

Patient Portal Utilization Effect on Patient Engagement

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Author Note

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Abstract

Purpose: Patient portals are widely available online applications with many health-related tools that facilitate patient engagement and enhance communication with providers yet are highly underutilized. The purpose of this evidence-based practice (EBP) project was to explore an English and Spanish patient portal educational video's impact on patient engagement in a Federally Qualified Health Center (FQHC). The social cognitive theory underpins the project because patients' portal use behavior can change if changing their environmental factors in the clinic with educational videos.

Methods: The Universities Institutional Review Board granted exempt approval to ensure human subject protection. The participants included bilingual adult patients in an FQHC who have access to the internet and email addresses who visited the center during the implementation period. The tablets in the patient rooms displayed the English and Spanish educational video on step-by-step instructions on accessing, using the patient portal, and the benefits of use. The information technology technician pulled aggregate data from the analytics component of the patient portal before and after the four-week implementation period. The data included total number of clinic patients, number of active portal users, number of monthly logins, and gender. The project facilitator used descriptive statistics to compare pre-and post-intervention analytics.

Results: Active portal users increased by 0.22% and monthly logins increased by 390 logins. Only aggregate data was collected so the statistical significance was not calculated.

Conclusion: This EBP project enhances knowledge on patient portal utilization's impact on patient engagement and may apply to current practice.

Keywords: patient portal, patient engagement, educational video

Patient Portal Utilization to Improve Patient Engagement

Healthcare providers consistently confront the challenge of motivating patients to engage in their care. More health information technology tools, such as patient portals, are accessible to patients as technology advances. Patient portals provide valuable and easy-to-access resources that facilitate patient participation in their care. Some of these resources include access to medication lists, access to health education, and the ability to communicate with providers. Unfortunately, patient portals are a frequently underutilized resource and a missed opportunity to allow patients to engage in their health fully.

Background and Significance

Problem Statement

Patient engagement in healthcare can be when a patient is willing to participate in their care, adhere to their plan of care, or display self-management behaviors (Fleming et al., 2017). Engaged patients are more likely to have healthy habits and practice preventative health measures (The Office of the National Coordinator for Health Information Technology [ONC], 2015). Unfortunately, many providers find it challenging to engage patients in their care, know how much information to share with patients, and know which practices best foster engagement.

Facilitating patient engagement is a complicated task that requires many resources, time, and effort. Nevertheless, the World Health Organization (WHO) (2021) believes that using digital health technology can empower individuals to engage in health and self-care interventions. Health information technologies, such as patient portals, are available in most health care systems across the United States; however, a study estimates that only 15%-30% of individuals utilize this platform (Lyles et al., 2020).

Purpose and Rationale

The Office of Disease Prevention and Health Promotion (ODPHP) (n.d.) reports that health information technology may foster shared decision-making between providers and patients, provide tools for patients to manage their health, and increase the efficiency of health care. Also, patient portal usage has demonstrated improved and increased patient and provider communication (Dendere et al., 2019). This evidence-based practice (EBP) project aims to evaluate how patient portal utilization influences patient engagement.

Patients in A Federally Qualified Health Center

Federally Qualified Health Centers (FQHC) provide primary and preventative care to primarily low-income and underserved individuals (Heisler, 2015). FQHCs are located in areas with scarce health care providers and provide care to underserved populations, including uninsured, underinsured, and undocumented. In addition, FQHCs serve many patients with chronic health conditions such as diabetes, hypertension, and coronary artery disease (Heisler, 2015). Managing chronic health conditions is complex and requires individualized care; and patient involvement in self-care management (Reed et al., 2019). Therefore, it is vital to utilize all the resources available to engage patients with chronic conditions in their care to improve their health outcomes.

Patient Portal Utilization

The WHO (2021) and the ODPHP (n.d.) recognize the value of health information technology to improve health outcomes and have created health initiatives to increase health information technology utilization worldwide. For example, one objective of Healthy People 2020 is to "increase the proportion of persons who use electronic personal health management tools" (ODPHP, n.d.). Patient portal utilization has demonstrated the potential in increasing patient engagement in health care. A noted benefit of using the patient portal is convenient

access to medication lists, lab results, and other medical records (Nahm et al., 2020; Reed et al., 2019). In addition, increased medication adherence and obtaining timely medication refills occurred with patient portal usage (Dendere et al., 2019; Lyles et al., 2015). Another benefit of patient portal utilization that patients have reported is easy access to a provider via the secure messaging component of the portal (Lyles et al., 2015).

Studies have found that people with higher health literacy levels tend to use patient portals more often than those with lower (Hoogenbosch et al., 2018; Irizarry et al., 2017). However, the ODPHP (n.d.) claims that health information technology can strengthen health literacy skills and understanding. The ODPHP (n.d.) also claims that if providers use health information technology effectively, there is a potential to improve the quality of care and increase patient participation in decision-making. Increasing uptake of patient portal utilization aligns with national initiatives and is a tool to empower and motivate patients to engage in their care.

No Patient Portal Utilization

Patients who do not utilize patient portals express various reasons for not doing so. Studies have found that some patients are satisfied with and prefer face-to-face or over-the-phone interactions with their health providers (Irizarry et al., 2017; Lyles et al., 2020; Reed et al., 2019). Other studies found that patients were apprehensive about using this type of technology due to fear of their personal information not being secure (Kisekka & Giboney, 2018; Lyles et al., 2020). Also, it is vital to note that many patients lack internet access or do not have a smartphone, which is necessary to utilize online patient portals (Irizarry et al., 2017; Reed et al., 2019).

Patient Engagement

Increasing patient engagement is the aim of many health care providers. Patient engagement is essential to improving the quality of care, improving health outcomes, and reducing health care costs (Irizarry et al., 2017; Fleming et al., 2017). Individuals often report a desire to engage in their healthcare but feel they have insufficient resources to increase their engagement and self-care management skills (ONC, 2015). Increasing patient engagement can help patients develop self-care management skills and encourage them to take ownership of their care and improve their health (WHO, 2021).

