



Use of a web portal among adult clinic patients seen for type 2 diabetes mellitus

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Background: To determine the number of adult clinic patients seen for type 2 diabetes mellitus (T2DM) at an academic medical center and to examine characteristics of those who had or had not registered for a web portal.

Methods: Electronic records were reviewed to identify web portal registration by patients treated for T2DM by age, sex, race and Hispanic ethnicity, and service (General Internal Medicine, Endocrinology).

Results: A total of 1,401 patients with T2DM were seen in General Internal Medicine and Endocrinology outpatient clinics. Less than one third (32%) had registered for the web portal. Women were more likely to have registered for the web portal than men [odds ratio (OR) =1.25; 95% CI, 0.99–1.57; P<0.063]. Black patients were less likely to have registered than whites (OR =0.40; 95% CI, 0.31–0.51; P<0.001). Patients who were 18–25 years of age were less likely to have registered for the web portal, along with those who were 56 to 60 and >66 years of age. In multivariate analysis, a statistically significant association was observed between web portal registration and General Internal Medicine clinic *vs.* Endocrinology clinic (OR =2.96, P<0.001). Inverse associations were observed with age >18–25 years, male sex (adjusted OR =0.71, P=0.006), and Black race (OR =0.33, P<0.001).

Conclusions: Additional research is needed to identify portal design features that improve glycemic control and interventions that will increase use of patient portals, especially among Black patients with T2DM and those with low health literacy or computer literacy.

Keywords: Blacks; diabetes; electronic health record; glycemic control; health information technology; patient web portals

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Introduction

Over 30 million Americans had diabetes in 2015 and the number is expected to increase over time (1). Persons with diabetes have an increased risk of macrovascular and microvascular complications (2). Good glycemic control is associated with reduced morbidity and mortality, but

almost half of patients with type 2 diabetes do not meet recommended targets for glycemic control, or cholesterol control, or blood pressure control (3–5).

To manage side effects, monitor blood test results, and screen for potential complications, type 2 diabetes requires effective communication between providers and patients and patient self-management (6). Studies have shown that

increasing patients' knowledge about their risk factors can lead to improved clinical outcomes (7,8). Moreover, evidence shows that fostering a collaborative relationship between patients and their health care providers can also improve clinical outcomes (9,10).

Efforts at health care reform and continued advances in information technologies have increased interest among providers and researchers in patient web portals. Stakeholders view patient portals, and parallel advances in eHealth such as personal health records and electronic medical records (EMRs), as an opportunity to leverage information technology to support patient self-management and improve patient-provider communication between office visits (11,12). The introduction of web-based, patient-centered health care information systems linked to a patient's EMR (patient web portals) constitute an important development in diabetes care.

The goal of the current feasibility study was to determine the number of adult patients seen for type 2 diabetes at a large medical center in the U.S. and to examine whether they had registered for the patient web portal according to age, sex, race and Hispanic ethnicity, service (General Internal Medicine, Endocrinology), and calendar year (all of 2016, vs. January to August of 2017).

Methods

The current study was conducted as "preparatory to research" in support of a grant application for a larger and more detailed proposed study. Prior to a review of computerized patient records, a determination was made by the Augusta University Institutional Review Board (IRB) that the study was exempt from IRB review. Informed consent was not required for a review of existing patient records that did include any personally identifying information. EMRs were reviewed including web portal registration by patients treated for type 2 diabetes (ICD-10 codes E-11, etc.). The patients were seen in General Internal Medicine and Endocrinology clinics at a large academic health center. De-identified number of patients seen for diabetes were examined by age categories, sex, race and Hispanic ethnicity, and era (*Table 1*). EMRs for patients seen in Family Medicine clinics were not abstracted because a different EMRs system is in use. Odds ratios (OR), 95% confidence intervals (CI), and P values were obtained using Epi Info version 7.2.0.1. An approximate chi-square test was used to test for interaction on an additive scale (13). Multivariate analysis was carried out using logistic

Table 1 Numbers of diabetic patients who registered for Augusta Health VIP web portal by service, age, sex, race, Hispanic ethnicity, and year*

