Comparing Real-Time Continuous Glucose Monitoring with Self-Monitoring of Blood Glucose in People with Type 1 Diabetes on Insulin Therapy: A Cost-Utility Study

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Background

Continuous glucose monitoring systems have been found to be beneficial in patients with type 1 diabetes mellitus (T1DM), a chronic condition with complications such as hypoglycemia and ketoacidosis. Yet, further research is warranted to help improve clinical decision-making.

Objective

To evaluate the cost-effectiveness of a real-time continuous glucose monitoring system (rt-CGM) compared to self-monitoring of blood glucose (SMBG) in older adults and adolescents with T1DM.

Methods

A decision tree model was developed using Excel to compare the costs and effectiveness of rt-CGM versus SMBG.

The decision tree included three health states: controlled diabetes mellitus, occurrence of hypoglycemia, and occurrence of hyperglycemia.

We considered scenarios for two groups of patients with T1DM: patients 24 years of age or older and patients 14-24 years of age.

We populated both scenarios with costs and gains (or losses) of each diabetes monitoring system, including emergency department visits, occurrence of adverse events, and utility of each health state considering age based on the most recent evidence available.

Results

Figure 1. Decision Tree for the Glucose Monitoring Systems.

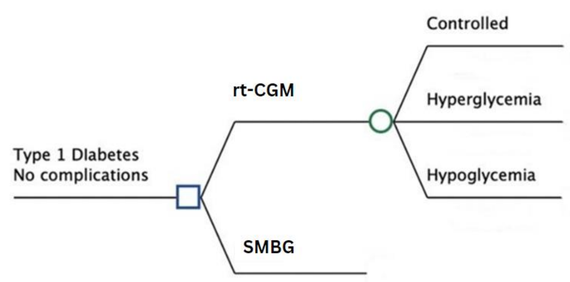


Table 1. Model Inputs.

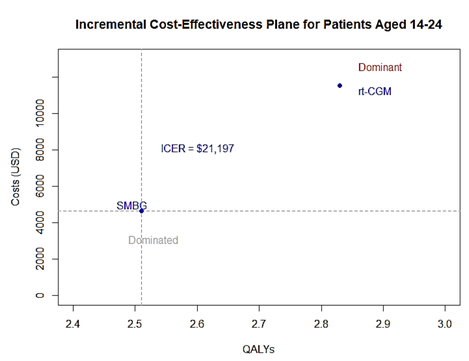
Adult Patients	**Outcome**	**Probability**	**Cost**	**Utility**
rt-CGM	**Controlled**	0.98	10,027	0.91
	Hypoglycemia	0.01	119	0.90
	Hyperglycemia	0.01	390	0.90
SMBG	**Controlled**	0.88	3,701	0.85
	Hypoglycemia	0.10	625	0.85
	Hyperglycemia	0.02	645	0.84
Young Patients	**Outcome**	**Probability**	**Cost**	**Utility**
rt-CGM	**Controlled**	0.92	9,396	0.95
	Hypoglycemia	0.04	494	0.95
	Hyperglycemia	0.04	1,630	0.94
SMBG				
	Controlled	0.96	4,041	0.84
	Hypoglycemia	0.03	156	0.84
	Hyperglycemia	0.01	433	0.83

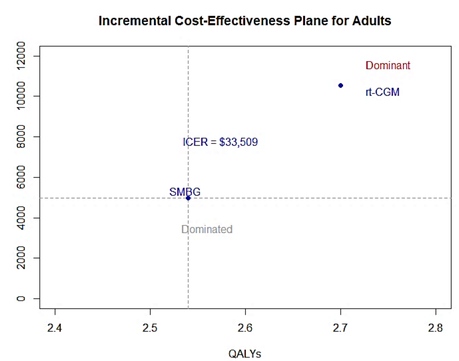
The mean total cost per patient was $10,536 for rt-CGM and $4,971 for SMBG, a difference of $5,565.

Considering adolescents and young adults only, the mean total cost per patient was $11,520 for rt-CGM and $4,629 for SMBG, a difference of $6,890.

The improvement in effectiveness of rt-CGM over SMBG was 0.166 Quality-Adjusted Life Years (QALY).

The incremental cost-effectiveness ratio (ICER) was $33,509 for adults and $21,197 for patients aged 14-24, considering the occurrence of hypoglycemia and hyperglycemia.





Conclusion

Rt-CGM is cost-effective compared to SMBG for adults as well as adolescents and young adults with T1DM based on a willingness-to-pay threshold of $50,000/QALY.

This benefit is more pronounced in adolescent and young adult patients.

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