As the prevalence of chronic health conditions increases worldwide, it is vital for patients to engage in their care to have successful outcomes. Further, improving patient engagement is complex and requires time and effort from health care providers, patients, and their family members. The patient portal is an existing tool that has shown the potential to facilitate communication with providers and patient participation in care. Therefore, healthcare providers should encourage their patients to utilize this tool to help achieve the goal of patient engagement.

Internal Evidence

Providers in a FQHC in the Southwestern United States voiced concern regarding the lack of patient engagement and patient portal utilization in their practice. A review of the analytics of this FQHC patient portal application, Healow, revealed that only approximately 2% of patients utilize the patient portal. It also revealed that the most active users are in the age range of 19-34. The least active users, apart from minors, are in the age bracket of 45-65; there is no data available for those over 65. Over one month, only three patients viewed their results of the 1,520 published lab results on the patient portal. Additionally, only 0.05% of patients logged in to the patient portal over one month, and 0.02% of patients have used it to communicate with their providers. This inquiry has led to the clinically relevant PICOT question, "For patients in a

Federally Qualified Health Center, how does utilizing the patient portal compared to not utilizing the patient portal influence patient engagement in healthcare."

Evidence Synthesis

Search Strategy

The electronic databases used were: PubMed, Cumulative Index of Nursing and Allied Health Literature (CINAHL), and PsycInfo to conduct a literature search. Keywords included: patient AND patient portal OR mychart OR patient web portal OR web portal AND engagement OR involvement OR participation OR satisfaction. The keyword for the population portion of the PICOT question only included the word patient because the keywords FQHC, underserved, uninsured, or underinsured yielded little to no relevant results. In addition, all the searches were limited to a publication date between 2016 to 2021 and peer-reviewed articles. To further refine the search, quotation marks were used for each MESH term for the keyword patient portal.

The initial search of the keywords in PubMed yielded 3,265 results. After the limiters were applied and the quotation marks were added to the MESH terms for *patient portal*, the results decreased to 474. To further refine the search, results were restricted to meta-analysis, randomized controlled trials, and systemic reviews, decreasing the final yield to 45 results. The initial search of the keywords in CINAHL yielded 457 results, after the limiters were applied, the results decreased to 158. The initial search of the keywords in PsycInfo yielded 178 results and after the limiters were applied, the results decreased to 50.

The titles and abstracts of the articles of the final yields were reviewed for relevance to the PICOT question. Only articles in English were reviewed. Articles related to health technology, but not specific to patient portals were excluded. Critical appraisal was performed on

20 articles and 10 were selected to be evaluated in depth. The 10 articles were chosen based on relevance to PICO questions and best level of evidence.

Critical Appraisal and Synthesis

The 10 selected articles were evaluated for quality and strength using the Melnyk & Fineout-Overhold (2019) rapid critical appraisal tools. All of the studies were published between the years 2017 and 2020, and the majority took place in the United States. The vast majority of the studies had reported no explicit biases (see Appendix A, Table A3). The most frequently utilized conceptual frameworks were the health belief model (HBM) and the social cognitive theory (SCT) (see Appendix A, Table A3). The studies that reported demographics all included adults with the mean ages between 46 to 82. Four of the studies had a large sample size, and the remaining had a smaller sample size (see Appendix A, Table A3).

Four studies were qualitative (see Appendix A, Table A1), and the other six were quantitative studies (see Appendix A, Table A2). The majority of the articles were a lower level of evidence, levels five and six. However, two studies were level two on the hierarchy of evidence. Although quantitative studies are a lower level of evidence, they were still included in the synthesis because they best described the effects of patient portal utilization.

The measurement tools were heterogeneous. They included chart reviews, questionnaires, interviews, focus groups, and full-text reviews (see Appendix A, Table A3). The most frequently used measurement tool was chart reviews. The outcomes identified were also heterogeneous but were all related to the effect of patient portal utilization or the predictors of patient portal utilization. The most frequent result of patient portal utilization was patient empowerment, and the most frequent predictor of patient portal utilization was younger age.

Evidence Influence on Project

Overall, the literature suggests that patient portal utilization has a positive outcome on patient engagement, communication, satisfaction, empowerment, and vaccine uptake (Hefner et al., 2019; Hoogenbosch et al., 2018; Lyles et al., 2020; Nahm et al., 2017; Ochoa et al., 2020; Risling et al., 2018; Stewart et al., 2020; Szilagyi et al., 2020). The patient portal is a tool that helps providers better engage their patients in their care. The evidence reveals that people that are insured, younger, have a higher level of health literacy, and are chronically ill are more likely to use the patient portal. However, no studies demonstrated improved clinical outcomes with patient portal utilization. The evidence also indicates that minorities, older adults, and patients with lower digital literacy are less likely to use the patient portal (Hoogenbosch et al., 2018; Lyles et al., 2020; Nahm et al., 2017; Ochoa et al., 2020; Portz et al., 2019; Risling et al., 2018; Wedd et al. 2019).

The literature makes it evident that the development of patient portal education should focus on older, uninsured, with lower health literacy, and minority populations. Many of the patients from the FQHC meet these characteristics. In addition, effective patient portal education should include the benefits of portal usage, online modules, in-person assistance and should be in the patient's preferred language (Lyles et al., 2020; Nahm et al., 2017; Portz et al., 2019). This search led to a project to increase patient portal usage in a FQHC by using a bilingual educational video to give patients step-by-step instructions on using the patient portal and educate them on the benefits of using the patient portal.

