

METABO: A New Paradigm Towards Diabetes Disease Management. An Innovative Business Model

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Abstract- Dealing with a chronic disease and, more specifically, with Diabetes Mellitus and other metabolic disorders, represents a great challenge for care givers, patients and the healthcare systems as their treatment requires continuous medical care and patient self management. The engagement of patients in the adoption of healthy lifestyles with a positive impact in the progression of their diseases is fundamental to avoid the appearance of chronic complications or co-morbidities. This paper presents the externalization of the health management of diabetic patients as an alternative to the current models of care for these patients that can help improve the quality of follow up and care delivery and contribute to the sustainability of the healthcare systems.

I. INTRODUCTION

Diabetes mellitus (DM) is a chronic illness in which the body has lost the ability to produce or to correctly utilize insulin. It is the most common metabolic disease, with a globally rising number of newly diagnosed cases affecting approximately a 7% of the population in Europe and more than 150 million people worldwide [WHO]. Type 2 Diabetes Mellitus (T2DM) accounts for around 85-95% of all cases and its prevalence has dramatically increased in Europe as the age-at-diagnosis has become younger. Non controlled diabetes causes micro-vascular and macro-vascular complications that lead to chronic complications and co-morbidities [ADA]. Diabetes is ranked among the leading causes of cardiovascular disease, blindness, renal failure and lower limb amputation, representing, thus, a critical burden for the Health Care Systems in terms of volume and variability of patients [1].

Treatment of diabetes requires continuous medical care and patient self-management education to prevent acute complications and to reduce the risk of long-term complications. Diabetes care is complex and requires many issues beyond glycaemic control to be addressed [2], like behavioral and lifestyle changes that are difficult for many patients to commit to [3]. Lack of adherence to these healthy lifestyle changes can increase the risks of poor glycaemic control in a disease whose prognosis depends on the adaptive-compensatory potential of the affected person [4].

Diabetes patients must deal with many different variables affecting their glycaemic control, i.e. medication, nutrition and physical activity, and their treatments are often disturbed by their environment, meaning their cultural background, their life routine, their family and support and, on top of these, the coverage and structure of their local Health Care System.

An analysis of the different diabetes care policies in the EU countries published by the Health Consumer Powerhouse [5] shows a considerable variation in all the approaches adopted in Europe, which evidences a lack of consensus in the standards of care for this disease. Most of the indicators considered in this analysis are based on the performance of the health care systems in terms of the amount and quality of the in-house procedures that patients have access to for diabetes prevention and care. They also contemplate the general outcomes in deaths, major diabetes-related complications and percentage of patients with HbA1c < 7%. When it comes to indicators related to the involvement of patients in the processes of care based on access to information, consumer rights and choices and participation in health care decisions, the results show a general underperformance in most of the countries. This suggests that the approaches for diabetes treatment are still pretty conservative in their engagement of patients and patient advocacy groups in the decision making processes as well as in the definition of treatments, which results in the medical professionals handling the whole responsibility for the therapies and follow up outlining. In opposition to this, the American Diabetes Association recommends that the diabetes management plan should be formulated as an individualized therapeutic alliance between patients and families and the health care team, and that implementation of the management plan requires that each aspect is understood and agreed on by the patient and the care providers, recognizing diabetes self-management education (DSME) as an integral component of care [2]. Meanwhile, the majority of the European Health Care Systems are focused on attending critical events and critical patients and are still not prepared to provide this type of continuous care delivery.

Optimal diabetes care should, in summary, account for the following coverage, according to literature:

- Consultations with health professionals trained in the treatment of diabetes
- Specific programs for education in several aspects of the disease such as medication, nutrition, exercise, recognition of signs of progression of the disease and reaction to acute events such as hypoglycaemia, ketoacidosis, etc.
- Minimum amount of visits to other specialists such as podiatric and ophthalmologist for revisions.
- Periodic laboratory tests and supervision of glycaemic levels, HbA1c and other relevant clinical parameters.
- Assessment of weight and physical shape
- Assessment of motivation and mental health by a clinical psychologist.

