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Assessment of self-management in patients with diabetes using the novel LMC Skills, Confidence and Preparedness Index (SCPI)

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ABSTRACT

Aims: The LMC Skills, Confidence & Preparedness Index (SCPI) is an electronic tool designed to meet ISOQOL standards and (a) assess three dimensions: knowledge, confidence and preparedness; (b) provide a clinically meaningful measure; (c) provide immediate feedback to the healthcare provider.

Internal consistency and external validity have been previously reported in a refractory diabetes cohort. This larger evaluation, broader in glycemic control, sought to assess clinical relevance to glycemia.

Methods: Participants with type 1 and type 2 diabetes were recruited from LMC Diabetes and Endocrinology specialist clinics, from April to October 2016. Participants completed the SCPI using a tablet. Demographic and laboratory data were extracted from the LMC Diabetes Patient Registry.

Results: In total, 529 patients met inclusion criteria and were included in psychometric analyses; 518 patients with established diabetes (>6 months) were assessed for SCPI – glycemia correlations. SCPI scores were found to have a high degree of validity, internal consistency, and test-retest reliability. Most importantly, the tool showed good external validity in its relation to glycemic control, both in tertile analysis, demonstrating a threshold effect consistent with a 'moderate' degree of poor control; and in overall correlation with HbA1c for the total SCPI score and two subscales (Skills and Confidence).

Conclusions: The SCPI tool is a quick (25 items), easy to use measure of three domains – knowledge, confidence and preparedness. The instant scoring and specific feedback, as well as the relationship to glycemic control should provide significant value in the patient assessment in the diabetes clinic.

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1. Introduction

Successful control of diabetes requires lifelong adherence to multiple self-management behaviours, in close collaboration with health care providers (HCPs). Audits in Canada [1], the US [2] and Europe [3] have found poor control of type 2 diabetes (T2D) to be common generally, with even higher rates among specialist practices, who may be caring for patients with more complex disease. A recent review [4] identified a consistent proportion of refractory patients (HbA1c $\geq$ 8.0% [64 mmol/mol), rangingfrom30-55%ofpatientsininternational specialist-ledregistries, to 16.1% inthelargestsuchregistry (Hb A1c $\geq$ 9.0% [75 mmol/mol]).

The unique challenge to optimal diabetes self-care, is the requisite integration of multiple skills and behavioural changes. The recent Diabetes Registry Outcomes Project for A1C Reduction (DROP A1C) study [5] of refractory patients used the Barriers to Care Index and found that when barriers were correctly identified, individualized care paths could be successfully implemented, and significant improvements in previously refractory glycemic control were possible. Interestingly, no one barrier or barrier category (psychological/support, socioeconomic, comorbidity, accessibility, cultural) was associated with greater likelihood of response, implying that each barrier could be equally overcome with appropriate care path individualization. Further, while knowledge gaps were often present, additional contributors were gaps in confidence and in patient preparedness to create the behaviour change.

Assessment tools to document these gaps in patient self-management have been developed, most typically to assess current behaviour, and usually in the context of assessing outcomes of a particular diabetes intervention (SDSCA [6], D-SMART [7], PDQ [8], DSMQ [9]). These tools effectively try to optimize the traditional medical history with a comprehensive, validated index. In the past decade, additional tools have been proposed that attempt to further assess the complexity of a patient's barriers – including their self-efficacy (DES [10] and DSES [11]), confidence (CIDS [12]), or their preparedness to change (PAM [13]). Recent critical reviews [14,15] have found each to be variously incomplete in the published evaluations of their validity, reliability or responsiveness. Further, although nearly all have been externally validated against prior existing scales, correlation with glycemia has only consistently been found for scales measuring actual patient behaviours: the DSMQ [9], in an insulin-using cohort at a tertiary in-patient education program; and D-SMART [7]. Measures of confidence and of preparedness have not been able to *consistently* show that these parameters do, in fact, relate to glycemia, and in both types of diabetes.