Theoretical and Implementation Framework

Theory Application

Theories are used in research to explain a phenomenon, facilitate the analysis and interpretation of findings, and generalize the findings to similar studies (Fain, 2017). The

theoretical framework selected for this project was the Social Cognitive Theory (SCT) (see Appendix B, Figure B1). Bandura's (1986) SCT postulates that human behavior is explained by personal factors, environmental factors, and behavioral factors. Personal factors include knowledge, attitudes, and outcome expectations. Environmental factors include perceived social norms, community, and influence on others. Behavioral factors include skill and self-efficacy (Bandura, 1991). Self-efficacy is a crucial component in the theory that influences the degree of effort one will apply and how much one will persist in their actions (Bandura, 1991). All of the factors mentioned above continuously impact one another and determine behavior.

The SCT applies to the PICOT question. The personal factors would be a patient's knowledge and attitude towards potential benefits related to the patient portal. Environmental factors could be perceived barriers and the ability to influence those barriers. Lastly, behavioral would be a patient's belief that they can utilize the patient portal. These factors would influence one another and determine the patient's ability to use the patient portal and influence their engagement in their health.

Implementation Framework

Implementation frameworks guide and execute an evidence-based project. The Rosswurm and Larrabee Model was selected to direct the implementation of this project (see Appendix B, Figure B2). This model has been successfully utilized in nursing evidence-based practice several times. Also, it provides six linear steps to implement a change to practice while allowing for flexibility if any step needs revisiting. Another added quality is that the first few steps include stakeholders, identifying a problem, identifying potential interventions, and synthesizing the best evidence, which aligns with the first steps completed in the project (Rosswurm & Larrabee, 1999).

The first step is to assess; in this step, the site champion identifies the lack of patient portal usage by communicating with stakeholders, the project facilitator collecting internal data, and comparing it with external data (Rosswurn & Larrabee, 1999). The following step links where the project facilitator selected the outcome of patient engagement. The next step is to synthesize the best evidence completed in the critical appraisal component. As the project facilitator followed the linear steps, the intervention was planned, evaluated, and integrated into standard practice (Rosswurn & Larrabee, 1999).

Methods

Human Subject Protection

Arizona State University's (ASU) Institutional Review Board (IRB) granted exempt approval for this EBP project to ensure human subject protection. The patients were consented to receive care with the clinic's established consent form by the front desk clerical staff while the patient registered. The minimal potential risk of participating was frustration with using technology. The information technology technician and the project facilitator only aggregate data from the analytics component of the patient portal application; the information is stored in the application and is stored for as long as the clinic continues to use this application. The data collected had no patient identifying factors, and the names of the active and inactive portal users were not known.

Population and Setting

The project site was a FQHC located in the Southwestern United States in a predominantly Hispanic community that serves primarily Hispanic families in the surrounding neighborhoods. FQHCs provide primary and preventative care to primarily low-income and underserved individuals (Heisler, 2015). The goal of this FQHC is to provide excellent healthcare regardless of

financial or insurance coverage status. Providers in this FQHC voiced concern regarding the lack of patient engagement and patient portal utilization in their practice. A provider in a FQHC, reported that she has never used the patient portal to communicate with her patients (Provider, personal communication, February 8, 2021). Instead, they usually call the office and leave a message with the receptionist or medical assistant (MA). Then, the MA relays the message to the provider, and either the provider or MA returns the patient's call. Another provider in a FQHC reported that she believes many patients are dissatisfied when calling the clinic because the hold time is usually very long (personal communication, February 8, 2021). She reported an opportunity to improve patient-provider communication and patient engagement. This clinic employs providers who are physicians, physician assistants, and nurse practitioners. Other employees include medical assistants, medical interpreters, receptionists, and an information technology technician.

The providers at this FQHC were stakeholders because increasing patient portal utilization can impact how they communicate with their patients. The medical director of this clinic was also a stakeholder as she is the site champion and the individual who expressed interest in exploring patient portal utilization. The medical director influenced other providers to encourage their patients to use the patient portal. Further, the medical assistants and receptionists were instrumental because they helped educate patients on the benefits of patient portal use. Other stakeholders included the patients at this FQHC. Their involvement in the project was critical as they viewed the educational tool and utilized the patient portal.

Expected Impact

Patient portals are a widely available yet highly underutilized health information technology tool to facilitate engagement. The exhaustive literature review affirms that patient

portals have many benefits but that many factors impact patients' use. Educating patients on the benefits of portal usage and giving them instructions on how to use the portal using online videos in the patient's preferred language can influence their utilization. This EBP project evaluated an educational video's influence on patient portal utilization in a FQHC. Going forward, the impact of increased patient portal use may improve patient-provider communication and ultimately increase patient engagement and satisfaction at this FQHC.

Project Description

After IRB approval, the project facilitator developed the English and Spanish educational video on step-by-step instructions on accessing and using the patient portal and the benefits of patient portal use. First, the project facilitator typed out the video scripts, and a native Spanish speaker uninvolved with the project proofread the Spanish script to assure accuracy. Then aggregate data from the analytics component of the patient portal application was pulled one month before the start of the project by the clinic's information technology technician. Then the videos were uploaded to the tablets located in the patient rooms and played on a loop of videos. The tablets displayed the video for four weeks. After four weeks, to assess the effectiveness of the video intervention, the project facilitator pulled aggregate data.

Data Collection

The information technology technician and project facilitator pulled data from the analytics component of the Healow patient portal application. The principal investigator, project facilitator, and site champion reviewed the data. The data collected had no patient identifying factors. The data collected included: the total number of clinic patients, number of active portal users, number of monthly logins, and gender. The data collected did not include the names of active portal users.

The plan for data analysis was descriptive statistics for the pre- and post-intervention analytics. The pre and post-statistics were compared to assess the significance of the intervention.

Budget

The total budget for this EBP project was about one hundred and seven dollars. Appendix C lists the budget allocation. The project facilitator created the educational video using Adobe Premiere Rush, which usually costs \$10 per month but is available at no cost to ASU students. The patients viewed the video while waiting to be seen; therefore, there is no estimated loss of productivity time. Printing handouts cost about \$60. The project facilitator received no funding from an external source for this project.

