

# **The Economic Impact and Cost-Effectiveness of Glucose Monitoring**

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# Why Perform Cost-Effectiveness Analyses?

- Resources are limited
- Choices must be made
- Choices should consider costs and outcomes

# Value for Money

- **What are the costs of self-monitoring of blood glucose (SMBG)?**
- **What determines the cost-effectiveness of an intervention?**
- **What is the cost-effectiveness of SMBG?**

**What are the costs of  
SMBG?**

# Annual Per Capita Cost of Diabetic Supplies by Age, U.S., 2007 vs 2012

	Age (years)			All
	<45	45-64	≥65	
2007 \$ (% total)	77 (2.0)	107 (2.1)	106 (1.1)	102 (1.5)
2012 \$ (% total)	73 (1.7)	98 (1.7)	120 (1.0)	103 (1.3)

ADA. *Diabetes Care* 31:596, 2008  
 ADA. *Diabetes Care* 36:1033, 2013

# Total Annual Cost of Diabetic Supplies, US, 2007 vs 2012

2007 (\$)	1,783,000,000
2012 (\$)	2,296,000,000

(a 29% increase over 5 years)

# **What determines the cost-effectiveness of an intervention?**

- **Characteristics of the target population**
- **Effectiveness of the intervention**
- **Cost of the intervention and cost of outcomes**
- **Impact of the intervention and outcomes on health-related quality-of-life**



# Characteristics of the Target Population

- Type 1 diabetes
- Insulin-treated type 2 diabetes
- Non-insulin-treated type 2 diabetes

- **SMBG is an integral and necessary part of therapy for patients with type 1 and insulin-treated type 2 diabetes**
- **SMBG should be available to diabetic patients with non-insulin-treated type 2 diabetes**

# **Additional Characteristics of the Target Population**

- **Age**
- **Duration of diabetes**
- **HbA1c**
- **Adherence**
- **Blood pressure**
- **Cholesterol**
- **Smoking status**
- **Complications**

# Effectiveness of the Intervention

- **Change in HbA1c**
- **Persistence of effect over time**
- **Time horizon**

# **Cost of Intervention and Complications**

- **Cost of test strips, lancets, meters**
- **Frequency of monitoring**
- **Patient and clinician education**
- **Data management**
- **Antidiabetic medications**
- **Complications**

# Impact on Quality-of-Life

- **SMBG**
- **Treatments**
- **Complications**

# 2012 Cochrane Review

**Systematic review of 12  
randomized controlled trials  
assessing the effects of SMBG in  
patients with type 2 diabetes not  
using insulin**

# How are SMBG data used clinically?

## “Structured SMBG”

### Frequency and timing

- Set regular times over a period of days

### Patient knowledge and skills

- When and why to test, how to use data

### Clinician knowledge, skills, and access to data

- Pattern detection, appropriate medication adjustments

### Display of data

- Easy-to-read online profile sheet



**But...**

**Structured SMBG will substantially increase  
the costs of SMBG**

# The Effectiveness of SMBG in Patients with Newly Diagnosed Type 2 Diabetes Not Using Insulin

Outcome	No. of Studies	No. of Participants	Effect Size (95% CI)
HbA1c @ 12 months follow-up	2	345	-0.52 (-0.89, -0.14)

# The Effectiveness of SMBG in Patients with Established Type 2 Diabetes (>1 year Duration) Not Using Insulin

Outcome	No. of Studies	No. of Participants	Effect Size (95% CI)
HbA1c @ 6 months follow-up	9	2,324	-0.26 (-0.39, -0.13)
HbA1c @ 12 months follow-up	2	493	-0.13 (-0.31, 0.04)

# Patient-Reported Outcomes

There is no significant evidence that SMBG has a beneficial effect on:

- Health-related quality-of-life (3/3 trials)
- Well-being (4/4 trials)
- Satisfaction (4/4 trials)

# Hypoglycemia

**SMBG increases the frequency of reported asymptomatic and symptomatic hypoglycemia (3/4 trials)**

# Conclusions

- **SMBG in patients with newly diagnosed T2DM is effective in lowering HbA1c at one year (-0.52%)**
- **In patients with established T2DM, introduction of SMBG is effective in lowering HbA1c at six months (-0.26%), but by one year, the effect subsides**
- **SMBG has no relevant effect on health-related quality-of-life, well-being, or satisfaction**
- **SMBG increases reported hypoglycemic episodes**

**What is the cost-effectiveness of SMBG in non-insulin treated T2DM?**

# **Cost-Effectiveness of SMBG in Patients with Non-insulin Treated Type 2 Diabetes: Economic Evaluation from the Diabetes Glycaemic Education and Monitoring Trial Group**

**453 patients randomized to:**

- Usual care**
- SMBG**
- SMBG and training**

**12-months follow-up**

**Cost-utility from a health system perspective**



# Differences in Costs and Outcomes Over 1 Year

	SMBG vs Usual Care	SMBG & Training vs Usual Care
$\Delta$ cost	£92	£84
$\Delta$ utilities	-0.027*	-0.075*

\* due to increased levels of anxiety and depression

# Conclusions

- In patients with non-insulin treated T2DM, SMBG with or without training is associated with higher costs and lower quality-of-life
- SMBG is unlikely to be cost-effective in addition to usual care

**Analysis using simulation modeling  
have reported a wide range of  
incremental cost-effectiveness ratios**

**In analyses using simulation modeling, SMBG is more cost-effective in type 2 diabetic patients not using insulin if...**

## The target population is:

- Less healthy (higher HbA1c, BP, lipids, etc.)
- More adherent

## The effectiveness of the intervention is:

- Substantial (more HbA1c lowering)
- Persistent

**The cost of the intervention is:**

- Low (and monitoring is less frequent)**

*Cameron C. CMAJ 182:28, 2010*

*Tunis SL. Appl Health Econ Health Policy 9:351, 2011*

**The quality-of-life impact of the intervention is:**

- Positive (for example, improves self-efficacy and does not increase anxiety)**



**The frequency and cost of late diabetic complications is:**

**– High**

*Cameron C. CMAJ 182:28, 2010*

*Tunis SL. Appl Health Econ Health Policy 9:351, 2011*

## The quality-of-life impact of late complications is:

- Substantial (complications are associated with large decrement in quality-of-life)

**Conclusion regarding the cost-effectiveness of SMBG in non-insulin-treated type 2 diabetes...**

**“the cost, effort, and time involved in the procedures may be better directed to supporting other health-related behaviors”**