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Cost Analysis of FreeStyle Libre® Systems in Patients with Type 2 Diabetes Receiving Basal Insulin and Poor Glycemic Control (HbA1c > 8%): A Societal Perspective in Spain

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INTRODUCTION

- FreeStyle Libre® systems (FSL) have proved to be effective in patients with type 2 diabetes (T2D) receiving basal insulin[1].
- FSL could produce cost-savings in several diabetic populations under the Spanish national healthcare system perspective[2,3], including poorly controlled patients with T2D[4]. However, its economic impact from a societal perspective remains unclear.

OBJECTIVE

This study aimed to conduct a cost analysis comparing FSL vs self-monitoring of blood glucose (SMBG) in T2D patients on basal insulin and poorly controlled (HbA1c > 8%), from a societal perspective in Spain.

METHODS

- A decision analytic model was designed to compare costs (€, 2024, VAT included when applicable) of FSL and SMBG in a cohort of 1,000 patients with T2D. All inputs were derived from the published literature and were validated by local experts.
- According to Spanish recommendations[5], glucose monitoring resources in SMBG included a daily consumption of 2.5 reactive strips (€0.55/unit)[6] and 2.5 lancets (€0.14/unit)[6]. FSL was associated with a consumption of 26.09 sensors/year (€3.00/day) and reduced the usage of strips/lancets by 83%[1].
- Acute events included diabetic ketoacidosis (DKA), non-severe (NSHE) and severe hypoglycemic (SHE) events (Table 1)[1,7-14].
- Chronic diabetic complications were modeled according to their frequency and to their risk reduction per each 1% decrease in HbA1c levels (Table 2)[5,15-23]. FSL was associated with an absolute decrease in HbA1c levels of 1.1%[24].

Table 1. Inputs for modeling acute events.

	SMBG cohort	FSL reduction vs SMBG	Cost per event [€, 2024]
NSHE			
Annual incidence [events/person-year]	17.02 [7]	58.0% [1]	–
Management by specialist	21.9% [8]	–	€17.40 [9]
Self-management	78.1% [A]	–	€0.00 [B]
SHE			
Annual incidence [events/person-year]	2.5 [7]	58.0% [1]	–
Hospital assistance	26.1% [10]	–	–
Hospitalization	21.7% [10]	–	€2,071.09 [11]
No hospitalization	78.3% [A]	–	€4,389.19 [12]
No hospital assistance	73.9% [A]	–	€448.91 [13]
DKA			
Annual incidence [events/1,000 people-year]	2.5 [14]	68.0% [1]	–
Hospital assistance	87.1% [14]	–	€2,818.81 [12]
No hospital assistance	12.9% [A]	–	€0.00 [B]

DKA: Diabetic Ketoacidosis; FSL: FreeStyle Libre systems; NSHE: Non-Severe Hypoglycemic Event; SHE: Severe Hypoglycemic Event; SMBG: Self-Monitoring of Blood Glucose. [A] Estimated input: complementary to the published data (1 – Data). [B] Assumption.

- Absenteeism in employed patients (26.5%)[8] was determined by an absenteeism rate of 18.5% (64.6 days lost per patient-year[25], average annual wage of €26,700/year[26]).

Table 2. Inputs for modeling chronic diabetic complications.

	Occurrence [% of patients]	Risk reduction per 1% decrease in HbA1c [%]	Annual cost per complication [€, 2024]
AMI	7.4% [15]	14.0% [16]	€1,214.44 [5]
Angina pectoris	8.6% [15]	9.9% [17]	€669.92 [5,19]
HF	6.3% [15]	16.0% [16]	€1,481.65 [5,20]
Stroke	3.56% [15, A]	12.0% [16]	€3,101.09 [5,21]
Transitory cerebral ischemia	3.64% [15, A]	12.0% [16]	€2,773.90 [22]
Diabetic neuropathy	5.3% [15]	37.0% [16]	€3,961.01 [5,23]
Diabetic retinopathy	8.1% [15]	19.0% [16]	€3,844.98 [5]
Peripheral arterial disease (Diabetic foot)	5.0% [15]	16.7% [18]	€1,085.66 [5]
Diabetic nephropathy	8.6% [15]	21.9% [16]	€1,883.87 [22]
ESRD	5.9% [15]	21.9% [16]	€41,592.79 [5]

AMI: Acute Myocardial Infarction; ESRD: End-Stage Renal Disease; HF: Heart Failure. [A] Occurrence estimated as a weighted average of the occurrence of cerebrovascular disease (7.2%)[15] multiplied by the proportion of patients with stroke (acute cerebrovascular disease) (49.5%)[15] or transitory cerebral ischemia (50.5%)[15].