Results

A month before the intervention, the number of active patient portal users was 1,981 or 3.27%. After the educational video intervention, the number of active portal users was 2,296 or 3.49%. There was a 0.22% increase in active patient portal users. Further, the number of monthly logins was extracted for the month before, the month during, and the month after the intervention. There were 1,367 monthly logins, 315 male and 1052 female, the month before the intervention. The month after the intervention, there were 1,778 monthly logins; 393 males and 1,364 females. The monthly logins increased by 390 logins, 78 males and 312 females. Of note, this FQHC serves a significant female population though the aggregate data did not provide specific numbers of total women served. The project facilitator did not gather individual user data, so the statistical significance of the results was not calculated..

Impact and Sustainability

The providers were receptive to the intervention since the clinic leaders aim to increase patient portal utilization. The videos also helped providers learn about the impact of patients

utilizing the patient portal. Unfortunately, the patient portal went through a major update after the project facilitator created the videos. Therefore, the site did not use the videos after the intervention period. However, the site champion hopes to have the videos recreated with up-to-date information. In the future, another student can update the videos and work on increasing uptake of the patient portal as a legacy project.

Discussion

This cost-effective, low-risk DNP project highlighted the significant gap in active patient portal users at this FQHC. The findings show the potential that educational videos may increase uptake of patient portal utilization, especially in women. There was a more significant increase in monthly logins by women. However, it is essential to note that the FQHC sees a substantial population of women; therefore, the finding might be skewed. These findings align with previous studies that found in-person or video tutorials in patients' preferred language increased patient portal utilization (Lyles et al., 2020; Nahm et al., 2017; Portz et al., 2019).

Limitations

A limitation of the project was the patient portal software was updated after the project facilitator created the educational videos. This update impacted the applicability and sustainability of the videos. Another limitation was a COVID-19 surge during the intervention, leading to minimal in-person visits. Further, the data only included aggregate data, so the statistical significance was not calculated.

Recommendations

Future recommendations include gathering individual patient data to calculate the statistical significance. Future data can also include qualitative data such as patient satisfaction in patients who are active patient portal users compared to non-active patient portal users.

References

- Bandura, A. (1986). *Social foundation of thought and action: A social cognitive theory*. Prentice Hall.
- Bandura, A. (1991). Social cognitive theory of self-regulation. *Organizational Behavior and Human Decision Processes*, 50(2), 248-287. [https://doi.org/10.1016/0749-5978\(91\)90022-L](https://doi.org/10.1016/0749-5978(91)90022-L)
- Dendere, R., Slade, C., Burton-Jones, A., Sullivan, C., Staib, A., & Janda, M. (2019). Patient portals facilitating engagement with inpatient electronic medical records: A systematic review. *Journal of Medical Internet Research*, 21(4), e12779. <https://www.jmir.org/2019/4/e12779/>
- Fain, J. A. (2017). *Reading, understanding, and applying nursing research* (5th ed.). F. A. Davis Company.
- Fleming, M. D., Shim, J. K., Yen I. H., Thompson-Lastad, A., Rubin S., Van Natta M., & Burke, N. J. (2017). Patient engagement at the margins: Health care providers' assessments of engagement and the structural determinants of health in the safety-net. *Social Science & Medicine*, 183, 11-18. <https://www.sciencedirect.com/science/article/pii/S0277953617302587>
- Han, H. R., Gleason, K. T., Sun, C. A., Miller, H. N., Kang, S. J., Chow, S., Anderson, R., Nagy, P., & Bauer, T. (2019). Using patient portals to improve patient outcomes: Systematic Review. *JMIR Human Factors*, 6(4), e15038. <https://doi.org/10.2196/15038>
- Health Communication Capacity Collaborative. (n.d.). *Social cognitive learning theory* [Image]. <https://sbccimplementationkits.org/sbcc-in-emergencies/social-cognitive-learning-theory/>

- Hefner, J. L., MacEvan, S. R., Blitz, A., & Sieck, C. J. (2019). Patient portal messaging for care coordination: A qualitative study of perspectives of experienced users with chronic conditions. *BMC Family Practice*, 20(1), 57. <https://doi.org/10.1186/s12875-019-0948-1>
- Heisler, E. J. (2015). *Federal health centers: An overview*. Congressional Research Service. [https://congressional-proquest-com.ezproxy1.lib.asu.edu/congressional/result/ppresultpage.gispdfhitspanel.pdflink/\\$2fapp-bin\\$2fgis-congresearch\\$2f1\\$2ff\\$2fa\\$2fe\\$2fcrs-2015-dsp-0149_from_1_to_38.pdf/entitlementkeys=1234%7Capp-gis%7Ccongresearch%7Ccrs-2015-dsp-0149](https://congressional-proquest-com.ezproxy1.lib.asu.edu/congressional/result/ppresultpage.gispdfhitspanel.pdflink/$2fapp-bin$2fgis-congresearch$2f1$2ff$2fa$2fe$2fcrs-2015-dsp-0149_from_1_to_38.pdf/entitlementkeys=1234%7Capp-gis%7Ccongresearch%7Ccrs-2015-dsp-0149)
- Hoogenbosch, B., Postma, J., De Man-Van, J., Tiemessen, N. A., Van Delden, J., & Van Os-Medendorp, H. (2018). Use and users of a patient portal: Cross-sectional study. *Journal of Medical Internet Research*, 20(9), e262. <https://doi.org/10.2196/jmir.9418>
- Irizzary, T., Shoemake, J., Nilsen, M. L., Czaja, S., Beach, S., & Dabbs, A. D. (2017). Patient portals as a tool for health care engagement; A mixed-method study of older adults with varying levels of health literacy and prior patient portal use. *Journal of Medical Internet Research*, 19(3), e99. <https://doi.org/10.2196/jmir.7099>
- Kisekka, V., & Giboney, J. S. (2018). The effectiveness of health care information technologies: Evaluation of trust, security beliefs, and privacy as determinant of health care outcomes. *Journal of Medical Internet Research*, 20(4), e107. <https://doi.org/10.2196/jmir.9014>
- Lyles, C. R., Nelson, E. C., Frampton, S., Dykes P. C., Cemballi, A. G., & Sarkar, U. (2020). Using electronic health record portals to improve patient engagement: Research priorities and best practices. *Annals of Internal Medicine*, 172(11), S123-S129. <https://www.acpjournals.org/doi/10.7326/M19-0876>

