were run between the TPB domain scores and each of the biomedical indicators of diabetes: BMI, HbA1c, Cholesterol, Triglycerides, HDL, LDL, systolic BP, albumin/creatinine ratio (ACR) (Table 4). Behavioural intention only correlated with cholesterol and no other indicators. No significant correlations were found between TPB domains and HbA1c with the exception of the subjective norm domain which showed a moderate positive correlation. Both the perceived behavioural control and the attitude domains showed an inverse correlation with BMI suggesting positive attitude and control beliefs results in lower BMI measures. The only other correlations were seen between medical indicators that would be expected to be related such as LDL and cholesterol. Correlation analysis was also conducted between TPB domains and the total number of biomedical indictors that were not at target according to Royal Australian College of General Practitioners (RACGP) guidelines (2). The null hypothesis is that poorer attitude or intention may correlate with a higher number of indicators not at target. No correlations were observed.

*Patient’s perception of medical advice to manage their diabetes is likely a surrogate measure of acceptability to the patient.*

There is a clear mismatch in what patients perceive their medical advice to be compared to their clinical indicators. As shown in Table 3, a large proportion of the sample are overweight or obese and have poor glycaemic control and lipid profiles. However only 60% perceive they are advised to lose
weight and exercise, and fewer (50%) to change their diet. Yet the majority of participants (90%) believe they are advised to take their medication. This perception of advice is identical if you stratify the participants by the number of years they have been diagnosed with diabetes. The proportion of people that perceive that they need to lose weight, exercise or change their diet is the same. It is possible that this perception is a surrogate measure of acceptability of the advice rather than accurately reflecting the advice given. This acceptability is not related to a poor attitude or willingness to take advice. A frequency analysis of individual items of the attitude domain supports this idea. Participants were asked directly to rate on a 7-point Likert scale “Taking medical advice to manage my diabetes is…” and the response options are below in Fig 1. The majority consider the advice beneficial and useful, but a very large proportion find it hard and inconvenient and this is reflected in the perception of advice given. These perceptions were similar irrespective of the length of time the participant had been living with diabetes.

Discussion

Key findings

Findings from this study suggest that individuals have a very positive attitude, intention and control beliefs towards following medical advice to manage their diabetes yet intention does not correlate with improved diabetes control. Interpretation of the contribution of subjective norms and control beliefs must be made with caution due to issues with internal consistency of the participant responses to the TPB domains in this study. It is possible that the interpretation of questions in the TPB construct resulted in considerable variability in participants’ responses. The use of reversed positive and negative endpoints as required by the TPB manual also has the potential to introduce error. Additionally, there may be a complexity behind what an individual believes about taking medical advice to manage their diabetes that complicates the use of the TPB construct in this context.

Participants generally felt that the medical advice they receive is beneficial and useful, however, there is a perception that the implementation of the advice is difficult and inconvenient. Biomedical indicators of disease progression are poor for a large number of the sample. There also appears to be a
disconnect with the perception of medical advice in this regard with a proportion of the sample requiring to lose weight and exercise not acknowledging medical advice to do so. These results may represent a perception that medication management is the primary goal, or perhaps that taking medication is more convenient to the patient compared to implementing behavioural or lifestyle changes.

Comparison with the wider literature

Our results suggest that individuals’ behavioural intention is mitigated by the difficulty of implementing the advice. There is widespread supporting evidence of the burden of illness for individuals living with diabetes [14, 22]. People with diabetes who want to follow advice often find a substantial number of factors work against them on personal, cultural, social and environmental levels. The diabetes-specific psychosocial difficulties encountered by people living with the disease has been termed ‘diabetes distress’ which can be measured over four distress-related domains including emotional burden, physician-related distress, regimen-related distress, and diabetes-related interpersonal distress [23]. Recent Australian literature shows rates of diabetes distress at 7% which may be an influencing factor for this study [7]. Research also suggests poorer glycaemic control in younger populations [24] and more adverse outcomes for people living with diabetes for more than 10 years [21]. Our study shows that there is little difference in clinical profiles for subsets of our sample who are living with diabetes for a long time (greater than 10 years) compared to those living with the illness for 9 years or less (Fig 1). Despite the 9 years or less group having a younger median age, there is no significant difference in ages when the two subsets are compared.

