以安全憑證及快速回應模式建構糖尿病人之網路健康服務系統

Building a Certificate-Based Secure and Quick Response Telemedical Health-care System for Diabetic Patients

劉立

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摘要

當今，網路資訊科技發達，並且已廣泛運用在各式健康照護上，為了改善糖尿病患的血糖控制品質並同時維護病人穩私和確保資料在網路傳輸過程中的安全性，我們便以安全憑證及快速回應為模式建構一套糖尿病人網路健康服務系統。病患可以藉此系統透過憑證，與醫事人員進行網路互動或取得衛生教育之相關資訊內容，並隨時可以上傳自我血糖監測值或其他相關資料至資料倉儲進行存取、整合及分析。由智慧型健康代理人系統或醫師得以進行網路健康快速回應的諮詢服務，並建立警示機制，如有偵測到異常之生理訊號，則健康代理人系統會將相關之警訊，迅速傳送到醫事人員及該病患端，以做必要之處置。為評估此系統效益如何，我們乃收集在馬偕紀念醫院及台北醫學大學附設醫院門診就醫的糖尿病患，隨機分組為實驗組（導入此套系統）及對照組（未導入此套系統）各 67 名，做為期六個月的觀察，我們對其空腹血糖及糖化血色素(HbA1c)的影響評估發現，六個月後，實驗組的空腹血糖平均值(179±61mg/dl)與初次登記平均值(241±77mg/dl)之間呈統計學上有意義的下降(p<0.001)。至於對照組，其空腹血糖初次登記之平均值為 252±57mg/dl，六個月後再追蹤，對照組的空腹血糖平均值(221±64mg/dl)與初次登記平均值之間相較，亦呈統計學上有意義的下降(p=0.008)。再者。實驗組的空腹血糖平均值(179±61mg/dl)又明顯比對照組(221±64mg/dl)低(p=0.038)。而就血糖值下降的改變幅度來看，實驗組(-63±86mg/dl)的改變幅度比對照組(-32±85mg/dl)來得大。而六個月後，實驗組的糖化血色素平均值(8.4±1.8%)與初次登記平均值(11.3±1.9%)之間，呈統計學上有意義的下降(p<0.001)。至於對照組，其糖化血色素初次登記之平均值為 10.9±2.0%，六個月後再追蹤，對照組的糖化血色素平均值(10.8±2.2%)與初次登記平均值之間相較，則無統計學上的差

異(p=0.807)。又實驗組的糖化血色素(8.4±1.8%)亦比對照組(10.8±2.2%)低。由研究結果可以獲致結論：透過網路健康服務系統的糖尿病思似乎比傳統照護模式有較佳的血糖表現，這將有助於併發症的防治。因此，我們建議以病人爲中心來整合醫療資源，以網路安全爲基礎，病患安全及隱私爲前提，提供糖尿病患健康的網路快速回應服務，期能促進糖尿病人良好醫病關係的建立、健康自主管理教育(diabetes self-management education, DSME)的推廣及養成，進而提昇生活品質。

Abstract

The internet has begun to play a greater role in many health-care processes. To improve the quality of diabetes control while safeguarding and keeping the patients information confidential, a certificate-based and quick response telemedical health-care system can be used to devise a program which allows patients with diabetes to transmit their self-monitored blood glucose data directly from their personal glucometer device to their diabetes care provider over the internet. The system can integrate the remotely transmitted glycemic data to a secure database for retrieval by physician to analyze at a later time. If unusual or alarming trends are detected by an intelligent agent (IA) system, both the physician and patient are notified of the occurrence. Patients are also allowed to access clinical data through web-based interface. We hope that this initiative can improve the quality of diabetic care. The aim of this study was to evaluate the effectiveness of a quick response telemedical health-care model to biomonitor type 2 diabetic patients attending the diabetic OPD of Mackay Memorial Hospital and Taipei Medical University Hospital. A total of 134 unrelated type 2 diabetic patients were included in a 6-month prospective study. They were categorized into either the experimental or the control group. The experimental group was monitored using our telemedical health-care system for 6 months. The control group received the usual outpatient management over the same period. We compared the differences in HbA1c and fasting plasma glucose levels before and at the end of the study, both in each group as well as between the experimental group and the control group. Initially, there is no significant difference in either fasting glucose levels or HbA1c between the experimental group and control group. At the end of the study (6 months later), there were significant changes in fasting plasma glucose when compared with the initial data, both in the experimental group (179±61mg/dl vs. 241±77 mg/dl, $p<0.0l$), as well as in the control group (221±64 mg/dl vs. 252±57mg/dl, p=0.008). Additionally, fasting plasma glucose levels showed significant difference (p=0.038) between the experimental group (179±61 mg/dl) and control group (221±64 mg/dl) at the end of the study. In the experimental group, mean HbA1c level reduced significantly ($p<0.001$)from the initial 11.3±1.9% to 8.4±1.8%, while in the control group, there was no significant change in mean HbA1c level (p=0.807), which was initially 10.9±2.0% and

10.8±2.2% at the end of the study. HbA1c levels showed significant reduction (p<0.00l) when the experimental group (8.4±1.8%) was compared with the control group (10.8±2.2%) at the end of the study. Our study demonstrated that the quick response telemedical healthcare system seems to be feasible and highly effective. It integrates not only the monitoring of blood glucose control but also allows a quick response model, assisting in the delivery of diabetes self-management education (DSME), an evolving process which helps to meet the needs and expectations of individuals with diabetes. These results suggest that our system could improve the quality of, and hence possibly help to reduce the complications of diabetes.