Drawing on this background and on the experience of the DROP A1C study, a group of Canadian experts in diabetes care contributed to the development of the LMC Skills, Confidence & Preparedness Index (SCPI, Appendix 1), an electronic tool designed to adhere to the International Society of Quality of Life Research (ISOQOL) standards and achieve three goals: (a) assess all three dimensions of self-management: knowledge of a skill; confidence in performing the skill; and preparedness to begin applying the skill; (b) provide a measure which is clinically meaningful (ie correlates with glycemic control); and (c) provide clinically useful immediate feedback to the HCP. While it is likely that the Skills and Confidence dimensions will reflect current glycemia, the Preparedness measure may better reflect future glycemic control, as a result of the behaviour that is about to be implemented. The resulting LMC SCPI is a 25-item electronic tool, based on the American Association of Diabetes Educators Self Care Behaviours (AADE7 Self-Care Behahviours™) [16], and is relatively easy and rapid for patients to use. Its initial psychometric evaluation showed high internal consistency, irrespective of variables such as age, gender, ethnicity or education level, and showed good external validation when compared to existing scales such as the Michigan Knowledge test [17] and the Diabetes Empowerment Scale [10], in a cohort of refractory patients with diabetes [18]. Here we report on a larger evaluation of the LMC SCPI, undertaken in a broader specialist-led population of patients with type 1 diabetes (T1D) and T2D, and to particularly assess the scale's external validity to clinically relevant outcomes such as glycated hemoglobin.

2. Subjects, materials and methods

2.1. *Study population and procedures*

Participants with either T1D or T2D were recruited from the waiting rooms of seven Ontario LMC Diabetes and Endocrinology clinics, and were asked to complete the SCPI. LMC Clinics are multidisciplinary, community-based clinics providing comprehensive diabetes care in the Canadian public health system using specialists, physician assistants, registered nurses, dietitians and pharmacists. Patients were recruited over a six-month period from April 2016 to October 2016 and had the option to complete the questionnaire over email or in person at their site. Patients were given minimal assistance from staff and their time to completion was recorded. Each question contained a visual analogue scale with anchors guiding scoring between 0 and 10; patient markings were then numerated to a score out of 10. The total score was a simple average out of 10 and each of the three subscales (Skills, Confidence and Preparedness) each produced its own score out of 10. Patients were then invited to complete the questionnaire a second time one week later in order to assess test-retest reliability.

Baseline data such as age, gender, education, ethnicity, diabetes duration, diabetes therapies, insulin use, duration as an LMC patient, and HbA1C laboratory results were extracted from patient records. The study protocol and informed consent document were reviewed and approved by IRB Services, an ethics review board.

2.2. *Data analysis*

Internal consistency was determined using reliability analysis to calculate Cronbach's alpha score for each of the subscales

scores as well as the total score. Construct validity of the scale was determined for age, sex, diabetes duration, ethnicity, education, insulin use and baseline HbA1c. We hypothesized that (a) patients with longer duration of diabetes would show higher mean scores; (b) similarly patients with T1D, who have generally had a longer duration of diabetes, would show higher mean scores than patients with T2D; (c) as tertile of HbA1c increases, mean SCPI score would be lower; (d) similarly, SCPI score would be inversely correlated to HbA1C. For relationship comparisons to glycated hemoglobin, patients with newly diagnosed diabetes (<6 months) were excluded. Data was analyzed separately for the T1D cohort and T2D cohort. Given the broader range in pathophysiology and degree of disease in the T2D cohort, we further hypothesized that the subset of patients with T2D using insulin (T2Di) would represent a more homogeneous cohort and were analyzed as the third cohort.

For categorical variables, an Analysis of Variance (ANOVA) was performed. For continuous variables and for test-retest reliability, Spearman's non-parametric correlation (R_s) was used. All statistical analysis was performed using SPSS version 20.0 (SPSS Inc., Chicago, Illinois).

3. Results

Baseline characteristics of the study participants are reported in Table 1. In total, 544 patients were enrolled. Ten patients (1.8%) had not completed the questionnaire correctly (scoring a '0' or a '10' repeatedly for the majority of their answers) and five patients were documented to have a physiologically unreliable glycated hemoglobin. These patients were excluded (Appendix 2), producing a cohort of 200 T1D patients and 329 T2D patients. Patients with T1D were younger (mean (SD); 44.0 (14.8) vs. 59.5 (11.7) years) compared to those with T2D. Each cohort was mostly Caucasian (T1D 76.5%, T2D 59.9%) with the remainder composed of multiple ethnicities consistent with the Southern Ontario resident population. Among patients with T1D, 50.5% were using insulin by pump. Patients with T2D were using a mean of 1.5 (1.0) non-insulin antihyperglycemic agents (AHA's); of those using insulin, 21.3% were using basal insulin (+/− OAD's) and a further 18.5% were using a basal-bolus regimen. Approximately half (53.0% of T1D patients and 48.9% of T2D patients) had received some post-secondary education. Completion time was 6.4 (4.8) minutes among T1D patients and 6.7 (4.7) minutes among T2D patients.