Our findings suggest that there is not a substantial improvement in clinical indicators of disease. We acknowledge that it is unknown how long each participant in our study had diabetes before seeking treatment and also how long treatment had been maintained in each case. Additionally there is a broad age range in each subset when stratifying the sample by the number of years since diagnosis which may in turn influence biomedical indicator measures. Nevertheless a significant proportion of participants in this study had more than one indicator in the suboptimal range showing diabetes management is inconsistent with recommended targets for treatment.
Strengths and Limitations

The strength of this study is the demonstration of compliance intention in the majority of patients attending general practice. This challenges perceptions that patients do not wish to follow medical advice. Instead it highlights the burden of a chronic illness such as diabetes mellitus. Acknowledgement of an individual’s current capacity within their individual circumstances to achieve suggested advice warrants further attention in the shared decision-making process to improve health-related outcomes.

We acknowledge that there are limitations to this study. There is a potential for social desirability bias in the evaluation of intention. Patients may be unwilling to admit they did not intend to follow advice. It is therefore possible that positive intention is an overestimate. We attempted to minimise this effect by making the survey responses anonymous and advising participants that their doctors would not see the survey responses. Other limitations are acknowledged due to a modest sample size and limited diversity in sampling. We acknowledge the potential for sampling bias. The age and gender distribution of our sample (Table 1) broadly reflects the prevalence rates for type 2 diabetes in Australia [25] with a higher proportion of males compared to females and an increased prevalence from age 55 years. The proportion of our sample with clinical indicators outside of the quoted reference range is also broadly comparable to studies of the general population of Australians with type 2 diabetes (Table 3). These comparisons suggest that our sample may be broadly representative of people with type 2 diabetes in Australia. However, we recognise the need for caution when generalizing to this population of patients.

With respect to the collection of biomedical information for this study we acknowledge that other clinical indicators may have added further information to the clinical profile of participants, however, we limited our data collection to information specifically related to the key indicators and reference ranges published in the Australian general practice guidelines for optimal diabetes care.[2]

There were also limitations in evaluating the influence of the individual general practitioner (GP) on patient intention to implement advice. It was not possible to complete a regression analysis looking at
the influence of the GP on the intention to follow medical advice. The patient-physician dynamic is an important part of effective management and may influence the patients’ intention to follow advice. However, it is not unreasonable to assume that the data captured in this study would also capture a range of patient-doctor dynamics from good to poor. Regardless, the intention to follow advice is very high across the sample. We believe it is not the intention to follow advice but the ability of the patients to be able to implement that advice in their day to day lives that is the reason for the poor correlation with improved diabetes control.

**Clinical implications**

Calls for patient-centred care have been reported for some time as a response to identified barriers to effective self-care in the management of chronic illness [14]. Our findings support this notion in that patients have intention and positive attitude to be concordant with treatment but find it difficult to do so. This may be a case of providing unrealistic therapeutic targets that exceed individuals’ capacity to achieve. While there are concerns from physicians about patient-led goal setting [10] there is clearly a disconnect between what patients intend to achieve and evidence-based therapeutic outcomes. Identifying common ground in shared decision making and developing a tailored approach to meeting therapeutic targets [26] may be a more effective way forward. The challenge is to build individual patient’s capacity and ability to action the advice as part of the shared decision making process to better enable effective outcomes for the patient. Given the significant challenges outlined here and in the wider literature, further improvements in patient outcomes may require concurrent advances in pharmacology, therapeutics and monitoring.

**Declarations**

Acknowledgements: We wish to acknowledge the practice nurses and general practitioners involved in implementing our study in all of our participating practices.

Funding: Partial funding for this study received as a donation from Amgen. Aron Chakera was the recipient of this donation.

Conflict of interest: All authors have no declarations of interest to declare.
Data availability: The data that support the findings of this study are available from the corresponding author, [MJ], upon reasonable request.

Author Contribution: All authors contributed to the study conception and design. Material preparation and data collection were performed by CK, EK, and LG. Analysis was performed by CK, EK, and MJ. The first draft of the manuscript was written by CK with critical appraisal from MJ, AC, and EK. All authors read and approved the final manuscript.

Ethics: Ethics approval for this project was obtained from The University of Notre Dame Human Research Ethics Committee (HREC), approval number 018071S. The procedures used in this study adhere to the tenets of the Declaration of Helsinki.

Consent to participate: Informed consent was obtained from all participants in this study.

Consent to publish: Informed consent was obtained from all participants for the publication of the results of this study.