- Lyles, C. R., Sarkar, U., Schillinger, D., Ralston, J. D., Allen, J. Y., Nguyen, R., & Karter, A. J. (2015). Refilling medication through an online patient portal: Consistent improvements in adherence across racial/ethnic groups. *Journal of the American Medical Informatics Association*, 23(e1), e28-e33. <https://doi.org/10.1093/jamia/ocv126>
- Melnyk, B. M., & Fineout-Overholt, E. (2019). *Evidence-based practice in nursing and healthcare* (4th ed.). Wolters Kluwer.
- Nahm, E. S., Diblasi, C., Gonzales, E., Silver, K., Zhu, S., Sagherian, K., & Kongs, K. (2017). Patient-centered personal health record and portal implementation toolkit for ambulatory clinics. *Computers, Informatics, Nursing*, 35(4), 176-185. <https://doi.org/10.1097/CIN.0000000000000318>
- Nahm, E. S., Zhu, S., Bellantoni, M., Keldsen, L., Charters, K., Russomanno, V., Rietschel, M., Son, H., & Smith, L. (2020). Patient portal use among older adults: What is really happening nationwide? *Journal of Applied Gerontology*, 39(4), 442-450. <https://doi.org/10.1177/0733464818776125>
- Ochoa, C., Baron-Lee, J., Popescu, C., & Busl, K. M. (2020). Electronic patient portal utilization in neurology patients and association with outcomes. *Health Informatics Journal*, 26(4), 2751-2761. <https://doi.org/10.1177/1460458220938533>
- Office of Disease Prevention and Health Promotion. (n.d.). *Health communication and health information technology*. <https://www.healthypeople.gov/2020/topics-objectives/topic/health-communication-and-health-information-technology>
- Office of the National Coordinator for Health Information Technology. 2015. *Federal health IT strategic plan 2015-2020*. https://www.healthit.gov/sites/default/files/9-5-federalhealthitstratplanfinal_0.pdf

- Portz, J. D., Bayliss, E. A., Bull, S., Boxer, R. S., Bekelman, D. B., Gleason, K., & Czaja, S. (2019). Using technology acceptance model to explore user experience, intent to use, and use behavior of a patient portal among older adults with multiple chronic conditions: Descriptive qualitative study. *Journal of Medical Internet Research*, *21*(4), e11604. <https://doi.org/10.2196/11604>
- Reed, M. E., Huang, J., Millman, A., Graetz, I., Hsu, J., Brand, R., Ballard, D. W., & Grant, R. (2019). Portal use among patients with chronic conditions: Patient-reported care experiences. *Medical Care*, *57*(10), 809-814. <https://doi.org/10.1097/MLR.0000000000001178>
- Risling, T., Martinez, J., Young, J., & Thorp-Froslic, N. (2018). Defining empowerment and supporting engagement using the patient views from the citizen health information portal: Qualitative study. *Journal of Medical Internet Research*, *6*(3), e43. <https://doi.org/10.2196/medinform.8828>
- Rosswurm, M. A., & Larrabee, J. H. (1999). A model for change to evidence-based practice [Image]. *Journal of Nursing Scholarship*, *31*(4), 317-322. <https://doi.org/10.1111/j.1547-5069.1999.tb00510.x>
- Stewart, M. T., Hogan, T. P., Nicklas, J., Robinson, S. A., Purington, C. M., Miller, C. J., Vimalananda, V. G., Connolly, S. L., Wolfe, H. L., Nazi, K. M., Netherton, D., & Shimada, S. (2020). The promise of patient portals for individuals living with chronic illness: Qualitative study identifying pathways of patient engagement. *Journal of Medical Internet Research*, *22*(7), e17744. <https://doi.org/10.2196/17744>
- Szilagyi, P. G., Albertin, C., Casillas, A., Valderrama, R., Duru, K., Ong, M. K., Vangala, S., Tseng, C. H., Rand, C. M., Humiston, S. G., Evans, S., Sloyan, M., & Lerner, C. (2020).

Effect of patient portal reminders sent by a health care system on influenza vaccination rates: A randomized clinical trial. *JAMA Internal Medicine*, 180(7), 962.

<https://doi.org/10.1001/jamainternmed.2020.1602>

Wedd, J., Basu, M., Curtis, L. M., Smith, K., Lo, D. J., Serper, M., Wolf, M. S., Parker, R., Patzer, R. E. (2019). Racial, ethnic, and socioeconomic disparities in web-based patient portal usage among kidney and liver transplant recipients: Cross-sectional study. *Journal of Medical Internet Research*, 21(4), e11864. <https://doi.org/10.2196/11864>

World Health Organization. (2021). *Self-care intervention for health*.