- Sensitivity analyses (SAs) were conducted for test the model robustness:
  1. Unit cost of strips and lancets at €0.00.
  2. Reduction of NSHE / SHE associated with FSL: 29.0% [27].
  3. Frequency of SHEs: 1.4 events/person-year[28].
  4. Absolute decrease of HbA1c associated with FSL: 0.45% [29].
  5. Proportion of employed patients: 37.0% [30].

RESULTS

- The annual cost per patient was €7,085 for SMBG and €5,172 for FSL (absolute difference per patient-year [FSL vs. SMBG] = -€1,913).
- For a cohort of 1,000 patients, FSL averted 9,872 NSHEs, 1,450 SHEs, 2 DKAs, 124 chronic complications, and 1,850 absenteeism days, resulting in total annual savings of €1,913,489 (Table 3).

Table 3. Results of the cost analysis in a cohort of 1,000 poorly controlled (HbA1c > 8%) patients with T2D on basal insulin.

	Glucose monitoring resources consumption, acute events, chronic diabetic complications and absenteeism days			Annual costs [€, 2024]		
	SMBG	FSL	Incremental (FSL vs. SMBG)	SMBG	FSL	Incremental (FSL vs. SMBG)
Glucose monitoring resources	**–**	**–**	**–**	**€630,056**	**€1,203,903**	**+€573,847**
Reactive strips	913,125 units	155,231 units	-757,894 units	€502,219	€85,377	-€416,842
Lancets	913,125 units	155,231 units	-757,894 units	€127,838	€21,732	-€106,105
FSL sensors	0 units	26,089 units	+26,089 units	€0	€1,096,794	+€1,096,794
Acute episodes	**19,553**	**8,199**	**-11,324**	**€2,579,967**	**€1,082,973**	**-€1.496.995**
NSHE	17,020	8,198	-9,872	€64,856	€27,240	-€37,617
SHE	2,500	1,050	-1,450	€2,508,973	€1,053,769	-€1,455,204
DKA	3	1	-2	€6,138	€1,964	-€4,174
Chronic diabetic complications	**624.00**	**500.03**	**-123.97**	**€3,643,842**	**€2,788,701**	**-€855,141**
AMI	74.00	62.60	-11.40	€89,869	€76,029	-€13,840
Angina pectoris	86.00	76.63	-9.37	€57,613	€51,339	-€6,274
HF	63.00	51.91	-11.09	€93,344	€76,915	-€16,429
Stroke	35.60	30.90	-4.70	€110,399	€95,826	-€14,573
Transitory cerebral ischemia	36.40	31.60	-4.80	€100,970	€87,642	-€13,328
Diabetic neuropathy	53.00	31.43	-21.57	€209,934	€124,491	-€85,443
Diabetic retinopathy	81.00	64.07	-16.93	€311,443	€246,352	-€65,092
Peripheral arterial disease (Diabetic foot)	50.00	40.82	-9.19	€54,283	€44,311	-€9,972
Diabetic nephropathy	86.00	65.28	-20.72	€162,013	€122,984	-€39,029
ESRD	59.00	44.79	-14.21	€2,453,975	€1,862,812	-€591,162
Work absenteeism	**3,167.02 lost workdays**	**1,317 .48 lost workdays**	**-1,8549.54 lost workdays**	**€231,507**	**€96,307**	**-€135,200**
TOTAL COSTS (1,000 patients)	**–**	**–**	**–**	**€7,085,373**	**€5,171,884**	**-€1,913,489**

AMI: Acute Myocardial Infarction; DKA: Diabetic Ketoacidosis; ESRD: End-Stage Renal Disease; FSL: FreeStyle Libre systems; HF: Heart Failure; NSHE: Non-Severe Hypoglycemic Event; SHE: Severe Hypoglycemic Event; SMBG: Self-Monitoring of Blood Glucose.

- All SAs confirmed cost savings for FSL (1,000 patients [FSL vs. SMBG]):
  1. Unit cost of strips and lancets at €0.00 → -€1,390,542.
  2. Reduction of NSHE / SHE associated with FSL: 29% [27] → -€1,167,079.
  3. Frequency of SHEs: 1.4 events/person-year[28] → -€1,273,199.
  4. Absolute decrease of HbA1c: 0.45% [29] → -€1,408,179.
  5. Proportion of employed patients: 37.0% [30] → -€1,967,059.

CONCLUSIONS

Compared to SMBG, FSL reduce diabetic complications and absenteeism in poorly controlled T2D patients on basal insulin, generating cost savings for the Spanish national healthcare system and society.

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