3.1. *Internal validity*

The entire 25-item scale showed strong overall interclass correlation (ICC) of 0.94 (Table 2). The individual subscales showed strong internal consistency with Cronbach's alpha ranging from 0.81 to 0.95. Age, ethnicity, gender, and education level were not significantly correlated with SCPI scores. No floor effects (>15% of patients with a score of 0) or ceiling

Table 1 – Baseline patient characteristics.

	T1D (N = 200)	T2Di (N = 148)	T2D (N = 329)
Number of Patients: n (%)	200 (38.0%)	148 (27.8%)	329 (62.0%)
HbA1c (%)	7.6 (1.1)	7.9 (1.7)	7.5 (1.4)
HbA1c (mmol/mol)	60 (12)	63 (19)	58 (15)
Age (years)	44.0 (14.8)	60.1 (12.4)	59.4 (11.7)
Male: n (%)	112 (55.7%)	91 (61.9%)	207 (63.1%)
Duration of Diabetes (years)	21.7 (12.9)	15.7 (8.3)	12.3 (8.2)
Ethnicity: n (%)			
African	9 (4.5%)	5 (3.4%)	10 (3.0%)
Caribbean	7 (3.5%)	2 (1.4%)	12 (3.7%)
Caucasian	153 (76.5%)	91 (61.9%)	197 (59.9%)
East Asian	5 (2.5%)	10 (6.8%)	22 (6.7%)
South Asian	15 (7.5%)	25 (17.0%)	53 (16.1%)
Other [a] /unspecified	11 (5.5%)	14 (9.5%)	35 (10.6%)
Education: n (%)			
University	69 (34.5%)	36 (24.3%)	108 (32.8%)
College	37 (18.5%)	28 (18.9%)	53 (16.1%)
Secondary	35 (17.5%)	42 (28.4%)	80 (24.3%)
declined/unspecified	59 (29.5%)	42 (28.4%)	88 (26.7%)
# non-insulin AHA	0	1.3 (1.0)	1.5 (1.0)
Using Insulin: n (%)			
Basal Only	3 (1.5%)	70 (47.6%)	70 (21.3%)
Bolus Only (pump)	101 (50.5%)	1 (0.7%)	1 (0.3%)
Mixed	2 (1.0%)	15 (10.2%)	15 (4.6%)
Basal and Bolus	93 (46.5%)	61 (41.5%)	61 (18.5%)

Data is presented as mean (SD) unless otherwise indicated.
[a] 'Other' includes Arab, Oceania, Hispanic/Latino, and First Nations.

Table 2 – Validity for total and subscale SCP Index Scores.

	Statistic	Measure
Internal Consistency		
Skills	0.90 (0.89 – 0.92); 9 items	Cronbach's alpha (95% CI)
Confidence	0.86 (0.84 – 0.88); 8 items	
Preparedness	0.81 (0.79 – 0.84); 8 items	
Total	0.95 (0.94 – 0.95); 25 items	
Construct validity		
Age	r = −0.03, P = 0.51	Spearman's Correlation
Ethnicity	F[5, 489] = 2.803;0.95	ANOVA, F Test, df; P-value
Gender	F[1, 527] = 2.087;0.36	ANOVA, F Test, df; P-value
Education	F[4, 377] = 1.356;0.25	ANOVA, F Test, df; P-value

effects (>15% of patients with a score of 10) were observed for the total score or any of the subscale scores. Duration of diabetes showed a small correlation with the SCPI score, in the T2D cohort only (r = 0.12, P = 0.02).

3.2. *Reliability*

For test-retest reliability, 61 patients completed the questionnaire a second time after a mean of 19.2 (range 6 – 66) days (T1D) or 10.0 (range 7 – 41) days (T2D). Reliability was high in the T1D cohort, r = 0.84 (P < .001) and in the T2D cohort, r = 0.84 (P < .001).

3.3. *Construct validity*

As expected, patients with T1D had higher mean scores in the total score and in each individual subscales vs. either patients with T2D or T2Di. Similarly, both cohorts of patients using insulin showed higher mean scores than the entire T2D cohort. (Table 3).