https://www.who.int/health-topics/self-care#tab=tab_1

Appendix A

Evaluation and Synthesis Tables

Table A1

Evaluation Table of Quantitative Studies

Citation	Theoretical/ Conceptual Framework	Design/ Method/ Purpose	Sample/Setting	Variables	Measurement/ Instrumentation	Data Analysis	Results/ Findings	Level of Evidence; Application to practice/ Generalization
<p>Nahm et al. (2017) Patient-centered personal health record and portal implementation toolkit for ambulatory clinics</p> <p>Country: USA</p> <p>Funding: University of Maryland School of Nursing</p>	<p>PRISM</p> <p>SCT</p>	<p>Design: 2 Phase Randomized Controlled Trail</p> <p>Purpose: To implement a PP implementation toolkit in a large underserved area and assess the impact</p>	<p>n= 74</p> <p>Demographics: Men: 21 (28.4%) Female: 53 (71.6%) Mean age: 57.4</p> <p>Setting Large diabetes and endocrinology ambulatory care center in an underserved area</p> <p>Inclusion 40 years or older Diagnosed with at least 1 chronic disease Can read/write English Can use internet Has an email account</p>	<p>IV: PP implementation toolkit (general and plus) CG: General toolkit only</p> <p>DV1: PP knowledge</p> <p>DV2: communication</p> <p>DV3: self-efficacy</p> <p>DV4: adherence</p>	<p>Face-to-face education on PP, brochures, demo videos, learning modules</p> <p>PP knowledge test</p> <p>Components of Primary Care Index</p> <p>Self-efficacy scale</p> <p>Medical Outcomes Study General Adherence Scale</p>	<p>Mann-Whitney U test</p> <p>Fisher exact test</p> <p>Linear mixed models</p>	<p>Both providers and patients need PP training</p> <p>Older adults may need additional PP training</p> <p>An online education module in addition to face-to-face education improved patient-provider communication</p>	<p>LOE: II</p> <p>Strength: Higher LOE</p> <p>Weakness: small sample size</p> <p>Harm: none</p> <p>Feasibility: Learning modules may be difficult to imbed into PP if they are currently non-existent</p> <p>Utility to PICOT: setting is similar to the population in the PICOT</p>

Key: CG- control group DS- database searched DV- dependent variable EC- exclusion criteria EHR- electronic health record HBM- health belief model IC- inclusion criteria IV- independent variable LOE- level of evidence n- number of participants N- number of studies NPPU- non patient portal user OP- outpatient PP- patient portal PPU- patient portal user pt- patient RCT-randomized clinical trial SCT- Social Cognitive Theory tx- transplants UCLA- University of California Lost Angeles UNOS- United Network for Organ Sharing

Citation	Theoretical/ Conceptual Framework	Design/ Method/ Purpose	Sample/Setting	Variables	Measurement/ Instrumentation	Data Analysis	Results/ Findings	Level of Evidence; Application to practice/ Generalization
							Patients prefer step-by-step assistance	
<p>Ochoa et al. (2020) Electronic patient portal utilization by neurology patient and association with outcomes</p> <p>Country: USA</p> <p>Funding: National Center for Advancing Translational Sciences of the National Institutes of Health under University of Florida</p> <p>Bias: None stated</p>	Inferred SCT	<p>Design: Quantitative retrospective cross-sectional</p> <p>Purpose: Identify pt characteristics and care implications associated with PP usage among neurology pts</p>	<p>n= 13,483</p> <p>PPU: 5,648 NPPU: 7,853</p> <p>Demographics: PPU: Female: 43.7% White 44.7% Black 27.6% Other 43.5% Mean age: 54.3</p> <p>NPPU: Female: 56.3% White: 55.3% Black: 72.4% Non-Hispanic 42.6% Hispanic: 38.7% Mean age: 55.6</p> <p>Setting: Chart reviews</p> <p>IC: 18 years and older, pts of University of Florida Health Neurology</p>	<p>IV: Demographics Neurological Diagnosis Number of prescriptions Number of clinic visits</p> <p>DV: PPU NPPU</p>	<p>Chart Reviews</p> <p>PPU identified as pt who logged into PP</p>	<p>Multivariate logistic regression</p> <p>Poisson regression</p>	<p>CI 95%</p> <p>Females most likely to be PPU</p> <p>Younger age more likely to be PPU</p> <p>Hispanic and Black decreased odds of PPU</p> <p>PPU utilized clinic more</p> <p>Black and Hispanic more likely to be hospitalized</p>	<p>LOE VI</p> <p>Strength large sample size</p> <p>Weakness Not generalizable</p> <p>Harm: none</p> <p>Feasibility: this type of data can be extracted from many types of EHRs</p> <p>Utility to PICOT This study highlights the characteristics of pts that are more likely to be PPU, thus likely more engaged in care</p>

Key: **CG-** control group **DS-** database searched **DV-** dependent variable **EC-** exclusion criteria **EHR-** electronic health record **HBM-** health belief model **IC-** inclusion criteria **IV-** independent variable **LOE-** level of evidence **n-** number of participants **N-** number of studies **NPPU-** non patient portal user **OP-** outpatient **PP-** patient portal **PPU-** patient portal user **pt-** patient **RCT-** randomized clinical trial **SCT-** Social Cognitive Theory **tx-** transplants **UCLA-** University of California Lost Angeles **UNOS-** United Network for Organ Sharing