References


List of Figures and Tables

**Fig 1** Frequency analysis of TPB survey items in the attitude domain for participants with T2DM from an Australian general practice in April-November 2019. Each question 4 to 7 represented a response to the stem “Taking medical advice to manage my diabetes is…” Participants selected responses on a 1-7 point scale as follows: Q4 harmful (1) to beneficial (7); Q5 worthless (1) to useful (7); Q6 easy (1) to hard (7); Q7 convenient (1) to inconvenient (7)

**Table 1** Characteristics of the TPB survey sample of participants with T2DM from four Australian general practices in April-November 2019. Age, gender and years since diagnosis. *There is no significant difference in age between the subsamples differentiated by years since diagnosis

**Table 2** Internal consistency and median scores for each domain and sub-domain of the TPB survey of participants with T2DM from four Australian general practices in April-November 2019

**Table 3** Proportion of the sample of participants with T2DM with indicators outside of the optimum range for diabetes management from four Australian general practices in April-November 2019. *Clinical indicator ranges are referenced from the RACGP guideline for the management of T2DM [2]. Proportions were calculated based on the number of readings available in medical records for each indicator as shown. bThe proportion of people with diabetes clinical indicators outside the target range in the general population are show in column 3 for comparison. The figures for the general population are drawn from a pooled analysis of Australian literature [27] cThe systolic BP reference range quoted for the general population was lower than our study at 130mmHg. dThe reference range for LDL was higher for the general population at ≤2.5mmol/L. eGeneral population comparison reference range for kidney disease was stated only as “microalbuminuria present” without quoting an ACR value. *Significant difference in proportion of indicator outside of target between sample subsets (<9 years; >10 years).(28)

**Table 4** Correlations between domains of the TPB survey and biomedical indicator of participants with T2DM from four Australian general practices in April-November 2019. Significant correlations are indicated by Spearman’s rho values in bold text. *correlation is significant at the 0.05 level (2-tailed), **correlation is significant at the 0.01 level (2-tailed).

**Supplementary File** The full survey administered to participants, developed using the TPB manual [20]
Table 1 Characteristics of the TPB survey sample of participants with T2DM from four Australian general practices in April-November 2019. Age, gender and years since diagnosis. *There is no significant difference in age between the subsamples differentiated by years since diagnosis.

<table>
<thead>
<tr>
<th>Gender</th>
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<tr>
<td>Male (N)</td>
<td>57 (54.8%)</td>
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<tr>
<td>Female (N)</td>
<td>47 (45.2%)</td>
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</table>

<table>
<thead>
<tr>
<th>Median Age (years)</th>
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<tbody>
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<td>Male</td>
<td>71 (IQR:18.3)</td>
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<tr>
<td>Female</td>
<td>67 (IQR:18.0)</td>
</tr>
<tr>
<td>Total</td>
<td>71 (IQR:18.5)</td>
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</table>

<table>
<thead>
<tr>
<th>Years since diagnosis</th>
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</tr>
</thead>
<tbody>
<tr>
<td>9 years or less (N)</td>
<td>43 (41%)</td>
</tr>
<tr>
<td>10 years or greater (N)</td>
<td>55 (53%)</td>
</tr>
<tr>
<td>Not stated (N)</td>
<td>6 (6%)</td>
</tr>
<tr>
<td>Median age [diagnosis 9 years or less]</td>
<td>63 (IQR:17.0)*</td>
</tr>
<tr>
<td>Median age [diagnosis 10 years or more]</td>
<td>73 (IQR: 13.0)*</td>
</tr>
<tr>
<td>Domain</td>
<td>Cronbach alpha</td>
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<tr>
<td>--------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Generalised Intention</td>
<td>0.74</td>
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<tr>
<td>Attitude</td>
<td>0.802</td>
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<tr>
<td>Subjective Norms</td>
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<td>Perceived Behavioural Control</td>
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<tr>
<td>Self-efficacy</td>
<td>0.355</td>
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<tr>
<td>Controllability</td>
<td>0.182</td>
</tr>
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</table>