Variables	Registered for VIP, N [%]	Not registered, N [%]
Service		
Internal medicine	205 [46]	245 [54]
Endocrinology	250 [26]	701 [74]
Total	455 [32]	946 [68]
Age (years)		
18–25	5 [17]	24 [83]
26–30	19 [30]	44 [70]
31–35	15 [38]	25 [63]
36–40	30 [39]	47 [61]
41–45	40 [40]	60 [60]
46–50	51 [39]	79 [61]
51–55	59 [37]	100 [63]
56–60	41 [24]	132 [76]
61–65	86 [39]	133 [61]
66+	109 [27]	302 [73]
Sex		
Male	163 [30]	388 [70]
Female	292 [34]	558 [66]
Race		
White	308 [40]	457 [60]
Black	113 [21]	421 [79]
Hispanic	9 [27]	24 [73]
Other	25 [36]	44 [64]
Year		
2016	302 [33]	624 [67]
2017 (Jan–Aug)	153 [32]	322 [68]

*, the above table does not include diabetes patients followed at Family Medicine clinics or at two satellite General Internal Medicine clinics (West Wheeler Internal Medicine Clinic and the Continuity Clinic). VIP, Virtually Informed Patient.

regression methods to determine adjusted odds ratios and assess statistical significance (14). In this regression method, the logarithmic odds of disease is modeled as a linear function of explanatory variables and maximum likelihood

Table 2 Numbers of adult patients with type 2 diabetes mellitus who registered for Augusta Health VIP web portal stratified by race and sex*

Demographic variables	Registered for VIP, N [%]	Not registered, N [%]	OR	P value
White female	192 [46]	240 [27]	4.14	0.000
Black female	85 [20]	277 [32]	1.58	0.058
White male	115 [27]	217 [25]	2.73	0.000
Black male	28 [7]	144 [16]	1.00 [†]	–
Total	421 [100]	878 [100]	–	–

*, the above table does not include diabetes patients followed at Family Medicine clinics or at two satellite General Internal Medicine clinics (West Wheeler Internal Medicine Clinic and the Continuity Clinic). Because the numbers of patients were small, those whose race was “Other” were excluded from this analysis along with those who were Hispanic. Chi-square test for additive interaction not significant ($P>0.05$); [†], referent category. OR, odds ratios; VIP, Virtually Informed Patient.

estimates of their beta coefficients.

Results

A total of 1,401 adult patients with type 2 diabetes mellitus were seen in General Internal Medicine and Endocrinology outpatient clinics between January 2016 and August 2017. Of the 1,401 patients, less than one third (32%) had registered for the web portal (*Table 1*). Women with diabetes were more likely to have registered for the patient web portal than men (OR =1.25; 95% CI, 0.99–1.57; $P<0.063$) although the association was not statistically significant. Black patients were less likely to have registered for the web portal than whites (OR =0.40; 95% CI, 0.31–0.51; $P<0.001$). Diabetic patients who were 18 to 25 years of age were less likely to have registered for the web portal, along with those who were 56 to 60 and >66 years of age.

Table 2 shows the relationship between race and sex. There was no indication that race modified the relationship between sex and patient web portal registration (*Table 2*). White women with type 2 diabetes mellitus were more likely to have registered for the web portal than Black males (OR =4.14, $P<0.001$). White men with type 2 diabetes mellitus were more likely to have registered for the web portal than Black men (OR =2.73, $P<0.001$).

Table 3 summarizes results from multivariate analysis using logistic regression. A statistically significant, independent association was observed between patient web portal registration and General Internal Medicine clinic *vs.* Endocrinology clinic (OR =2.96, $P<0.001$). Inverse associations were observed with age ≥ 18 –25 years, male sex (adjusted OR =0.71, $P=0.006$), and Black race (OR =0.33, $P<0.001$). No association was observed between having registered for the patient web portal and calendar year ($P=0.297$).