The SCPI questionnaire has previously [18] shown high correlation with each of the Michigan Knowledge test [17] and the Diabetes Empowerment Scale [10]. The current study undertook two separate analyses to compare SCPI scores to the clinical outcome of glycemic control, using glycated hemoglobin. For these analyses, 11 patients with newly diagnosed diabetes (< 6 months) were excluded (T1D, 2 patients; T2D, 9 patients).

Glycated hemoglobin tertiles were determined in each of the T1D (n = 198) and T2D (n = 320) cohorts. With each diminishing HbA1C tertile, the mean SCPI total score and the mean subscale scores for Skills and Confidence showed progressive increasing value, reaching significance for patients with T1D and T2Di (Figs. 1a and b) at the highest HbA1C tertile (HbA1C ≥ 7.7% [61 mmol/mol]). In the third tertile, above the HbA1C threshold of 7.7% (61 mmol/mol), patients with T1D showed a mean total SCPI score of 7.2 (1.6), Skills score of 7.4 (1.7), and Confidence score of 7.3 (1.7) - each significantly lower than the respective score in tertiles 1 and 2 (P < .01). Similarly in the T2Di cohort, patients in tertile 3 (HbA1C ≥ 7.7%

Table 3 – Mean SCP Index Scores by cohort.

Scales	T1D (N = 200)	T2Di (N = 148)	T2D (N = 329)
Skills	8.0 (1.4)	7.4 (1.7)	7.1 (1.8)
Confidence	7.7 (1.4)	7.3 (1.7)	7.2 (1.7)
Preparedness	7.2 (1.6)	7.0 (1.7)	6.6 (1.8)
Total Score	7.6 (1.3)	7.3 (1.6)	7.0 (1.7)

Data is presented as mean (standard deviation).

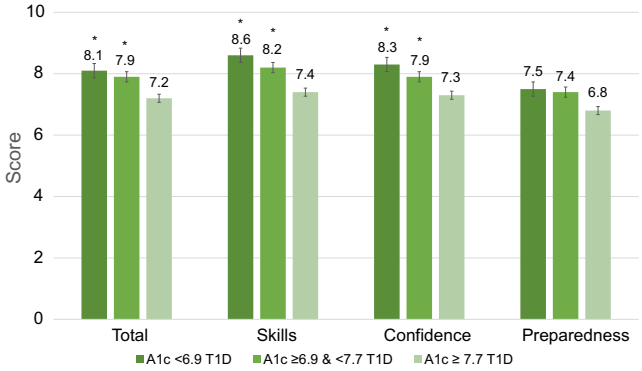

Fig. 1a – Mean SCPI scores by HbA1c tertile in patients with T1D * = significantly different compared to HbA1c≥7.7% (P<.01).

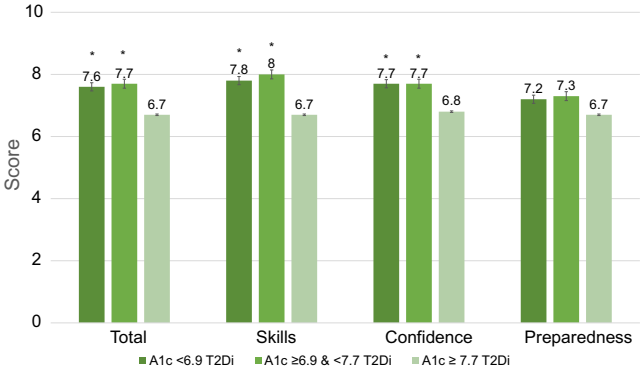

Fig. 1b – Mean SCPI scores by HbA1c tertile in patients with T2D using insulin * = significantly different compared to HbA1c≥7.7% (P<.01).

Table 4 – Correlation of SCP Index scores with HbA1c.

	T1D[a] (N = 198)	T2Di[b] (N = 147)	T2D[b] (N = 320)
Total	r = −0.30; P < .001	−0.23, P <.01	−0.12, P = .03
Skills	r = −0.35, P < .001	−0.29, P < .01	−0.16, P < .01
Confidence	r = −0.31, P < .001	−0.24, P < .01	−0.15, P < .01
Preparedness	r = −0.15, P = .04	−0.07, P = .40	−0.01, P = .88

[a] 2 patients with newly diagnosed T1D removed.
[b] 9 patients with newly diagnosed T2D removed.

