

Contents lists available at [ScienceDirect](#)

Canadian Journal of Diabetes

journal homepage:

www.canadianjournalofdiabetes.com

Original Research

Impact of Patient Use of an Online Patient Portal on Diabetes Outcomes

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ARTICLE INFO

Article history:

Received 7 May 2013

Received in revised form

13 October 2013

Accepted 20 October 2013

Keywords:

A1C

chronic disease

diabetes mellitus

Internet

patient portal

self-management

web-based care

Mots clés :

A1c

maladie chronique

diabète sucré

Internet

portail destiné aux patients

prise en charge autonome

soins sur le Web

ABSTRACT

Objective: To assess the effect of patient use of an online patient portal on diabetes outcomes.**Methods:** Patients included were those with diabetes who were newly referred to a Vancouver-based tertiary care diabetologist between April 2008 and October 2012. Each patient was assessed by the diabetologist, received initial diabetes education and was referred, as necessary, for further education and self-management training. All patients who provided an e-mail address at registration were invited to open an online patient portal account. The portal provided access to diabetes education material, personal laboratory values and a messaging system allowing communication with the diabetologist and staff. Patients who logged in 1 or more times were defined as portal users (n=50); patients who never logged in to the portal were defined as non-users (n=107). A1C was measured at 2 time points: at baseline (i.e. initial, in-clinic visit) and at last follow up (visit no less than 6 months and no more than 2 years after the initial visit). Because usership is self-selected, propensity score matching was used to create comparable user/non-user groups based on available baseline covariates.**Results:** Compared to non-users, a higher proportion of users achieved A1C $\leq 7\%$ at follow up (56% vs. 32%) (p=0.031).**Conclusion:** Accessing an online patient portal is associated with improved glycemic control.

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R É S U M É

Objectif : Évaluer l'effet de l'utilisation par les patients d'un compte d'utilisateur du portail en ligne destiné aux patients sur les résultats liés au diabète.**Méthodes :** Les patients inclus étaient des diabétiques qui avaient été orientés récemment vers un diabétologue d'un centre de soins tertiaires de Vancouver entre avril 2008 et octobre 2012. Chaque patient était évalué par le diabétologue, recevait un enseignement initial sur le diabète, et était orienté si nécessaire pour poursuivre un enseignement et une formation sur la prise en charge autonome. Tous les patients qui fournissaient une adresse de courriel à l'inscription étaient invités à ouvrir en ligne un compte d'utilisateur du portail destiné aux patients. Le portail donnait l'accès au matériel d'enseignement sur le diabète, aux résultats de laboratoire personnels et au système de messagerie permettant la communication avec le diabétologue et le personnel. Les patients qui se connectaient 1 fois ou plus étaient considérés comme étant des utilisateurs du portail (n = 50); les patients qui ne s'étaient jamais connectés au portail étaient considérés comme étant des non-utilisateurs (n = 107). L'A1c était mesurée à 2 moments précis, soit au début (c.-à-d. à la visite initiale à la clinique) et à la dernière visite du suivi (la visite ne devait pas être de moins de 6 mois et de plus de 2 ans après la visite initiale). Puisque l'utilisation se faisait sur une base volontaire, l'appariement sur le score de propension était utilisé pour créer des groupes comparables d'utilisateurs et de non-utilisateurs basés sur les covariables initiales disponibles.**Résultats :** Comparativement aux non-utilisateurs, une plus forte proportion d'utilisateurs obtenaient une A1c $\leq 7\%$ durant le suivi (56 % vs 32 %; valeur p = 0,031).

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Conclusions : L'accès en ligne à un portail destiné aux patients est associé à l'amélioration de la régulation de la glycémie.

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Introduction

Electronic health records systems were initially developed as tools for physicians and their staffs and as such have been in wide use for more than a decade. They have been shown to provide modest improvement in diabetes outcomes (1–3). In recent years, advances in web-based electronic health record technology have provided patients with online access to their health information through patient portals; such access has been considered to complete the “circle of care” (4), which is defined as patients' being surrounded by interdisciplinary care teams that include a diabetologist, diabetes nurse, dietitian, family physician and other relevant healthcare providers.

A number of qualitative and quantitative studies from the United States have examined the effect of patient portals on diabetes care. Patients' races (non-Hispanic Caucasian and Asian), higher educational levels and greater health literacy have been observed to be associated with increased use of web-based care, whereas patients' immigration statuses have had no effect (5,6). Patient reception has been positive (7–9), provided that use of patient portals was easy to learn and did not diminish the patient-doctor relationship (9). Specifically, patients have cited personal alerts, ease of access to personal laboratory values and communication with the medical providers to be the most valuable aspects of patient portals (7,8).

