Cost Analysis of a Flash Glucose Monitoring System in Type 2 Diabetes Receiving ≥2 Insulin Doses a Day in Spain

Gomez-Peralta, Fernando¹; Oyagüez, Itziar²; Artola, Sara³; Carrasco, Francisco Javier⁶; Gomez-Huelgas, Ricardo⁷; Merino-Torres, Juan Francisco⁶; Perez, Antonioీ

1 Unidad de Endocrinologia y Nutricion. Hospital General de Segovia. Spain; 2 Pharmacoeconomics & Outcomes Research Iberia (PORIB). Madrid. Spain; 4 UGC Medicina Interna. Hospital de Zafra. Badajoz. Spain; 5 Porriño Primary Care Centre, Pontevedra. Spain; 5 Servicio de Medicina Interna. Hospital de Zafra. Badajoz. Spain; 6 Porriño Primary Care Centre, Pontevedra. Spain; 5 Servicio de Medicina Interna. Hospital de Zafra. Badajoz. Spain; 6 Porriño Primary Care Centre, Pontevedra. Spain; 6 Porriño Primary Care Centre, Pontevedra. Spain; 7 Unidad de Endocrinologia y Nutricion. Hospital Universitario Juan Ramon Jimenez. Huelva. Spain; 8 Outcomes Research Iberia (PORIB). Madrid. Spain; 9 Outcomes Research Iberia 7 Servicio de Medicina Interna, Hospital Regional Universitario de Malaga; and Ciber Fisiopatología y Nutricion (CIBEROBN), Instituto de Malaga; and Ciber Fisiopatología y Nutricion (CIBEROBN), Instituto de Malaga; and Ciber Fisiopatología y Nutricion (CIBEROBN), Instituto de Salud Carlos III, Madrid, Spain; 8 Endocrinología y Nutricion (CIBEROBN), Instituto de Malaga; and Ciber Fisiopatología y Nutricion (CIBEROBN), Instituto de Malaga; and Ciber Fisiopatología y Nutricion (CIBEROBN), Instituto de Malaga; and Ciber Fisiopatología y Nutricion (CIBEROBN), Instituto de Malaga; and Ciber Fisiopatología y Nutricion (CIBEROBN), Instituto de Salud Carlos III, Madrid, Spain; 8 Endocrinología y Nutricion (CIBEROBN), Instituto de Malaga; and Ciber Fisiopatología de Ia Obesidad y Ia Nutricion (CIBEROBN), Instituto de Salud Carlos III, Madrid, Spain; 8 Endocrinología y Nutricion (CIBEROBN), Instituto de Salud Carlos III, Madrid, Spain; 9 Endocrinología y Nutricion (CIBEROBN), Instituto de Salud Carlos III, Madrid, Spain; 9 Endocrinología y Nutricion (CIBEROBN), Instituto de Salud Carlos III, Madrid, Spain; 9 Endocrinología y Nutricion (CIBEROBN), Instituto de Salud Carlos III, Madrid, Spain; 9 Endocrinología y Nutricion (CIBEROBN), Instituto de Salud Carlos III, Madrid, Spain; 9 Endocrinología y Nutricion (CIBEROBN), Instituto de Salud Carlos III, Madrid, Spain; 9 Endocrinología y Nutricion (CIBEROBN), Instituto de Salud Carlos III, Madrid, Spain; 9 Endocrinología y Nutricion (CIBEROBN), Instituto de Salud Carlos III, Madrid, Spain; 9 Endocrinología y Nutricion (CIBEROBN), Instituto de Salud Carlos III, Madrid, Spain; 9 Endocrinología y Nutricion (CIBEROBN), Instituto de Salud Carlos III, Madrid, Spain; 9 Endocrinología y Nutricion (CIBEROBN), Instituto de Salud Carlos III, Madrid, Spain; 9 Endocrinología y Nutricion (CIBEROBN), Instituto de Salud Carlos III, Madrid, Spain; 9 Endocrinología y Nutricion (CIBEROBN), Instituto (CIBEROBN), Instituto (CIBEROBN), Instituto (CIBEROBN), Instituto (CIBEROBN), Instituto (CIBEROBN), ⁹ Servicio de Endocrinologia y Nutricion. Hospital de la Santa Creu i Sant Pau. Barcelona. Spain

BACKGROUND

- In Diabetes mellitus (DM), it's important to keep a good glycaemic control and the maintenance of hormoglycaemia for reducing disease burden and it has been estimated that only 24% of type 2 DM (T2DM) follow the recommendations for monitoring¹.
- FreeStyle Libre² system is a sensor-based flash monitoring (FM) system, which asseses interstitial fluid glucose, and provides an alternative to SMBG¹. This system has demonstrated clinical evidence in T2DM patients in the REPLACE^{3,4} clinical trial and other studies^{5,6,7}.
- In addition, the FM system has a digital ecosystem that allows better management of both patients and health professionals through the use of tools FreeStyle LibreLinkUp and LibreView, with a positive impact on the quality of life of patients with T2DM¹.