[61 mmol/mol]), the mean total SCPI score was 6.7 (1.7), Skills score was 6.7 (1.8), and Confidence score was 6.8 (1.7), each significantly lower than the corresponding scores in tertiles 1 and 2 (P < .01).

The SCPI total score, the Skills subscale and the Confidence subscale each showed high correlation with HbA1c (Table 4) and were significant for each cohort. The total score correlations ranged from r = −0.30 in the T1D cohort (P < .001), r = −0.23 in the T2Di cohort (P < .01) and r = −0.12 in the entire T2D cohort (P = .03). The Preparedness subscale, as expected, showed only a small significant correlation (r = −0.15, P = .03) with glycemia in the T1D cohort and no correlation in the T2D cohorts.

4. Discussion

The LMC Skills, Confidence & Preparedness Index was developed in response to several needs in patient education. An assessment tool that could better identify specific patient gaps and barriers would allow better individualization of support strategies and teaching, as recently demonstrated in the DROP A1C study [5]. A tool that could measure patient confidence and preparedness, beyond just current behaviour, and still correlate consistently to accepted clinical outcomes, such as glycemic control, would allow better triaging of patients into appropriate interventions. Finally, a tool that would allow a HCP to receive immediate feedback on specific self-care behaviours would allow a better plan for 'what to teach first'.

The LMC SCPI has proven to be a very simple and efficient tool that addresses each of these needs and has been proven to meet the recently published ISOQOL standards for patient-reported outcomes research [19]. The questionnaire is easy to administer with minimal supervision or instruction. It is web-based and usually completed by the patient on a tablet, in approximately 6 min. The Flesch-Kincaid readability of the questions has been reported at the eighth or ninth grade level [18]. The questions are based on the AADE seven self-care behaviours and therefore provide immediate feedback to the HCP for behaviour areas in greatest need of intervention. The immediate electronic scoring further provides key summary feedback to the HCP, in real time.

In this report, the SCPI has again been found to have a high degree of validity and internal consistency, in large populations of patients with T1D and T2D, drawn from specialist waiting rooms. Building on its initial evaluation, it has now been shown to have a high test-retest reliability. Most importantly, the scale shows high external validity, and is directly relevant to glycemic control, as demonstrated through two perspectives. Firstly, a tertile analysis has shown the expected inverse relationship between mean scores and mean HbA1c, with a threshold effect at the HbA1C level of 7.7% (61 mmol/mol). For patients with T1D, the mean SCPI score of 7.2 associated with this third HbA1c tertile, could represent a convenient marker for a clinically 'moderate' level of poor glycemic control. For patients with T2D, the mean SCPI score of 6.7 or lower could similarly serve as a marker of poor glycemic control. Further, strong correlations with glycated hemoglobin were found for each of the total SCPI score, the Skills subscale and the Confidence subscale. For a given patient, other than a threshold effect, an HCP would be able to anticipate a lower HbA1C and improved glycemic control among patients who score highest in these SCPI scores. The Preparedness subscale, by its nature, may be more reflective of the potential future change in HbA1c, rather than the current HbA1c, and is being assessed in a separate intervention-based investigation.

Additional strengths of the LMC SCPI were demonstrated. Whereas health literacy has complicated interpretation of traditional scales [17], SCPI scoring was not related to level of education. SCPI scoring was also unrelated to ethnicity as demonstrated in this population which included a broad representation of multiple ethnicities. Patients with T1D typically score higher on knowledge-based assessments than those with T2D and the same pattern was seen here. This pattern may be related to the longer mean diabetes duration of patients with T1D and their inherent need for greater pre-investment in education and training.

Although many tools have been developed to measure diabetes self-care behaviour, specific limitations have prevented their extension "from bench to bedside". Most are now >10 years old [6,7,10,12,17] and were evaluated in an era that spawned, but did not yet exhibit, today's current heightened standards for patients living with diabetes. Therapy developments in the past decade have altered the typical curriculum, including training for new injectable therapies and more complex dietary self-awareness, such as 'carbohydrate counting'. Many were developed expressly for the purpose of measuring the educational impact of an intervention, rather than gaining insights into specific

behaviours outcomes or measuring disease outcomes [20]. Some are very lengthy (eg D-SMART 47 items [7], PDQ 67 items [8]) and take 30 or more minutes to complete, possibly hindering their usefulness. Only one tool has tried to assess Preparedness, by measuring "patient activation" [13], but using a tool not developed specifically for diabetes management. Most are only available, or have only been validated in paper format, leading to delays in scoring and in the interpretation of the results. The LMC SCPI was developed in a contemporary diabetes care context, based on extensive experience with refractory patient cohorts, and specifically designed to electronically generate real time insights into specific behaviours, in an easy to read and easy to administer approach.