Citation	Theoretical/ Conceptual Framework	Design/ Method/ Purpose	Sample/Setting	Variables	Measurement/ Instrumentation	Data Analysis	Results/ Findings	Level of Evidence; Application to practice/ Generalization
			Clinics between 7/2016-7/2017					
<p>Szilagyi et al. (2020) Effect of patient portal reminders sent by a health care system on influenza vaccination rates: A randomized clinical trial</p> <p>Country U.S.A</p> <p>Funding UCLA Health System</p> <p>Bias Study included vaccines received outside of the UCLA Health System All information was in English</p>	<p>HBM</p> <p>Principles of Health Literacy</p>	<p>Design 4-arm, pragmatic, intention-to-treat RCT</p> <p>Purpose Evaluate effect of patient reminders send via patient portal on influenza vaccination rates</p>	<p>n= 164,205</p> <p>Demographics Female: 58.3% Mean age: 46.2 Race: 57.3% White</p> <p>Setting All 57 UCLA health system primary care practices</p> <p>EC Not an active portal user, a family household member already participating</p>	<p>DV Receive influence vaccine</p> <p>IV Patient portal reminders (1,2,3)</p> <p>CG no patient portal reminder</p>	<p>Influenza vaccine administration documented in EHR Self-reported administration of influenza vaccine at outside facility</p>	<p>Fixed effect Poisson regression</p> <p>Random practice effects</p>	<p>CG 37.5%</p> <p>IV1 38.0% P= .008 CI 95% (1.00-1.03) ARR = 1.02</p> <p>IV2 38.2% P= .03 CI 95% (1.00-1.04) ARR=1.02</p> <p>IV3 38.2% P= .02 CI 95% (1.00-1.04) ARR= 1.02</p> <p>Reminders increased vaccines received</p>	<p>LOE: II</p> <p>Strengths Randomization, large sample,</p> <p>Weakness Lacks generalizability, limited to English speaking only, could not track all of participants vaccinated at outside facility</p> <p>Feasibility low cost, low risk, potential effectiveness</p> <p>Utility to PICOT PPU engage more in preventative care such as receiving influenza vaccines</p>
<p>Wedd et al. (2019)</p>	<p>Inferred SCT</p>	<p>Design: Quantitative</p>	<p>n= 710 PPU: 375 NPPU: 335</p>	<p>IV: Gender, Race, Marital Status,</p>	<p>Chart reviews</p>	<p>Compared PPU and NPPU using</p>	<p>PPU higher in kidney tx pts</p>	<p>LOE VI</p>

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Citation	Theoretical/ Conceptual Framework	Design/ Method/ Purpose	Sample/Setting	Variables	Measurement/ Instrumentation	Data Analysis	Results/ Findings	Level of Evidence; Application to practice/ Generalization
<p>Racial, ethnic, and socioeconomic disparities in web-based patient portal usage among kidney and liver transplant recipients: cross sectional study</p> <p>Country USA</p> <p>Funding National Institutes of Health grant number R21NR014544</p> <p>Bias: None declared</p>		<p>retrospective cross-sectional</p> <p>Purpose: Examine demographic, clinical and socioeconomic characteristics associated with usage of PP among diverse populations of tx pts</p>	<p>Kidney tx: 455 Liver tx: 255</p> <p>Demographics Mean Age PPU: 50.6 Mean Age NPPU: 52.1 Kidney tx: Mean age: 49.1 Male: 55.2% White: 33.9% Black: 56.9% Married: 53.4%</p> <p>Liver tx: Mean age: 53.4 Male: 59.6% White: 71.8% Married: 65.5%</p> <p>Setting: Chart Reviews</p> <p>Inclusion: kidney or liver tx pt recipient in Southeast between 3/2014 and 11/2016.</p>	<p>Education, Insurance, Poverty level Kidney tx Renal tx</p> <p>DV: PPU NPPU</p>	<p>UNOS database review</p>	<p>chi-square tests and independent <i>t</i> tests</p> <p>Descriptive statistics for frequency</p>	<p>PPU higher in younger age pts</p> <p>PPU higher in college graduates than grade school education</p> <p>PPU higher in private insurance compared to public insurance</p> <p>PPU higher in employed compared to unemployed</p> <p>PPU lower in lower poverty levels</p>	<p>Strength large sample size</p> <p>Weakness Not generalizable</p> <p>Harm: none</p> <p>Feasibility: this type of data can be extracted from many types of EHRs</p> <p>Utility to PICOT This study highlights the characteristics of pts that are more likely to be PPU, thus likely more engaged in care</p>

Key: **CG**- control group **DS**- database searched **DV**- dependent variable **EC**- exclusion criteria **EHR**- electronic health record **HBM**- health belief model **IC**- inclusion criteria **IV**- independent variable **LOE**- level of evidence **n**- number of participants **N**- number of studies **NPPU**- non patient portal user **OP**- outpatient **PP**- patient portal **PPU**- patient portal user **pt**- patient **RCT**-randomized clinical trial **SCT**- Social Cognitive Theory **tx**- transplants **UCLA**- University of California Lost Angeles **UNOS**- United Network for Organ Sharing

Table A2

Evaluation Table of Qualitative Studies

Citation	Theoretical/ Conceptual Framework	Design/ Method/ Sampling	Sample/Setting	Major Variables/ Research Questions	Measurement/ Instrumentation	Data Analysis	Findings/ Themes	Level of Evidence; Application to practice/ Generalization
<p>Hefner et al. (2019)</p> <p>Patient portal messaging for care coordination: a qualitative study of perspectives of experienced users with chronic conditions</p> <p>Country USA</p> <p>Funding Grant from Ohio State University Department of Family Medicine</p> <p>Bias None evident</p>	<p>Inferred HBM</p>	<p>Design: Qualitative exploratory study</p> <p>Purpose: To understand how pts with chronic conditions utilize the SM component of PP</p>	<p>n = 17 1 5-person FG, 2 6-person FG</p> <p>IC- current user of MyChart PP, diagnosed with cardiopulmonary condition, patient of Department of Family Medicine Clinic</p> <p>Setting: FG conducted at a round table while eating lunch</p>	<p>Guided questions regarding: -How pts learned to use PP - Any training in use of PP - Frequency of SM - Perceived value of SM</p>	<p>3 FGs conducted by principal investigator</p>	<p>FG were audio recorded and transcribed by 2 medical students</p> <p>Codebook developed to identify themes</p> <p>Transcript reviewed by 2+ code team members</p>	<p>Pts use SM because it is quicker communication with provider</p> <p>SM used to coordinate care with different specialties</p> <p>Challenges to SM: DL, worry about bothering provider,</p>	<p>LOE: VI</p> <p>Strength investigator was very experienced in FG interviews</p> <p>Weakness Only included pts already using PP, small sample size, no demographic information provided</p> <p>Harm none</p> <p>Feasibility may be difficult to find a group of pts already using PP. Focus group questions were included and study could perhaps be replicated</p> <p>Utility to PICOT Study aim demonstrates how pts engage using PP</p>

