Self-Management of Diabetes Mellitus with Remote Monitoring: A Retrospective Review of 214 Cases

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ABSTRACT

Purpose: The efficacy of one remote monitoring system was reviewed in order to explore if optimal self-management of diabetes was achieved. Methods: Medical records of 214 patients with diabetes were reviewed from seven diabetes clinics within a single Health & Social Care trust using a remote monitoring solution to help patients self-manage their condition. Data on HbA1c, blood glucose, blood pressure and body mass index were obtained from the patient’s medical record, before and after using the remote monitoring solution. Results: The average age of users was 61 years: 60% of the sample were male. The average time living with diabetes was 14 years; the mean duration with remote telemonitoring was 147 days. A greater reduction in HbA1c was seen with female users compared to males 2.37% and 0.87%, respectively. Conclusion: Remote telemonitoring provided the opportunity to collect comprehensive data, allowing patients to be maintained at home, while showing significant improvement in their HbA1c and better overall management of their diabetes.

KEYWORDS
Connected Health, Diabetes Mellitus, Self-Management, Self-Monitoring of Blood Glucose, Telemonitoring

INTRODUCTION

Globally, diabetes mellitus is considered to be an epidemic and a growing burden on public health (Matuleviciene, et al., 2014). It is associated with a significant morbidity and mortality (Schwartz & Scheiner, 2012). It has been estimated that 385 million people worldwide live with Diabetes and the number is predicted to rise to 500 million in 2030 (Matuleviciene, et al., 2014). In the UK, there are some four million people diagnosed with diabetes and an estimated additional 590,000 that are not yet diagnosed (Diabetes UK, 2015). The costs associated with diabetes account for almost 10% of the NHS primary care budget with a daily average expenditure of £2.2m on prescriptions for managing the condition (Matuleviciene, et al., 2014) (Lacobucci, 2014).

The key to good self-management of diabetes is to understand the importance of regular blood glucose measurement and the need for good blood glucose control together with a strong belief in one’s ability to achieve target levels. Levels of blood glucose vary dynamically from one individual to another and a recommended target range for blood glucose is determined by the healthcare team (Diabetes.co.uk, Blood Sugar Level Ranges). The target is individualised and based on the duration of
diabetes, age, comorbid conditions, micro/ macrovascular diseases, hypo/ hyperglycaemia awareness and other individual considerations such as patient’s lifestyle and dietary habits (ADA, Checking Your Blood Glucose, 2015).

The American Diabetes Association suggests the blood glucose target in those with diabetes should be 4.4 to 7.2 mmol/L (80 to 130 mg/dL) before meals and under 9.0 mmol/L (162 mg/dL) for people with type 1 diabetes (T1DM) and under 8.5 mmol/L (153 mg/dL) for people with type 2 diabetes (T2DM) after meals (Diabetes.co.uk, Blood Sugar Level Ranges) (ADA, Checking Your Blood Glucose, 2015). These equate to glycated haemoglobin (HbA1c) levels of less than 7% or 48 mmol/L for people with diabetes (ADA, Checking Your Blood Glucose, 2015) (Diabetes.co.uk, Guide to HbA1c). The healthcare team can get an overall idea of the average blood glucose levels over a period of time –usually every three months- by regular measurement of HbA1c (Matuleviciene, et al., 2014) (Diabetes.co.uk, Guide to HbA1c). HbA1c is the gold standard marker for assessing long-term glycaemic control; however, it does not reveal the immediate hour-to-hour blood glucose levels like self-monitoring of blood glucose does and it does not provide detailed information about individual hyperglycaemic or hypoglycaemic excursions (Boutati & Raptis, 2009).

It has been established that a significant reduction in long-term diabetes-related complications is associated with tight glycaemic control (Boutati & Raptis, 2009) (Association, 2004). Self-monitoring of blood glucose (SMBG) is the process of collecting regular blood glucose information, often up to three to four times daily, to aid maintaining a constant stable glucose level (Diabetes.co.uk, Guide to HbA1c). SMBG is an important component of diabetes treatment and self-management. Results of monitoring are used to assess the efficacy of the therapy, while enabling people with diabetes to make appropriate day-to-day therapeutic choices in insulin dosage as well as to see the effect of diet and physical activities (Diabetes.co.uk, Guide to HbA1c) (Boutati & Raptis, 2009) (Association, 2004) (Benjamin, 2002). SMBG is a widely recommended daily routine as part of good self-management among people with T1DM or insulin-treated T2DM (Boutati & Raptis, 2009). However, it is still unclear as to what extent SMBG is useful and accepted in patients with non-insulin-treated T2DM (Boutati & Raptis, 2009) (Association, 2004) (Martin, et al., 2005). Self-management programs can empower patients by increasing confidence in their abilities, by teaching them skills and techniques to better self-manage their condition, and how to improve their interaction with the healthcare system – all of which can lead to better management of chronic conditions like diabetes (Jaglal, et al., 2014). Within a few years, SMBG by patients has revolutionised management of diabetes but not without barriers including: the costs of SMBG, lack of understanding from patients about the health benefits and proper use of SMBG results, patient psychological and physical discomfort associated with finger-pricking for blood testing, the time consuming nature and inconvenience of testing, and for some the complexity of the technique (Association, 2004).

Through recent advances in technology, blood glucose monitors have been equipped with wireless technology to enable transmission of self-measured blood glucose readings to the healthcare team in real-time or when needed, via communication networks such as the internet or phone line (Medical Advisory Secretariat, 2009). The aims of such developments are to promote, empower and facilitate health and wellbeing within individuals, families and communities; to enhance professional practice through the use of information management and information and communication technology; and to reduce unnecessary hospitalisation (International, 2012). Recently, the term Connected Health Technology has been introduced in the UK (Roberts, et al., 2010) encouraging organisations to share information across boundaries and enable healthcare providers to extend their care to patients’ homes, helping them to relieve the increasing burden of chronic diseases including diabetes (AHRQ, 2014). Monitoring patients remotely while supporting the transmission and interpretation of data may help patients’ better control their blood glucose levels. Evidence indicates that intensive glucose monitoring
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