**Table 2** Internal consistency and median scores for each domain and sub-domain of the TPB survey of participants with T2DM from four Australian general practices in April-November 2019.
<table>
<thead>
<tr>
<th>Clinical indicator relative to the optimum goals for management of patients with T2DM*</th>
<th>Number of clinical indicator readings</th>
<th>Total Sample Number and proportion of total sample outside the reference range (%)</th>
<th>General population Number and proportion of total sample outside the reference range (%)</th>
<th>Number of clinical indicator readings for each subset [&lt;9 years; &gt;10 years] Number and proportion of sample subset outside the reference range (%)</th>
<th>Diagnosis of diabetes for 9 years or less Number and proportion of total sample subset outside the reference range (%)</th>
<th>Diagnosis of diabetes for 10 years or more Number and proportion of total sample subset outside the reference range (%)</th>
<th>Significance *</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI ≤ 25</td>
<td>100</td>
<td>89 (89)</td>
<td>14,021 (79)</td>
<td>39; 55</td>
<td>35 (90)</td>
<td>49 (89)</td>
<td>0.877</td>
</tr>
<tr>
<td>HbA1c ≤ 7.0</td>
<td>104</td>
<td>44 (42)</td>
<td>1,786,983 (47)</td>
<td>43; 55</td>
<td>21 (49)</td>
<td>21 (38)</td>
<td>0.277</td>
</tr>
<tr>
<td>Systolic BP ≤ 140mmHg</td>
<td>104</td>
<td>42 (40)</td>
<td>18,826 (62)c</td>
<td>43; 55</td>
<td>17 (33)</td>
<td>23 (42)</td>
<td>0.844</td>
</tr>
<tr>
<td>Cholesterol below 4mmol/L</td>
<td>101</td>
<td>46 (46)</td>
<td>10,138 (83)</td>
<td>41; 54</td>
<td>23 (56)</td>
<td>19 (35)</td>
<td>0.042*</td>
</tr>
<tr>
<td>LDL levels &lt; 2.0mmol/L</td>
<td>101</td>
<td>48 (48)</td>
<td>20,125 (62)d</td>
<td>41; 54</td>
<td>22 (54)</td>
<td>20 (37)</td>
<td>0.100</td>
</tr>
<tr>
<td>HDL levels ≥ 1.0mmol/L</td>
<td>101</td>
<td>24 (24)</td>
<td>14,485 (21)</td>
<td>41; 54</td>
<td>13 (32)</td>
<td>11 (20)</td>
<td>0.184</td>
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<tr>
<td>Triglycerides &lt; 2 mmol/L</td>
<td>101</td>
<td>32 (32)</td>
<td>15,677 (35)</td>
<td>41; 54</td>
<td>16 (39)</td>
<td>13 (24)</td>
<td>0.117</td>
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<tr>
<td>ACR &lt; 3.5mg/mmol (women)</td>
<td>42</td>
<td>13 (31)</td>
<td>947,767 (33)c</td>
<td>18; 22</td>
<td>4 (22)</td>
<td>4 (18)</td>
<td>0.755</td>
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<tr>
<td>ACR &lt; 2.5 mg/mmol (men)</td>
<td>48</td>
<td>22 (46)</td>
<td>17; 28</td>
<td>4 (24)</td>
<td>15 (54)</td>
<td>0.051</td>
<td></td>
</tr>
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</table>

Table 3 Proportion of the sample of participants with T2DM with indicators outside of the optimum range for diabetes management from four Australian general practices in April-November 2019. *Clinical indicator ranges are referenced from the RACGP guideline for the management of T2DM [2]. Proportions were calculated based on the number of readings available in medical records for each indicator as shown. bThe proportion of people with diabetes clinical indicators outside the target range in the general population are show in column 3 for comparison. The figures for the general population are drawn from a pooled analysis of Australian literature [27]. cThe systolic BP reference range quoted for the general population was lower than our study at 130mmHg. dThe reference range for LDL was higher for the general population at ≤2.5mmol/L. eGeneral population comparison reference range for kidney disease was stated only as “microalbuminuria present” without quoting an ACR value. *Significant difference in proportion of indicator outside of target between sample subsets (<9 years; >10 years).[28]
<table>
<thead>
<tr>
<th>Behavioural Intention</th>
<th>Attitude (direct)</th>
<th>SN (direct)</th>
<th>PBC (direct)</th>
<th>Systolic BP</th>
<th>BMI</th>
<th>HBA1C</th>
<th>LDL</th>
<th>Cholesterol</th>
<th>Triglyc.</th>
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**Table 4.** Correlations between domains of the TPB survey and biomedical indicator of participants with T2DM from four Australian general practices in April-November 2019. Significant correlations are indicated by Spearman’s rho values in bold text. *correlation is significant at the 0.05 level (2-tailed); **correlation is significant at the 0.01 level (2-tailed).