Further, although other scales have been developed to assess behaviour [6] or knowledge [17]; self-efficacy [10,11] or confidence [12]; and patient activation [13], SCPI is the first scale to simultaneously evaluate these three dimensions of diabetes self-management in one tool.

Some limitations to the current assessment should be acknowledged. The patient cohorts were drawn from a specialist clinic in diabetes and the results may not generalize to a broader primary care patient population. Although correlation with glycated hemoglobin validates the clinical meaningfulness of the SCPI, we have not yet also formally shown responsiveness to an educational intervention, which would be requisite for a full reflection of a patient's glycemic control. A suggestion of scale responsiveness was actually seen in the initial psychometric evaluation of the SCPI questionnaire [18] which reported a 6-month post-education mean score increase of 1.3, in association with an interval mean absolute HbA1c improvement of 1.3%. Similarly, the Preparedness subscale did not correlate with current glycemia. In fact, a high Preparedness score implies that new behaviour is about to be implemented and it may therefore reflect a setting ripe for subsequent improvement. This hypothesis is currently being tested formally in a large cohort of refractory patients undergoing a 6-month structured diabetes education program [21]. Similarly, its applicability in a primary care environment and its responsiveness to intervention or time requires further investigation. The 8th–9th grade reading level of the SCPI was necessary to express nuances within the questionnaire but may be less optimal than the 6th grade level generally targeted for educational materials. The lack of correlation of our findings to patient education level suggest that the current SCPI reading level is functional. Finally, although the SCPI is based on the seven behaviours identified in the AADE7 [16], the behaviour "Healthy Coping" was assessed only from the aspect of stress awareness and management and may not be as thoroughly represented.

The education and support of patients with diabetes has evolved over the past two decades, gaining focus in objectives with the AADE7 self-care behaviours [16] and broadening in scope with the opportunities of empowering and activating the patient. Diabetes education programs have consistently proven effective in improving patient satisfaction and confidence, and usually in improving glycemic outcomes. Yet, despite a growing therapy armamentarium and growing education know-how, there continues to be a consistent proportion of patients that remains uncontrolled, across specialists, across countries and across health care systems [4].

The LMC Skills Confidence Preparedness Index (SCPI) is a new validated tool that simultaneously measures the three domains critical in advancing self-management of patients with diabetes – knowledge of a skill, confidence to apply the skill and preparedness to begin applying the skill. The instant scoring availability and the immediate feedback into the AADE7 behaviour gaps will optimize teaching individualization. The close relationship to glycemic control and the use of threshold scores to indicate a moderate degree of poor control should optimize triaging of patients into appropriate interventions. Finally, its rapidity and ease of use should provide significant value as a routine component of the patient assessment in the diabetes clinic.

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Declaration of interest

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None of the other authors have competing interests to declare.

Author Contribution

RA provided contributions to the conception and design of the study and wrote the manuscript. REB provided contribution to the conception and design of the study, data collection, and provided revisions to the manuscript. DJ conducted all of the statistical analyses and edited the final manuscript. NO provided contributions to the concept and design of the study, data collection and edited the final manuscript. AW provided contributions to the concept and design of the study, data collection and edited the final manuscript. LM provided contributions to the concept and design of the study, data interpretation, and edited the final manuscript. All authors have approved the final manuscript.

Appendix A. The LMC Skills, Confidence and Preparedness Index (SCPI)

LMC Diabetes Skills, Confidence & Preparedness Index (SCPI)

Answer the following questions on a scale of 1-10 (1= very little and 10= a lot). Please do this by drawing a line on the scale where you see yourself for each question.

1. I am able to portion out and choose foods that have the optimal balance between carbohydrates, proteins and vegetables to help keep my blood sugars in target.

   1 (very little) 10 (a lot)

2. I know how my diabetes insulin or medication works in my body and at which time of day I should check my blood sugars to make sure my dose is correct.

   1 (very little) 10 (a lot)

3. I feel confident that I can plan balanced meals and snacks effectively.

   1 (very little) 10 (a lot)

4. If I miss a dose of my insulin or medication, I know how my body will react and the steps to take to get back on track.

