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Patient Preferences for Continuous Glucose Monitoring Devices: A Preliminary Study from People Living with Type 2 Diabetes

Tim C. Lai, BSc[1], Heather P Whitley, PharmD. [2], Surachat Ngorsuraches, PhD. [1]

1.Department of Health Outcomes Research and Policy, Harrison College of Pharmacy, Auburn University, Auburn, AL, USA. 2. Department of Pharmacy Practice, Harrison College of Pharmacy, Auburn University, Auburn, AL, USA

BACKGROUND

- The American Diabetes Association (ADA) updated its evidence-based guideline in 2023 around the use of continuous glucose monitoring (CGM) devices, noting several clinical benefits, including reducing and/or maintaining HbA1c, reducing the risk of hypoglycemia and reducing the need for or replacing self-monitoring of blood glucose (SMBG).[1]
- While patient preferences play a crucial role during the shared decision-making process for diabetes technology adoption[1], limited evidence exists to quantify the value of CGM devices, especially from patients with Type 2 diabetes (T2D).[2]

OBJECTIVE

- To quantify the relative importance of device attributes from the perspective of patients with T2D.

METHODS

Study Design

- This was a cross-sectional study (see **Figure 1** for details of the study flow). Patient preferences were elicited by a discrete choice experiment (DCE).[3](**Figure 2**)

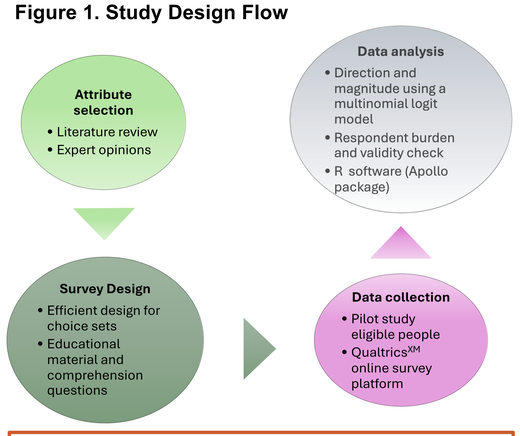
Sample Population

- American adults with T2D and proficient in English

Instrument Development

- Seven attributes of CGM devices were identified through a literature review and consultation with five clinical experts. The levels of the study attributes were selected based on literature to align with the devices currently available in the market. **(Table 1)**
- D-efficient design was used to generate 36 choice sets, which were divided into 4 blocks.
- Finally for the pilot study, we included a tutorial section, four random blocks with nine choice sets and two validity choice sets, and questions for demographics and disease experience.

Figure 1. Study Design Flow



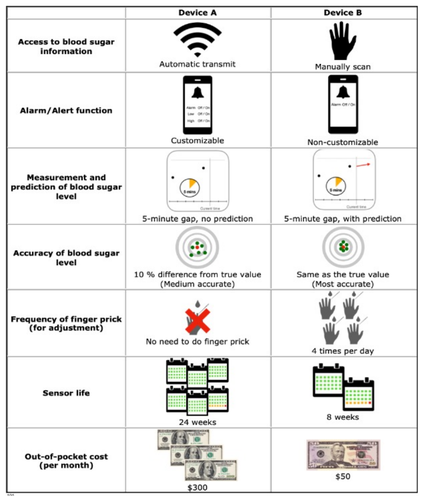
CONTACT

- **Email**: czl0152@auburn.edu
- **LinkedIn**: www.linkedin.com/in/timclai

Table 1. Selected Attributes and Levels for the DCE Survey Instrument

Attributes	Levels
Access to blood sugar information	Manually scan
	Automatically transmit
Alarm/Alert function	No alarm function
	Non-customizable
	Customizable
Measurement frequency and prediction	5-min gap, no prediction
	1-min gap, no prediction
	5-min gap, with prediction
	1-min gap, with prediction
Accuracy (difference from true value)	0% difference – most accurate
	10 % difference – moderate accurate
	15 % difference – least accurate
Frequency of calibration	0 time per day (No need to calibrate)
	2 times per day
	4 times per day
Sensor lifespan	1 week
	8 weeks
	24 weeks
Out-of-pocket cost	$ 50
	$ 150
	$ 300
	$ 500

Figure 2. An Example of the DCE Choice Set



Data Analysis

- Descriptive analyses were conducted. Associations between time working on the survey, age, education, and comprehension score were plotted.
- Based on random utility theory, a multinomial logit model was developed to assess preference weights.

RESULTS

- Data were collected from 41 patients with T2D. Their mean age was 43 years old. Of all patients, 49% were female, 58.5% were non-Hispanic White, 58.5% were employed, 53.7% had annual household income less than $50000, and 68.3% were current CGM users. (**Table 2**)
- We included two validation questions (a dominant choice set and a repeated choice set) to assess patients' attention to the choice questions. Patients who failed the dominant choice spent less time (8.3 minutes) than those who passed (11.3 minutes). However, we found no statistically significant difference between groups who failed/passed a repeated choice set. (**Figure 3**)