Conclusions

The results of this feasibility study indicate that less than one-third of adult clinic patients with type 2 diabetes mellitus have registered for the VIP web portal and that registration rates are particularly low among patients who are Black, male, or <26 years of age, and those seen in endocrinology clinics. Based upon these findings, we are planning a larger and more detailed study to determine why many patients do not use the web portal and to examine the effectiveness of the web portal in improving glycemic control among adult clinic patients with type 2 diabetes mellitus. A goal of the planned study, which is dependent upon receipt of extramural funding, is to determine the specific portal features that may improve quality of care or glycemic control (e.g., patient-provider secure messaging) and to examine the effectiveness of an intervention to increase use of the patient web portal by diabetic patients.

The inverse association with Black race may be due to uncontrolled confounding by health literacy or computer literacy (15,16). In this initial feasibility study, no information was available about the computer literacy or health literacy of the adult patients with type 2 diabetes mellitus. Limited health literacy is relatively common among patients with type 2 diabetes and is likely to contribute to poorer diabetes outcomes (15–18). Studies indicate that patients with lower health literacy are less likely to use web portals to help manage a chronic illness (12,15). Patients with lower health literacy or computer literacy may have difficulty learning how to use a web portal or they may have difficulty navigating a portal. Educational outreach efforts for potential web portal users may be helpful in overcoming these perceived barriers.

A limited number of studies have examined the use of web

Table 3 Adjusted odds ratios from logistic regression model*

Covariates	OR	P value	95% CI
Service			
Endocrinology	1.00 [†]	–	–
Internal medicine	2.96	<0.001	2.27–3.85
Age (years)			
18–25	1.00 [†]	–	–
26–30	2.04	0.215	0.66–6.26
31–35	2.87	0.080	0.88–9.37
36–40	2.85	0.060	0.95–8.48
41–45	3.15	0.035	1.09–9.15
46–50	2.74	0.059	0.96–7.81
51–55	2.35	0.106	0.83–6.63
56–60	1.46	0.479	0.51–4.14
61–65	2.49	0.079	0.90–6.92
66+	1.32	0.593	0.48–3.61
Sex			
Male	1.00 [†]	–	–
Female	0.71	0.006	0.55–0.91
Race/ethnicity			
White	1.00 [†]	–	–
Black	0.33	<0.001	0.25–0.43
Hispanic	0.52	0.110	0.23–1.16
Other	0.72	0.226	0.42–1.23
Year			
2016	<0.001	–	–
2017	0.15	0.297	0.89–1.49

*, the above table does not include diabetes patients followed at Family Medicine clinics or at two satellite General Internal Medicine clinics (West Wheeler Internal Medicine Clinic and the Continuity Clinic); [†], referent category. OR, odds ratios.

portals tethered to EMRs for diabetes management (19). Although results-to-date have been mixed, results from prior studies suggest that secure messaging between adult diabetic patients and their clinician is associated with improved glycemic control (19). Improvements in low density lipoprotein (LDL) cholesterol and blood pressure have also been observed in some studies of web portals used by patients with diabetes and hypertension (6). The specific

portal features that may impact quality of care or improve glycemic control (e.g., patient-provider secure messaging, online access to lab test results or instructions, other patient supports) has not been clearly distinguished by studies completed to date. Results from prior studies indicate that many diabetic patients do not take advantage of web portal features such as secure messaging, when offered, perhaps because of a lack of internet access or to a lack of experience in navigating web portal resources (16).

With respect to limitations, the current study did not examine the specific reasons that patients with diabetes had registered for the web portal or whether they used it over time. Future studies should examine whether patients who have registered for the web portal use it for secure messaging and whether they are active secure message users or whether they only rarely send secure messages to their provider. A further limitation is that the current study was cross-sectional in nature and lacked information about the temporal relationship between treatment for diabetes and patient web portal registration. The current study examined prevalent cases of diabetes which could have been diagnosed recently or in the past.

Additional research is needed to identify specific portal design features that improve glycemic control and interventions that are effective in increasing use of this patient web portals among diabetic patients, especially among Black patients and among patients with low health literacy or computer literacy.

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Footnote

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at <http://dx.doi.org/10.21037/jhmhp.2017.12.04>). SSC serve as an unpaid Associate Editor of *Journal of Hospital Management and Health Policy*. The other authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are

appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The Augusta University Institutional Review Board (IRB) determined that the study was exempt from IRB review. Informed consent was not required for a review of existing patient records that did include any personally identifying information.

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