   1 (very little) 10 (a lot)

5. When I am planning to exercise, I know what changes I need to make to avoid a low blood sugar before, during, and after exercise.

   1 (very little) 10 (a lot)

6. I am confident that I can implement stress management techniques into my lifestyle.

   1 (very little) 10 (a lot)

7. I know when to check my blood sugar if I want to see how my body reacted to a meal.

   1 (very little) 10 (a lot)

8. When I am sick, I know what to do differently with my medicatio
   intake, blood sugar testing, and when to go to the hospital.

   ns, fluid intake, food

   1 (very little) 10 (a lot)

9. I intend to start planning and eating balanced meals and snacks starting next week.

   1 (very little) 10 (a lot)

10. I know how to identify stress in my life and how it can impact my diabetes management & overall health.

    1 (very little) 10 (a lot)

11. I'm confident that I can plan ahead for what to do, and how to react, either before, during or after exercise to avoid a low blood sugar.

    1 (very little) 10 (a lot)

12. When I look at my blood sugars in my meter or in my logbook in a given week, I could explain to my diabetes educator or doctor what my blood sugar pattern is.

    1 (very little) 10 (a lot)

13. I plan to choose an activity and begin incorporating it into my schedule in the coming week.

    1 (very little) 10 (a lot)

Appendix A (*continued*)

14. I am confident that at the next time I am eating out of my home, I will be able to plan and select the foods that best keep my blood sugars under control.

1 (very little) 10 (a lot)

15. I plan to start using my blood sugar levels to make changes to my diet and/or insulin starting next week.

1 (very little) 10 (a lot)

16. I am confident that I can choose a healthy activity for me and include it into my schedule.

1 (very little) 10 (a lot)

17. I plan to start making a list of stress management techniques which will work for me in the upcoming week.

1 (very little) 10 (a lot)

18. I am confident that I can adjust my insulin or medication doses, on my own, to reach the target blood sugar levels.

1 (very little) 10 (a lot)

19. I am confident that I can commit to preventing and monitoring my diabetes complications such as seeing my eye doctor at least once a year and checking my feet on a daily basis.

1 (very little) 10 (a lot)

20. I plan to start adjusting my insulin or medication doses on my own starting next week.

1 (very little) 10 (a lot)

21. I am confident that I will use my blood sugar results to make changes to my diet and/or insulin to help keep my blood sugars in target.

1 (very little) 10 (a lot)

22. I know what the ABCs (A1c, Blood Pressure, and Cholesterol) of Diabetes are, what my targets are and how they impact my diabetes.

1 (very little) 10 (a lot)

23. I plan to start looking for patterns in my meter or logbook starting next week.

1 (very little) 10 (a lot)

24. The next time I am sick, I will make the necessary changes to my medications, insulin and/or eating depending on my blood sugars.

1 (very little) 10 (a lot)

25. With my next exercise, I am going to make a plan to reduce the chance of a low blood sugar, or to react with a good response if I do have a low blood sugar.

1 (very little) 10 (a lot)

Appendix B. Baseline Characteristics of excluded patients (N=15).

	T1D Patients (N = 2)	T2D Patients (N = 13)
Number of Patients: n (%)	2 (0.3%)	13 (2.4%)
HbA1c (%)	10.2 (0.2)	9.6 (2.9)
HbA1c (mmol/mol)	88 (2)	81 (32)
Age (years)	39.5 (10.6)	58.9 (11.2)
Males: n (%)	0 (0%)	5 (38.5%)
Duration of Diabetes (years)	24.5 (2.1)	7.0 (7.8)
Ethnicity: n (%)		
Arab	1 (50.0%)	0 (0%)
Caribbean	0, 0%	1 (7.7%)
Caucasian	0, 0%	4 (30.8%)
East Asian	0, 0.0%	0 (0.0%)
South Asian	0, 0%	6 (46.2%)
other /unspecified	1 (50.0%)	1 (7.7%)
Education: n (%)		
University	1 (50.0%)	3 (23.1%)
College	0 (0.0%)	3 (23.1%)
Secondary	1 (50.0%)	3 (23.1%)
declined/unspecified	0 (0%)	4 (30.8%)

Data is presented as mean (SD) unless otherwise indicated. [a] = reported as a percent of total enrolled patients (N = 544).

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