Promoting Engagement in Type 2 Diabetes Self-Management: Development of the Impact of Glucose Monitoring on Self-Management Scale (IGMSS)

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PURPOSE

- Type 2 diabetes (T2D) outcomes rest on self-management, which requires motivation; i.e., engagement in, and prioritization of, diabetes tasks over other life choices[1].
- Continuous glucose monitoring (CGM) technologies may increase self-management motivation[2].
- Prior research[1] combined lived experience of those with T2D reporting CGM to be "game changing" in increasing motivation, behaviour theory (Capability, Opportunity and Motivation lead to Behaviour; COM-B[3]) and expert opinion to create items assessing perceived improved health (Capability), improved relationships (social and provider relationships) in the context of device characteristics (Opportunity) and motivation to self-manage (Motivation).
- This study evaluated the psychometric characteristics of a novel person-reported outcome (PRO) measure – the Impact of Glucose Monitoring on Self-Management Scale (IGMSS) – that uses these items to assess the impact of CGM on capability, motivation and opportunity to engage in self-management.

METHODS

- Canadians with T2D using CGM technologies (n=514) were recruited through an online panel to complete the new IGMSS and additional PRO measures.
- The initial 42 IGMSS items were reduced based on factor analyses, item performance (Cronbach's alpha and item-total alpha) and expert review.
- The IGMSS Performance and Characteristics were assessed as follows:
  - Scale Characteristics: proportion of respondents scoring high or low on the dimensions of the IGMSS (scale scores recoded into disagree [mean scores <2.5 on 5-pt Likert scale] or agree [mean scores >3.5])
  - Construct Validity: comparison with participant responses to Glucose Monitoring System Satisfaction Survey (GMSS).
  - Predictive Validity: comparison with participant responses to Diabetes Self-Management Questionnaire (DSMQ), Diabetes Distress Scale (DDS), World Health Organization- Five Well-Being Index (WHO-5) and Centre for Epidemiology Depression scale (CES-D).
  - Test-Retest Reliability: subsample of 130 respondents repeated IGMSS 4 months after initial completion and intraclass correlation coefficient (ICC) calculated.

RESULTS:

Item Reduction

- Based on factor analyses and individual item analyses, the initial 42 items were reduced to 22:

CAPABILITY 7 items (reduced from 11)	Personalized Knowledge **∝ = 0.85**	Device helps:	*To understand how specific foods, exercises and stress directly affects my glucose levels; To learn how I can adjust my behaviour to keep glucose readings within range; To know if my glucose level is trending up or down at any moment; I avoid highs and lows by using the trend values or alarms*
	Improved Health **∝ = 0.79**	Device helps:	*To improve my A1c level (the blood test that measures 3-month control); To improve my general health; To stay safe from problems with glucose levels that are either too low or too high*
OPPORTUNITY 9 items (reduced from 20)	HCP Relationships **∝ = 0.79**	Device helps:	*To have more useful conversations with HCPs about diabetes management; To receive better care from my HCPs*
	Social Relationships **∝ = 0.79**	Device helps:	*To improve the conversations about diabetes with the important people in my life; To feel more cared for because others can view and respond to my glucose levels if I need help*
	Device Characteristics **∝ = 0.79**	Device	*It provides me with reliable information; It is comfortable to use; Although it can be visible, I feel comfortable with other/people recognizing it and realizing that I have diabetes; I don't mind that wearing it reminds me that I have diabetes; To feel comfortable sharing my glucose data with my HCPs*
MOTIVATION 6 items (reduced from 11)	Motivation **∝ = 0.79**	Device helps:	*To become more engaged (involved) in controlling my diabetes; To take action to better manage my diabetes; To become more optimistic about my diabetes; To make life with diabetes easier; To feel more confident that I can manage diabetes; I believe that if I stopped using a sensing device my diabetes control would be worse*

Test-Retest Reliability

- Moderate to strong for all scales except device characteristics, which was associated with increased positive CGM experience over time

Construct Validity

- Moderate for all scales except improvements in relationships.

Predictive Validity

- Significant relationships between positive experience of CGM and self-management
- Few significant correlations between IGMSS and distress measures, with exception that positive experience with device was associated with lower distress.
- Overall positive CGM experience was associated with well-being.

Scale Characteristics

- Vast majority agreed with motivational impact of CGM, except for device characteristics.

	Test-Retest Reliability	Construct Validity	Predictive Validity				Scale Characteristics	
	ICC (N=130)	GMSS	DSMQ	DDS	WHO-5	CES-D	Disagree (%)	Agree (%)
CAPABILITY	0.72**	0.38**	0.18**	ns	0.16**	ns	1.9%	79.0%
Personalized Knowledge	0.73**	0.37**	0.18**	ns	0.15**	ns	2.3%	78.6%
Improved Health	0.61**	0.35**	0.17**	ns	0.15**	ns	2.7%	79.0%
OPPORTUNITY	0.58**	0.68**	0.35**	-0.35**	0.20**	-0.24**	2.5%	46.5%
HCP Relationships	0.68**	0.27**	0.16**	ns	0.19**	ns	6.2%	77.2%
Social Relationships	0.69**	0.27**	0.13**	ns	0.22**	ns	9.3%	70.0%
Device Characteristics	-0.53*	0.59**	0.31**	-0.41**	0.09*	-0.25**	17.3%	39.9%
MOTIVATION	0.79**	0.47**	0.22**	ns	0.23**	ns	4.1%	75.3%

**p<0.01; ** p<0.001; ns = not significant; CES-D = Centre for Epidemiology Depression scale; DDS = Diabetes Distress Scale; DSMQ = Diabetes Self-Management Questionnaire; GMSS = Glucose Monitoring System Satisfaction Survey; ICC = intraclass correlation coefficient; WHO-5 = World Health Organization-Five Well-Being Index*

SUMMARY – CONCLUSIONS

- **This study provides support for the reliability and validity of the IGMSS, which assesses the impact of a person's glucose monitoring method on Capability, Opportunity and Motivation, constructs shown to be important in predicting behavior.**
- The items of the IGMSS index **Capability** by the impact of glucose monitoring on personalized knowledge of behaviour-glycemia relationships and perceived improved health, **Opportunity** by the impact of glucose monitoring on HCP and social relationships, as well as experience of device characteristics, and **Motivation** based on self-management motivation**.**
- Assessing these important self-management constructs can help us understand the role of glucose monitoring method in improving diabetes outcomes.
- The IGMSS can be used as an outcome measure associated with CGM use (or any method of glucose monitoring) as well as a means for HTA bodies to evaluate CGM in T2D to inform payers and other decision makers
- Further, the constructs validated in this study can be adapted for use as a dialogue tool to help providers support those with T2D consider the role of CGM in self-management regimens.

REFERENCES

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DECLARATION OF INTEREST

- Abbott provided funding for this study
- MV, LB, EC, FK, RR-L, WP have received personal fees from Abbott as a speaker and consultant
- F L-G is an Abbott employee and stockholder