

COSTS ANALYSIS OF A MOBILE PHONE TELEMONTITORING SYSTEM FOR GLYCAEMIC CONTROL IN PATIENTS WITH DIABETES MELLITUS IN SPAIN: PRELIMINARY RESULTS

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Introduction

Diabetes Mellitus (DM) management in Spain represents 1.5% to 6.2% of public health expenditure¹. Technological developments facilitate remote monitoring of patients and improve DM care. A mobile phone telemonitoring system (TM) might improve the ability of DM patients to engage with treatment.

Objectives

- To estimate the annual costs that implementing a TM for glycaemic control in DM patients might represent to the National Health System and to society in Spain.
- To calculate the variations in costs that may occur after improving DM treatment compliance by means of implementing a mobile phone TM system for glycaemic control.

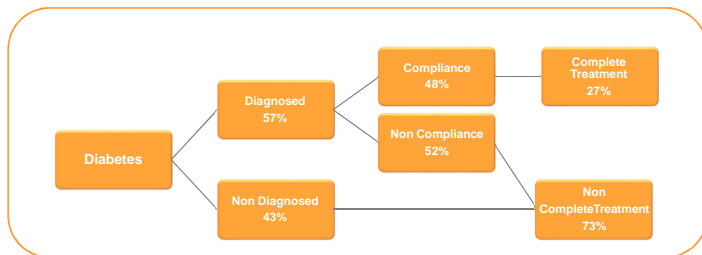
Methods

A systematic review of the literature was conducted to determine cost drivers in DM TM. Electronic databases including Pubmed and MEDES were searched to identify international and national clinical and economic articles, published between January 2001 and December 2011, reporting on the clinical benefits, health resources and costs associated to DM TM.

A previously published mathematical model² was applied to determine the variation in costs associated with the reduction in the risk of developing micro and macrovascular DM complications derived from hypothetically reaching 100% DM treatment compliance. This model allows an estimation of the improvement on DM complications when applying TM to non-compliant patients in terms of risk reduction. A Spanish National Health System perspective was adopted. All costs were updated to €, 2011.

Data included in the model were based on the Diabetes Control and Complications Trial (DCCT)³, the Epidemiology of Diabetes Interventions and Complications (EDIC)⁴ and Spanish prevalence data for micro and macrovascular complications⁵ (Figure 1).

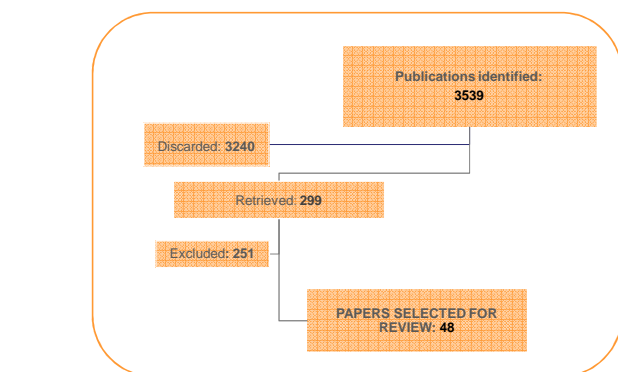
Figure 1. Proportion of non-compliant, undiagnosed and untreated patients included in the model.



Results

More than 3,000 relevant titles were initially identified. After discarding and excluding articles not accomplishing the inclusion criteria, a total of 48 publications were reviewed (Figure 2).

Figure 2. Systematic review process



SYSTEMATIC REVIEW RESULTS

- In Spain, direct costs associated with DM monitoring ranged between 21.699€ and 22.681€ per patient/year.

- TM in DM patients provides a better control of DM, decreasing the frequency of use of health care resources (Table 1).

Table 1. Impact of telemonitoring on health care resources in DM patients.

HEALTHCARE RESOURCES TYPE	PERCENTUAL VARIATION IN HEALTH CARE RESOURCES USE*
Hospital admissions	↓ 20%
Hospital admissions (DM complications)	↓ 75%
Length of hospital stay	↓ 51%
Urgency care visits	↓ 34%
Urgency care (diabetes complications)	↓ 83%
Outpatient care	↓ 49%
Primary care visits	↓ 19%

* The variation in the use of each resource type is expressed as percentage variation per patient/year.

- Devices acquisition and staff training involve an initial cost for both patients and the National Health System. These costs would be amortized over three years⁶.

