Cost-Effectiveness of Real-Time Continuous Glucose Monitoring (RT-CGM) in Type 2 Diabetes (T2DM)

Stephanie J. Fonda, PhD,[a] Claudia Graham, PhD,[b] Yevgeniy Samyshkin, MSc,[c] Julie Munakata, MS,[c] Julie Powers, MHS,[c] David Price, MD,[b] Robert A. Vigersky, MD[a]

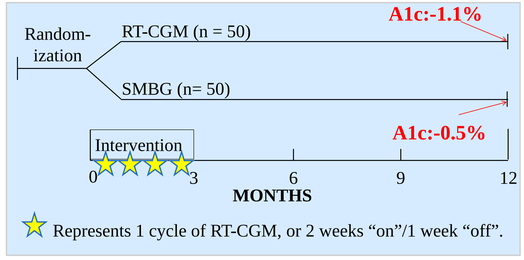
[a]Diabetes Institute, Endocrinology Service, Walter Reed National Military Medical Center (Washington ,DC), [b]Dexcom, Inc. (San Diego), [c]IMS Health, (London, Redwood City, & Alexandria)

BACKGROUND AND OBJECTIVE

- The social and economic burdens of diabetes make it important to identify cost-effective approaches for managing Type 2 diabetes mellitus (T2DM).
- A 3-month course of RT-CGM in people T2DM who do not take prandial insulin reduces A1c compared with self-monitoring of blood glucose (SMBG) – an effect which persists for 9 more months.[1,2]
- There are no studies of cost-effectiveness of RT-CGM in people with T2DM not taking prandial insulin; to our knowledge, there are no published cost-effectiveness studies of RT-CGM in T2DM.
- We examined the potential impact of RT-CGM on the lifetime clinical and economic impact of such a treatment approach.

METHODS

FIG 1. DESIGN OF CLINICAL STUDY



Main features of clinical study:

- 12-week active intervention (Fig. 1)
  - 4 two-week "cycles" of RT-CGM
  - SMBG group asked to monitor 4x/day
- No interpretation of glucose data given
- Study staff did not alter treatment
- ***A1c declined 1.1% with RT-CGM at 12 months vs. 0.5% with SMBG***

Main assumptions of the cost-effectiveness analysis:

- We used the validated[3] IMS CORE Diabetes Model (CDM). The CDM:
  - ⇨ Predicted cumulative rates of diabetes complications and progression physiological parameters, such as A1c.
  - ⇨ Used inputs from: a) the clinical study or cohort; b) clinically-derived assumptions about treatment algorithms; and c) data from the UKPDS, the DCCT, and Framingham Study.
  - ⇨ Estimated health outcomes in the modeled cohort in terms of quality-adjusted life-years (QALYS).
- Base case and scenario analyses performed; base case assumed no further use of RT-CGM after Year 1, and scenario assumed refresher use at beginning of Year 2. Both analyses assumed average transition to insulin would be by Year 5.
- Analyses performed from a US payer perspective, including only direct costs obtained from published sources and inflated to 2011 U.S. dollars. Costs and outcomes discounted at 3% annually.
- We performed sensitivity analyses and these were generally robust.

RESULTS – BASE CASE

TABLE 1. INPUT PARAMETERS

PARTICIPANT	MEAN	SD
Age (years)	57.8	10.8
Male (proportion)	0.6	
Duration of diabetes (years)	9.0	6.8
Baseline A1c (%-points)	8.3	1.2
Baseline BMI (kg/m^2)	32.3	6.8
COSTS/PARTICIPANT	**RT-CGM**	**SMBG**
Year 1 – Base Case ($)	4,074	3,659
Year 2+ – Base Case ($)	3,482	3,482

Cost of RT-CGM course in Years 1 and 2 based on 4 reimbursement codes CPT90250. Costs also include lancets, strips, and anti-diabetic medications.

- The cohort was middle-aged, overweight/obese, w/ an average A1c of 8.3% (Table 1)
- ~60% were taking oral medications & ~33% were taking basal insulin + oral medications
- Costs of RT-CGM in Year 1 was higher than SMBG alone, assuming tests 3/day

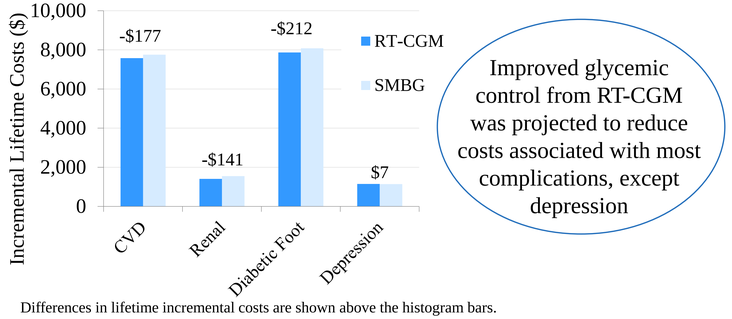
TABLE 2. SUMMARY OF COST-EFFECTIVENESS – LIFETIME HORIZON

	RT-CGM	SMBG	DIFFERENCE
LE	10.626	10.540	0.086 (1.03 mos.)
QALY	6.037	5.970	0.067 (0.80 mos.)
Total costs ($)	69,889	69,639	250
ICER $/LE			2,903
ICER $/QALY			3,735

LE = life expectancy; QALY = quality-adjusted life years; ICER = incremental cost-effectiveness ratio

- RT-CGM had an increase in LE of 1.03 mos. (Table 2), and an increase in QALY of 0.8 mos.
- Costs of RT-CGM are: $2,903/life year gained and $3,735/QALY gained

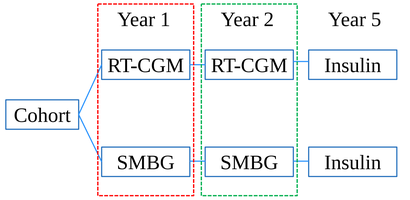
FIG 2. DIABETES COMPLICATION COSTS FOR RT-CGM VS. SMBG



Differences in lifetime incremental costs are shown above the histogram bars.

RESULTS – SCENARIO ANALYSIS

FIG 3. ASSUMPTIONS OF SCENARIO



Base Case. Assumes a 3-month RT-CGM intervention in Year 1 only

Scenario. Assumes a 3-month RT-CGM interventions in Year 1 and Year 2, same format

- A refresher use of RT-CGM in Year 2 resulted in an increased health gain (0.165, or 2 quality-adjusted life-months)
- The total cost in this scenario is $1,217 (vs. $250 for Base Case)
- The costs are $10,071 per QALY gained

CONCLUSIONS AND DISCUSSION

- Intermittent, short-term use of RT-CGM is a cost-effective disease management option in the U.S. for people with T2DM not taking prandial insulin. A repeat "course" or "dose" of RT-CGM may result in additional cost-effective health benefits, due to longer-term impact on physiological parameters.
- However, the gains in quantity and quality of life are modest. Thus, much of the cost-effectiveness is due to the low cost of the intervention, which is far below standard thresholds for costs per quality of life year gained.
- The small effect on quantity and quality of life is typical of behavioral interventions, where no prolonged action of the intervention is assumed. This use of RT-CGM is a behavioral intervention because no interpretation of RT-CGM data by a clinician was provided, nor did study staff adjust diabetes therapies; physiologic effects were due to participants' actions. Clinician interpretation might increase costs, but might also increase the beneficial effects of this technology, and thereby offset costs. This is a question for future research.

ACKNOWLEDGMENTS

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