The use of patient portals has been linked to improved outcomes for patients with diabetes (6,10,11). Patients who utilized a patient portal managed their risk factors more effectively than those who did not (6). In a population of patients with poorly controlled diabetes, those provided with additional web-based care had improved control of A1C, systolic blood pressure, lipids and diabetes-related distress (10,11).

To date, the relationship between patients' portal use and diabetes-related health outcomes has not been reported in Canada. For this reason, the present study examined the impact of patient portal use on glycemic control among patients with type 1 and type 2 diabetes who are newly referred to a tertiary care diabetologist. In this population, our primary hypothesis was that users of patient portals would have greater reductions in A1C.

Methods

This retrospective observational study was conducted in Vancouver, British Columbia, in a university/hospital/private practice setting, BCDiabetes (www.bcdiabetes.ca). All participating patients provided informed consent for the recording and storage of their demographic, clinical and laboratory information in a proprietary electronic health record system comprising both physician- and staff-accessed electronic medical records and a patient-accessed portal). All patients consented to their health data being analyzed and published in an anonymous aggregate fashion.

All patients with diabetes seen at BCDiabetes participated in a 15+ minute face-to-face diabetes education session delivered by the diabetologist. This session is defined as their initial visit. Ongoing care was provided by a team of healthcare providers, including endocrinologists, a behavioural psychologist, an optometrist, a podiatrist and diabetes case managers, as deemed desirable or necessary. Patients were seen in person and virtually (by telephone and secure email messaging) and were provided treatment

and counsel as needed. Laboratory values were measured prior to each clinic visit at local laboratories that had been self-selected by patients.

During their initial visits, patients were also introduced to the concept of a free web-based patient portal; patients with active e-mail addresses who provided consent to receive e-mails were e-mailed an encrypted URL on the day of their first visits, and the encrypted URL remained active for 14 days. Clicking on the URL opened a window with an end-user license agreement for use by the patient of the portal; upon acceptance of the end-user license agreement, patients were presented with a dialogue box containing an anonymized username and were prompted for an alias (familiar username) and for an 8+ character password in duplicate. Each patient who completed these fields was initialized with a patient portal account. No specific training was provided for use of the patient portal, nor was any computer hardware made available. A telephone help line was available, and calls were returned within 48 hours. Patients were regularly encouraged to engage with and use the patient portal.

The online patient portal was designed, developed and maintained by BCDiabetes staffers and was hosted on a remote secure server using 128-bit encryption. The patient portal provided each patient with a library of medical education documents, a journal entry application, access to up-to-date personal laboratory values, and a secure e-mail/messaging system that allowed patients to ask questions of their BCDiabetes caregivers. The diabetes education material explained medical knowledge to the patient and outlined care plans concerning complications in diabetes. Only the patients (and individuals provided with a username and password) could use and view their own journal entries. Laboratory values were provided in a chronologic matrix form and also in a detailed form; mouse-over simple explanations for common laboratory parameters were provided. Questions asked on the messaging system were answered within 1 business day by the BCDiabetes team. For the first 3 years, portal access required use of the Firefox browser. For the past year, access was also available via Internet Explorer, Chrome and Safari.

In this retrospective observational study, participants included in the analysis were all those aged 18 years or older on initial visit for whom baseline characteristics (age, gender and weight), initial visit A1C score and a follow-up A1C (no less than 6 months and no more than 2 years after the initial A1C score) were measured. For those patients having recorded multiple follow-up A1C scores, their latest A1C value was used. Initial visits took place between April 2008 and October 2012.

Patient capacity to access the Internet was not assessed other than by providing an e-mail address. The patient portal kept track of patient logins and time stamped each log in between patients' initial clinical visits and their latest clinical visits. In an effort to simplify our analysis, all patients who logged in one or more times were defined as users and a non-user was defined as a patient who did not log in.

Statistical analyses included calculation of descriptive statistics, including proportions, means and standard deviations. All confidence intervals are 95% confidence intervals, and all hypothesis tests are 2 sided with an alpha level of 0.05. Because participation in the online portal was voluntary and probably related to specific patient characteristics, the potentially beneficial effect patients received from participation may be confounded with the patients'

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