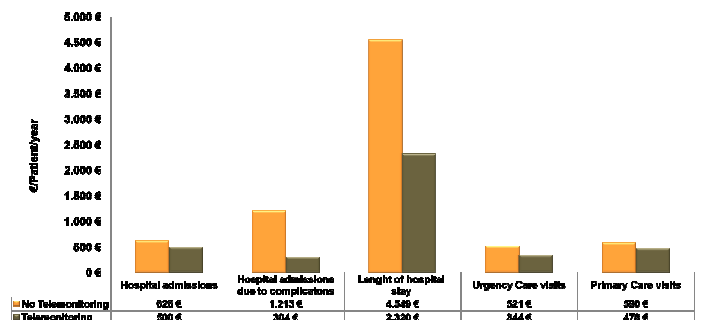
- In Spain, TM of DM patients would provide a reduction of €3.553 per patient/year if TM would be available to DM patients (Figure 3).

- DM patients most suitable for TM would be those that require frequent monitoring visits⁷:

- DM1 recent diagnosis.
- DM1 continuous insulin pump infusion carrier.
- Gestational diabetes.
- DM1 preconceptional control
- DM1 pregnancy monitoring
- DM1 y DM2 intercurrent processes worsening metabolic control (infections, steroids, etc.,...).
- DM1 y DM2 difficult access to health care center (lack of mobility; considerable distance to the health center).

- Following the implementation of TM to DM patients in need of intervention, most cost reduction would come from shortening the length of hospital stays. Costs due to complications related to hospital admissions would also be significantly decreased.

Figure 3: Differences in DM direct costs explained by changes in health care resources use with or without TM.



- TM would influence indirect costs, avoiding patients travelling to hospital or health care centers for glycaemic testing and routine controls, saving waiting time as well as absenteeism from work.

- Patients using TM have a higher degree of satisfaction with the control of the disease, better understanding and greater compliance^{6,8,9,10,11}. Further, health professionals consider TM to be a useful tool in their clinical practice¹⁰.

MODEL RESULTS

- Risk points and estimated prevalence of DM complications were used to calculate the reduction in the number of patients with micro and macrovascular complications and the costs avoided due to TM implementation (Table 3).

- A hypothetical implementation of TM in 100% DM patients in current need of the technology would lead to a reduction in the risk of developing DM micro and macro complications, such as DM related retinopathy, peripheral vascular disease and peripheral neuropathy with an estimated cost saving of 5,500 million €/year to the National Health System (Table 3)⁴.

Table 3. DM therapeutic compliance improvement due to telemonitoring implementation and cost savings on most frequent DM micro and macrovascular complications⁵. Spanish data, €2011.

	ISCHEMIC HEART DISEASE	PERIPHERAL NEUROPATHY	NEPHROPATHY	PERIPHERAL VASCULAR DISEASE	RETINOPATHY
Risk Points					
Compliant Group Base Risk Point	0,27	0,27	0,27	0,27	0,27
Incompliant Group Base Risk Point	0,51	0,49	0,59	0,70	0,38
Undiagnosed Group Base Risk Point	0,76	0,72	0,87	1,04	0,57
Total Base Risk Point	1,55	1,48	1,73	2,00	1,23
Compliant Strategy Risk Point	1,33	0,72	0,87	1,04	0,57
Case Reduction	0,14	0,51	0,17	0,48	0,53
Estimated Prevalence	14% (n=419.495)	40% (n=1.198.558)	17% (n=509.387)	21% (n=629.243)	33% (n=988.810)
Estimated reduction in the number of patients with the DM related complication	59.771 (2%)	613.639 (20%)	86.260 (3%)	304.254 (10%)	528.783 (18%)
Estimated prevalence of the DM related complication after TM implementation	12%	20%	14%	11%	15%
Cost of DM related complication management per patient per year	4.546,52€	4.379,50€	4.360,42€	3.683,98€	2.609,09€
Annual cost of illness reduction	271.751.480€	2.687.431.112€	376.130.715€	1.120.863.86€	1.379.642.548€

Conclusions

The benefits that could be achieved through the use of TM on glycaemic control and the possibility of better communication between patient and professional would result in a decrease of acute complications, with fewer hospital admissions and, in the long term, in a reduction of the occurrence of chronic complications derived from a better metabolic control with a consequent economic impact on the health system.

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