These programs of care require, not only a dedication of a significant amount of time in each visit of the patients to complete the full revision, but also a complex coordination among several different specialists that are involved in the care of these patients and that must exchange information and interact in the processes of decision making. In most of the cases it even requires the collaboration between primary care and specialized care professionals, who handle the treatment of their patients at different stages of the disease. This represents an important difficulty in most of the healthcare systems, where the deficient information management systems and the organizational constraints represent important barriers for the implementation of this care guidelines.

On top of this, The costs of diabetes management are considerable, both for the person with the condition and the health-care providers and relate mainly to the management of the condition and the treatment of short and long-term diabetes complications, stressing even more the importance of preventing or delaying these complications from happening.

II. THE CHALLENGES OF THE HEALTHCARE SYSTEMS

The global socio-economic crisis, together with the budget deficits and the shortage of health care workers is causing the European healthcare systems serious difficulties to handle the increasing number of patients and to provide them with the early and continuous care and interventions that may result in both, better glycaemic control and the delay of the onset and progression of complications.

The future of healthcare is foreseen to be shaped by several factors like the increase in the responsibility of the patients in their own care, together with the promotion of lifestyle changes and the appointment of the general physicians as gatekeepers of the systems and coordinators of the treatment of patients with multiple health issues [6].

Engaging patients into taking responsibility for managing their health, understanding the importance of adhering to their treatment and actively collaborating with their care providers in their disease management becomes in this scenario critical for the sustainability of the system. For this, it is fundamental to

facilitate care providers with the tools necessary to redesign the services in a way that allows patients to be part of the decision making processes and to move the focus of care from event management to continuous disease management, placing the patients in the center of such new scheme. At the same time, patients must be also provided with the instruments to actively control their condition, learn how to do so and communicate with their care providers. This also requires the system to be responsive to the new position adopted by the patient, who is not a passive player anymore.

III. CASE STUDY: THE METABO PLATFORM

METABO is an EU-funded ICT project carried out within the 7th Framework Program of the European Commission devoted to the study and support of diabetes management-related problems for both, patients and specialists [7].

The aim of METABO is to set up a comprehensive platform, running both in clinical settings and in every-day life environments, for continuous and multi-parametric monitoring of the metabolic status in patients with diabetes and associated metabolic disorders. The type of parameters that are monitored, in addition to “traditional” clinical and biomedical parameters, include subcutaneous glucose concentration, dietary habits, physical activity and energy expenditure, effects of ongoing treatments, and autonomic reactions [8].

The METABO system addresses the problems related to the diabetes management from two fronts, the professional end-stream and the patient end-stream.

On the one hand, METABO has defined a remote monitoring system that allows the patients to keep track of most of the variables and environmental changes that may have an effect on their metabolic status. This is possible through the usage of the so called Patient Monitoring Device (PMD), this is, a PDA and/or a Desktop Device (PC, UMPC, Tablet, etc.) that the patient will use to access the METABO data anytime and anywhere. This information can be gathered in different ways, either from the direct connection to monitoring devices such as a glucometer, a weight scale, a continuous glucose monitoring system or an activity monitor to the PMD, or through manual input of the data by the user.

This element of the system obeys a double purpose: the first one is the exhaustive collection of data and its intelligent processing and interpretation and patient empowerment and motivation to adhere to their treatment by helping them to understand their disease and by providing educational contents, feedback and care alerts adapted to their status and needs, which should enhance their decision-making and self-management.

The Motivational Plan Observer, the tool built in the patient system to support the aforementioned features, allows also to define goals or quantifiable outcomes to be achieved in a medium-long term period (related to food intake, physical activity and weight loss), with a previous consensus between care giver and patients. This strategy is intended to encourage

the patients and engage them into their self-management, as several clinical studies suggest [9].