METHODS

- A cost-analysis model was designed to estimate the annual costs associated with glucose monitoring in T2DM patients from the Spanish National Health System perspective.
- In the analysis the cost for glucose monitoring in T2DM patients treated with ≥2 insulin doses a day was modelled. The cost estimation comprised the annual resource consumption for glucose monitoring (strips, lancets and FM sensors) and clinical management of hypoglycemia episodes (severe and non-severe).
- All the inputs were derived from a literature search and were validated by an endocrinologist's expert panel.
- Severe hypoglycemia episodes (SHE) and non-severe hypoglycemia episodes (NSHE) published event rates (2.5 and 17.2 episodes/patient/ year)⁸ were considered.
- Event reductions associated to FM system use were applied (48.8% [SHE]; 27.7% [NSHE]), derived from REPLACE trial findings³.
- Based on published evidence, hospital attendance was required in 20.5% of SHEs⁹ (further hospitalization in 16.0%)¹⁰.
- An average daily consumption of 4.81 strips and lancets for SMBG users was estimated considering the national recommendations of 1.81 strips and lancets for SMBG users was estimated considering the national recommendations of 1.81 strips and lancets for SMBG users was estimated considering the national recommendations of 1.81 strips and lancets for SMBG users was estimated considering the national recommendations of 1.81 strips and lancets for SMBG users was estimated considering the national recommendations of 1.81 strips and lancets for SMBG users was estimated considering the national recommendations of 1.81 strips and lancets for SMBG users was estimated considering the national recommendations of 1.81 strips and lancets for SMBG users was estimated considering the national recommendations of 1.81 strips and lancets for SMBG users was estimated considering the national recommendations of 1.81 strips and lancets for SMBG users was estimated considering the national recommendations of 1.81 strips and 1.81 strips and 1.81 strips and 1.81 strips are strips at 1.81 strips and 1.81 strips and 1.81 strips and 1.81 strips are strips at 1.81 strips at 1.81 strips are strips at 1.81 strips a population, assuming 60.5% of patients with basal-bolus insulin and 39.5% with insulin mix¹². According to the REPLACE findings⁴, 0.2±0.6 (0.66) strips and lancets a day was applied for FM users⁷. Equivalent consumption of lancets and strips (one lancet per SMBG) was assumed.
- The FM system considered was FreeStyle Libre 2, as this is available in Spain since the beginning of 2020, which includes key features like optional glucose alarms. FM sensor annual consumption per patient was 26 (sensor life 14 days).
- Unitary costs (€, 2019 excluding VAT) derived from national databases and literature were: €0.28/strip; €0.09/lancet; €3.09/daily FM sensor; €3,774/hospitalized SHE¹³; €1,779 hospital-attended non-admitted SHE¹⁴; €385/community attended SHE¹⁵ and €15/NSHE¹⁶. (Table 1)

Table 1. Unitary costs (€, 2019 excluding VAT)

	Unit cost (€, 2019)
Strip	€ 0.28
Lancet	€ 0.09
FM sensor (FreeStyle Libre 2)	€ 43.27
Events management	
SHE requiring hospitalization	€ 3,773.98 ¹³
SHE requiring hospital attendance, without hospitalization	€ 1,779.50 ¹⁴
SHE requiring community attendance	€ 385.47 ¹⁵
NSHE	€ 14.95 ¹⁶

FM: flash monitoring; NSHE: non-severe hypoglycemia event; SHE: severe hypoglycemia event