Figure 3. Time spent on the survey stratified by validation questions

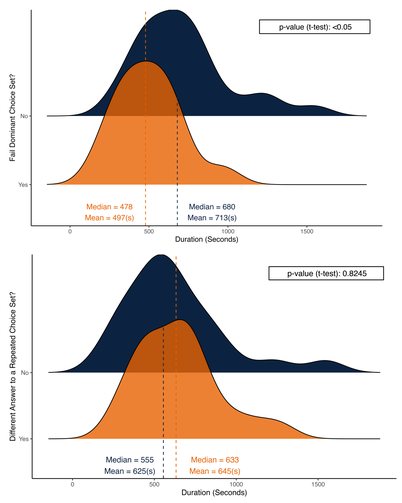


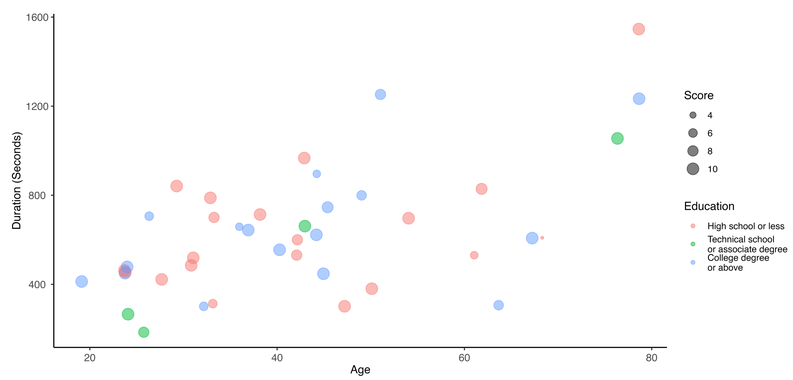
Table 2. Demographic Characteristics of Respondents

Variables	N (%)
Total Sample	41
Age (mean, sd)	42.6 (16.2)
Sex	
Female	20 (48.8)
Race/ethnicity	
White, non-Hispanic	24 (58.5)
Black, non-Hispanic	12 (29.3)
Hispanic	2 (4.9)
Others, non-Hispanic	3 (7.3)
Education	
Less than high school	2 (4.9)
High school or equivalence (e.g. GED)	18 (43.9)
Associate degree (Technical school or 2-year college degree)	4 (9.8)
College or university	7 (17.1)
Graduate degree	10 (24.4)
Employment status	
Employed (including self-employed)	24 (58.5)
Unemployed	7 (17.1)
Retired	7 (17.1)
Student/Stay-at-home spouse	2 (4.9)
Disabled	1 (2.4)
Annual household income[$]	
Less than $50,000	22 (53.7)
$50,000 - $99,999	8 (19.5)
$100,000 - $149,000	5 (12.2)
$150,000 - $199,999	4 (9.8)
$200,000 or above	2 (4.9)
Insurance Type*	
Private (Employer)	18 (43.9)
Private (Marketplace)	4 (9.8)
Medicare	11 (26.8)
Medicaid	13 (31.7)
Uninsured	1 (2.4)
Year since DM diagnosis	
<5 years	16 (39.0)
5 - 10 years	11 (26.8)
> 10 years	14 (34.1)
CGM current user (in the past 3 months)	
Yes	28 (68.3)

*A person can have more than one insurance type

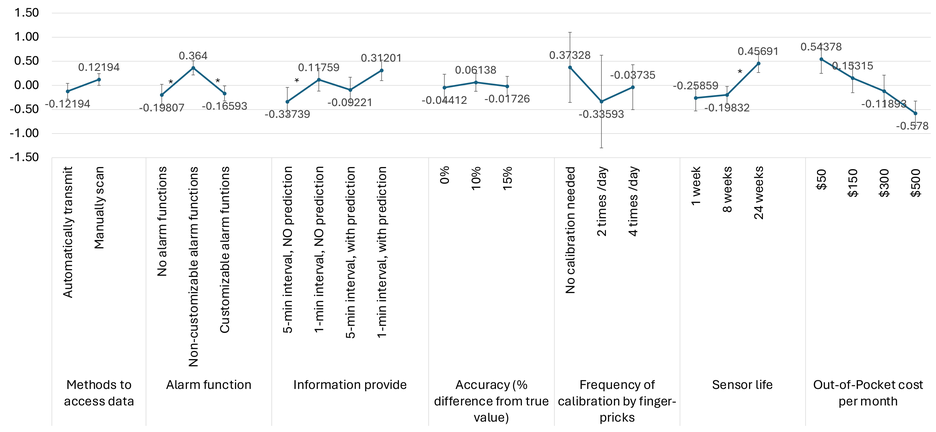
- Other than study attendance, factors such as age, education level, or patient's comprehension of choice attributes (based on comprehension quiz scores from 1 to 10) that may be associated with time on a survey were assessed. We found no specific patterns in terms of education level and comprehension score on survey time. However, patients' ages are positively associated with the time on the survey. (**Figure 4**)

Figure 4. Associations between Participants' Time on Survey and Age, Education Levels, and Comprehension Score



- After excluding patients who failed the dominant choice set, twenty-six patients were included in the analysis. The preference weights of all attributes, except measurement error, were in the expected directions. The preference weights of four attributes, including alarm function, information provided, sensor lifespan, and out-of-pocket cost, were statistically significant.
- The conditional relative importance of out-of-pocket cost was the highest (1.12), followed by sensor lifespan (0.72), calibration frequency required (0.71), information provided (0.65), alarm function (0.56), methods to access information (0.24), and measurement error (0.11). (**Figure 5**)

Figure 5. Preference Weights of Attributes



CONCLUSION

The majority of selected CGM attributes in this preliminary study are potentially important to patients with T2D. Specifically, the patients identified the alarm function, information provided, sensor lifespan, and out-of-pocket cost as significantly important attributes when selecting preferred CGM devices. However, other attributes, especially measurement errors, still required attention before conducting the main survey.

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