

Chapter 19

Health Guidance Provision Infrastructure for Personalized Diabetes Management: The HealthDiab Solution

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ABSTRACT

Over the last 30 years, diabetes mellitus has changed from being seen as a relatively mild ailment associated with ageing and the elderly (‘just a touch of sugar’) to one of the major contemporary causes of premature mortality and morbidity in most countries. HealthDiab aims at proposing the development of an innovative personal health management system overcoming the current limitations patients and their physicians find at managing the disease. The central element for such system will be patient’s own daily health records, as base for the provision of personalised and real-time guidance in the treatment of diabetes. The proposed solution could easily be adopted as a commercial product by a company willing to bring an innovative and effective Personal Health Management technology platform into market. Such a platform could help reduce the risks for the patient by getting new comorbidities associated to their disease while helping decrease the billionnaire public costs linked with health assistance in our European welfare states

DOI: 10.4018/978-1-5225-7122-3.ch019

INTRODUCTION

Diabetes mellitus (or Diabetes) is a chronic disease which cannot be cured except in very specific situations. Its management concentrates on keeping blood sugar levels as close to normal (“euglycemia”) as possible, without causing hypoglycemia. This can usually be accomplished with diet, exercise, and use of appropriate medications (insulin in the case of type 1 diabetes, oral medications, as well as possibly insulin, in type 2 diabetes).

Patient education, understanding, and participation is vital, since the complications of diabetes are far less common and less severe in people who have well-managed blood sugar levels (Stahl & Johansson, 2008). The goal of treatment is an HbA1C (“What is the hba1c,” 2014) level of 6.5%, but should not be lower than that, and may be set higher. Attention is also paid to other health problems or parameters that may accelerate the deleterious effects of diabetes. These include smoking, elevated cholesterol levels, obesity, high blood pressure, and lack of regular exercise (Research2Guidance, 2013).

And although it is well proven that control of blood pressure and blood glucose and cholesterol levels can dramatically reduce diabetes complications (“WHO | Country and regional data on diabetes,” 2011; “WHO | Diabetes,” 2015; Wild, Roglic, Green, Sicree, & King, 2004), (TucsonMedicalCenter, 2015), which can be devastating (blindness, amputations, even death), the fact is that studies show that one of the main causes of associated-complications in diabetes is non-adherence to control and medication (Shamsi, Khodaifar, Arzaghi, Sarvghadi, & Ghazi, 2014). Alarming, it is estimated that less than 2% of adults with diabetes perform the full level of care (Beckles et al., 1998), which includes at least self-monitoring of blood glucose and dietary restrictions as well as medication use as recommended by their specialists (“Technology Assessment of the U.S. Assistive Technology Industry. Markets & Future Demand,” 2009). It is estimated that from 40% to 50% of blindness, kidney, and foot amputations cases could be prevented just by properly adhering to the glucose level controls. In addition, the proper control of blood pressure and diet could reduce cardiovascular complications (heart disease, strokes) by approximately 33% each (Sheang, Hua, & Juan, 2010).

However taking good care of diabetes implies a big part should come from the diabetic patient him/her-self. In their day-to-day a diabetic must calculate how much insulin he/she will take before each meal (and in relation to the previous ones during the day), test glucose at least six times a day, receive multiple injections and record their levels for continuous self-management and future appraisal with the physician. Up to the present day, diabetics have traditionally self-managed their disease through their own in-situ calculations, general guidelines and basic trial & error.

There exists now the context for swiftening this situation and related trends, mitigating the patients in their management of the disease, reducing impact of diabetes and its consequences and helping the health professionals in supporting patients, thanks to:

- New scientific advances in the understanding of diabetes, that are given as a result mathematical models to short-term predictions on glucose evolution (Georga, 2011);
- New understanding of complementary influence of several physiological parameters (blood glucose and pressure levels, physical activity, nutrition and, also, individual’s psychological condition), and emerging technologies for monitoring them;
- The continuous presence and innovations provided by of a variety of ICTs in our lives (great enablers for the implementation of systems involving mobility, ubiquity, reusability, communication, security and data gathering).

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