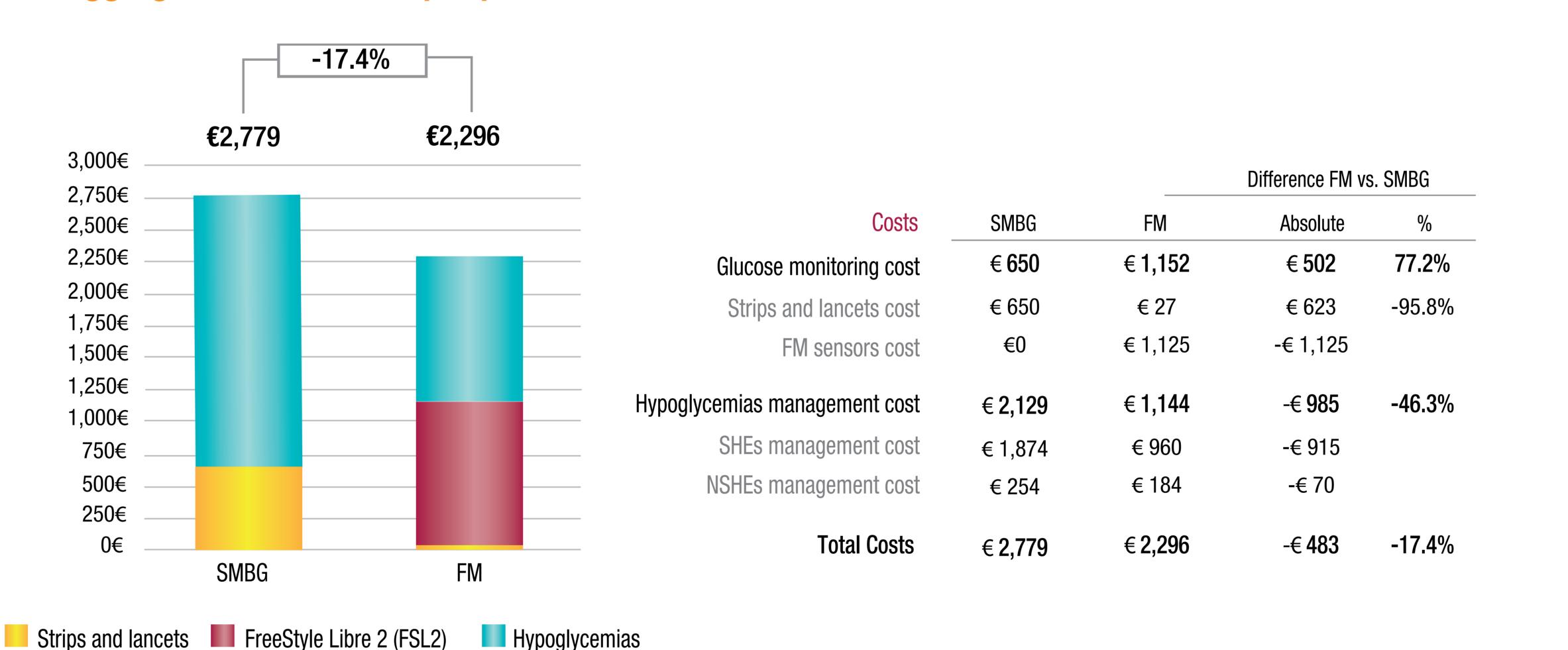
SENSITIVITY ANALYSES

Sensitivity analyses (SA) were conducted:

- SA1: Alternative SHE rate of 1.3 episodes/patient-year⁸.
- SA2: Considering only SHE rate.
- SA3: Consumption of strips and lancets: 3 daily for SMBG.
- SA4: Consumption of strips and lancets: 2.1 daily for SMBG⁷.
- SA5: Consumption of strips and lancets: 0.66 daily for FM system⁷.

- Total annual cost per patient was €2,779 for SMBG and €2,296 for FM. The use of FM system would generate total savings of €483 (-17.4%) per patient in comparison to SMBG (Figure 1).
- Annual cost related to hypoglycemia events was €2,129/patient for SMBG patients (€1,874 for SHE and €254 for NSHEs). For FM patients, this cost was €1,144/patient (€960 for SHE and €184 NSHEs). That means that use of FM system would reduce 46.3% the hypoglycemia management cost.
- Glucose monitoring annual cost was €650 for SMBG patients, and €1,152 for FM patients. This increase was compensated by the savings related to management cost of hypoglycemia episodes.

Figure 1. Disaggregated annual cost per patient



- For a cohort of 1,000 patients using ≥2 insulin doses a day, SMBG system would produce 19,520 hypoglycemias (2,500 SHE and 17,020 NSHE) in comparison with FM system that would produce 13,585 hypoglycemias (1,280 SHE and 12,305 NSHE) (Table 2).
- FM use in comparison to SMBG, would yearly avoid up to 5,935 hypoglycemias (-30.4%). Concretely -1,220 SHEs (-48.8%), including 48 hospitalizations for SHE and 4,715 NSHEs (-27.7%). (Table 2)

Table 2. Annual hypoglycemia events in a 1,000 T2DM patient cohort

	SMBG	FM	Difference FM vs. SMBG Absolute (%)
HYPOGLYCEMIA EVENTS, TOTAL PER YEAR	19,520	13,585	-5,935 (-30.4%)
SHE	2,500	1,280	-1,220 (-48.8%)
Hospitalized SHE	98	50	-48 (-48.8%)
Hospital attended, non-admitted SHE	416	213	-203 (-48.8%)
Community attended SHE	1,987	1,017	-969 (-48.8%)
NSHE	17,020	12,305	-4,715 (-27.7%)

FM: flash monitoring; NSHE: non-severe hypoglycemia event; SHE: severe hypoglycemia event; SMBG: self-monitoring of blood glucose

To estimate the annual cost associated with FM system (FreeStyle Libre 2) compared to SMBG in T2DM adult population receiving ≥2 Insulin doses a day.