In the other hand, METABO has defined a web-based patient-management platform through which the care providers can access in an ordered way all the relevant information of their patients and receive feedback from the METABO Clinical Decision Support System (CDSS). METABO proposes a standard framework of care, based on NHS and ADA guidelines, that structures the patient follow up in four major milestones: diagnose, education, treatment and complications; providing this way a unique and standardized care pathway. This structure is flexible to permit its adaptation to the needs and requirements of the care providers and the Health Care Centers, bringing efficiency to the daily care processes. The tool allows the care providers to access reliable data, tailor the treatments, communicate through messages with the patients and program visits and referrals that can be tracked and trigger reminders.

The METABO CDSS is based specifically in the analysis of the most common problems that patients encounter as a result of the combination of all the variables that affect their metabolic status and the influence of their environment on them.

The closed-loop of data flow between the two main elements of this system and the stratification of patients according to their health status, care needs and requirements for intensity of follow up, allows the METABO platform to provide personalized decision support, which translates also into personalized feedback to the patients and the possibility to better tailor their treatment. This has the potential to help improving clinical outcomes, and have a positive impact in the willingness of patients to take responsibilities over their condition.

IT-enabled diabetes management is believed to create value by improving processes of care and follow up, which incurs in a reduction of the rate of diabetic complications, which in turn produces both cost savings and enhanced quality of life.

IV. AN INNOVATIVE BUSINESS MODEL: THE EXTERNALIZATION OF DIABETES FOLLOW UP

The Center for Diabetes and Endocrinology in South Africa launched in 1996 a Diabetes Management Programme for the treatment and management of diabetes. The program is based on the externalization of the follow up of patients in accredited centers for diabetes care that follow a standard program of care based on the establishment of targets for blood sugar control between physicians and patients and in the provision of a minimum set of services to the patients specially designed for this purpose. The clinics receive a capitation fee in advance for each person to receive care, with an economic penalization for the physicians if poor glycaemic control ends up in a hospitalization as result of failure in education and patient-empowerment. This program is funded on an individualized and holistic approach encompassing intensive patient education to

facilitate self-empowerment and including prompting for the management of risk factors. This managed care model of diabetes care in the context of South African Private Health Care System achieved long term improvement in glycaemic control and all-cause hospitalization admission rates [10], [11].

The similarities of this program with the METABO proposition are significant, as both systems are based on the concepts of target definition between patients and care providers, an exhaustive follow up and control and an intensive focus on education for patients and for professionals. On top of this, METABO offers the added value that an IT-enabled system can provide by allowing remote monitoring and control of patients, integration of physical and psychosocial information coming from the patients together with data from the health care records and with the support of an intelligent CDSS to assist the definition of the care strategy.

For this, there is room to believe that a system like METABO has the potential to be successful in its propositions, and could be used to enhance the performance of a follow-up externalization program like the aforementioned one.

V. CONCLUSIONS

A deep analysis of the current healthcare systems and, more specifically, of diabetes treatment along Europe, suggests that the system is not currently prepared to cover the increasing needs of the chronically sick population, which incurs in poor quality of care that leads to the appearance of chronic complications that must be treated by the same overloaded healthcare system. The efficiency and the productivity of the processes of care is too low to be able to respond properly to the new challenges derived from the changes in an ageing society and the socio-economic crises.

A revolutionary business model like the one referred in this paper could represent a new paradigm for chronic disease management if it can be empowered with the use of an ICT platform that fulfills the requirements of the optimal follow-up pathways. This is the case of the METABO platform for diabetes, where the system is believed to be able to enable better processes of care, more efficient and dynamic, for an effective and high quality delivery of treatment.

The METABO project will set up a small pilot with a few patients that will be followed during a six month period within private clinics according to the scheme described in the previous chapters. This pilot intends to prove that the creation of a unit for integrated diabetes care that can deploy dynamic care pathways – designed within the METABO project – optimized for different patient profiles if worthwhile in terms of patient outcomes, quality of care and reimbursement. At the same time, the study will serve to define and tailor a business model for the provision of services through the METABO platform that represents benefits for the providers, the private care centers and the private insurances involved.

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