OBJECTIVE

RESULTS

• The use of the FM system in 1,000 patients could generate annual cost-savings up to €483,031 compared to SMBG (-17.4% of cost reduction). (Table 3).

Table 3. Annual cost for 1,000 T2DM patient

	SMBG	FM	Difference FM vs. SMBG Absolute (%)
Glucose monitoring	€ 650,035	€ 1,152,049	€ 502,013 (77.2%)
Strips and lancets	€ 650,035	€ 27,029	-€ 623,007 (-95.8%)
FM sensor cost	€0	€ 1,125,020	€ 1,125,020
Hypoglycemias events management	€ 2,128,550	€ 1,143,506	-€ 985,044 (-46.3%)
SHEs management cost	€ 1,874,101	€ 959,540	-€ 914,561
NSHEs management cost	€ 254,449	€ 183,967	-€ 70,482
TOTAL COST	€ 2,778,585	€ 2,295,555	-€ 483,031 (-17.4%)

Table 4. Results of SA

Annual costs for 1,000 patients with T2DM Receiving ≥2 Insulin Doses a Day	SMBG	FM	Difference FM vs. SMBG Absolute (%)
Base case	€ 2,778,585	€ 2,295,555	-€ 483,031 (-17.4%)
SA1 (1.3 SHE episodes/patient-year)8	€1,879,017	€ 1,834,976	-€ 44,041 (-2.3%)
SA2 (considering only SHE rate)	€ 2,524,136	€ 2,111,588	-€ 412,548 (-16.3%)
SA3 (3 strips and lancets/day for SMBG)	€ 2,533,977	€ 2,295,555	-€ 238,423 (-9.4%)
SA4 (2.1 strips and lancets/day for SMBG) ⁷	€ 2,412,349	€ 2,295,555	-€ 116,794 (-4.8%)
SA5 (0.66 strips and lancets/day for FM) ⁷	€ 2,778,585	€ 2,357,720	-€ 420,865 (-15.1%)

The results of the SA analysis (Table 4) for 1,000 patients with T2DM which use ≥2 insulin doses a day were:

- SA1: Using an alternative rate of 1.3 SHE episodes per patient-year⁸, the FM system would avoid 634 SHEs. This decrease would mean a saving of € 44,041 (-2.3%) with FreeStyle Libre 2.
- SA2: Considering only SHE episodes, the use of FreeStyle Libre 2 would be a saving of € 412,548 (-16.3%) in comparison with SMBG.
- SA3: A hypothetical scenario in which consumption is reduced to 3 strips and lancets/day for SMBG patients, would mean a saving of € 238,423 (-9.4%) with FreeStyle Libre 2.
- SA4: A more conservative scenario in which consumption is reduced to 2.1 strips and lancets/ day for SMBG patients⁷, would mean a saving of € 116,794 (-4.8%) with FreeStyle Libre 2.
- SA5: A hypothetical scenario in which consumption is increased to 0.66 strips and lancets/day for FM patients⁷, would mean a saving of € 420,865 (-15.1%) with FreeStyle Libre 2.

DISCUSSION AND CONCLUSIONS

- This cost comparison shows that the use of FM for patients with T2DM which use ≥2 insulin doses a day in Spain could generate total annual savings up to €483,000 for 1,000 patients.
- The sensitivity analysis suggested that FreeStyle Libre 2 could generate savings in all the scenarios analyzed, even in more conservative ones, for example if SMBG patients performed only 2 finger pricks per day.
- Currently in Spain, the system FM FreeStyle Libre 2 is financed only for children and adults with diabetes mellitus type 1. If the financing is extended with TD2M patients, it would mean savings for the Spanish National Health System.
- In conclusion, FM system is a potential cost-saving strategy in T2DM patients treated with ≥2 insulin doses a day in Spain.

DISCLOSURE

- Abbott Diabetes Care provided non-restricted financial support for the development of this analysis.
- IO is an employee of PORIB a consultant company which provided technical and editorial support for this analysis.
- FGP, SA, FJC, JC, JGS, RGH, JFMT and AP validated inputs and results.
- FreeStyle, Libre, and related Brand name are Brand names property of Abbott Diabetes Care Inc. Contact to Dr. Fernando Gomez Peralta: fgomezperalta@gmail.com

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