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Citation	Theoretical/ Conceptual Framework	Design/ Method/ Sampling	Sample/Setting	Major Variables/ Research Questions	Measurement/ Instrumentation	Data Analysis	Findings/ Themes	Level of Evidence; Application to practice/ Generalization
<p>Hoogenbosch et al. (2018) Use and the users of a patient portal: Cross-sectional study</p> <p>Country Netherlands</p> <p>Funding University Medical Centre Utrecht</p> <p>Bias None declared</p>	<p>Unified Theory of Acceptance and Use of Technology</p>	<p>Design: Cross-sectional study</p> <p>Purpose: Explore the prevalence of PP use and the characteristics of pts who use and do not use PP</p>	<p>n= 439 PPU: 141 NPPU: 298</p> <p>IC: >18 years old, visiting on OP department of specified medical center, fluent in Dutch,</p> <p>EC: inpatient</p> <p>Setting: Patients visiting OP departments</p> <p>Demographics: Mean age PPU: 50 Mean age NPPU aware: 53 Mean age NPPU not aware: 55 Females 51.2% Female PPU: 55.3% Female NPPU aware: 50.7% Female NPPU not aware: 48.4%</p>	<p>IV: Gender Chronically II Life Status Education Level eHL</p> <p>DV: PPU NPPU but aware of PP NPPU not aware of PP</p>	<p>Structured paper questionnaire</p> <p>5-point Likert scale</p> <p>eHL questionnaire</p>	<p>Descriptive statistics to identify: PPU NPPU but aware of PP NPPU not aware of PP</p> <p>Logistic regression to explore use of PP</p>	<p>PPU: 32.1% NPPU aware of PP: 31/2% NPPU not aware of PP: 36.7%</p> <p>PPU were significantly younger, not retired, more often chronically ill, higher eHL scale score, more likely to be satisfied with care</p>	<p>LOE VI</p> <p>Strength Large sample size,</p> <p>Weakness Convenience sample limits generalizability Dutch eHL questionnaire not reliable</p> <p>Harm: none</p> <p>Feasibility: Similar study could be completed in other OP setting</p> <p>Utility to PICOT This study highlights the characteristics of pts that are more likely to be PPU, thus likely more engaged in care</p>

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Citation	Theoretical/ Conceptual Framework	Design/ Method/ Sampling	Sample/Setting	Major Variables/ Research Questions	Measurement/ Instrumentation	Data Analysis	Findings/ Themes	Level of Evidence; Application to practice/ Generalization
<p>Lyles et al. (2020) Using electronic health record portals to improve patient engagement: Research priorities and best practices</p> <p>Country USA</p> <p>Funding Many grants</p> <p>Bias None evident</p>	Principles of implementation science	<p>Design: Qualitative Grounded Theory</p> <p>Purpose: To examine studies that address patient engagement with EHR to identify best practices and research priorities</p>	<p>N: 52 articles</p> <p>DBS: PubMed</p> <p>IC: Published between 9/2013-6/2019, include intervention</p> <p>EC: non-original data- reviews, protocols, studies outside the USA, observational studies without intervention</p>	<p>PP use and outcome studies</p> <p>PP usability studies</p> <p>PP barriers to use</p>	<p>Two authors completed data extraction and conducted full-text review to select articles that met inclusion criteria</p> <p>Another author reviewed full text of selected articles to ensure all were reliable</p>	REAIM framework	<p>Patient's DL and HL should be examined when implementing PP usage uptake efforts</p> <p>Barriers to use should be addressed such as language and access</p> <p>Interventions to promote usage should include in-person tutorials</p> <p>Interventions via EHR should be user friendly to effect engagement</p>	<p>LOE V</p> <p>Strength Included 52 primary research articles</p> <p>Weakness Lower level of evidence, only used one database</p> <p>Harm none</p> <p>Feasibility Findings could potentially be addressed in an intervention</p> <p>Utility to PICOT This study highlights the characteristics of pts that are more likely to be NPPU, perhaps revealing pts less likely to be engaged</p>
<p>Portz et al. (2019) Using the technology acceptance model to</p>	Technology acceptance model	<p>Design: Qualitative descriptive study</p> <p>Purpose: To use the technology</p>	<p>n= 24 PPU: 14 NPPU: 9</p> <p>IC: Presence of multiple chronic</p>	<p>PPU: Why did you enroll in PP? What features do you use most?</p>	<p>Semi-structured FGs</p> <p>Technology utilization survey</p>	FC audio recorded and transcribed verbatim	PPU mostly used PP for communicating with provider	<p>LOE VI</p> <p>Strength Included NPPU</p> <p>Weakness</p>

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<p>explore user experience, intent to use, and use behavior of a patient portal among older adults with multiple chronic conditions: Descriptive qualitative study</p> <p>Country: USA</p> <p>Funding: National Institute on Aging</p> <p>Bias: None declared</p>		<p>acceptance model do describe PP user interface and PP user experience, intent to use, and use behaviors among older patients with multiple chronic conditions</p>	<p>conditions, age ≥65, pt of geriatric Denver clinics</p> <p>EC: non-English speaker, skilled nursing facility residents, dementia diagnosis</p> <p>Demographics: Female PPU: 12(80%) Female NPPU: 5(56%) Mean age: 78.41 Mean age PPU: 76.4 Mean age NPPU: 82.7 White: 19 Hispanic: 3 College Grad: 9 Some College: 0 High school Grad: 6 Income >\$30,000: 4 \$300,000-49,999: 13 >\$50,000: 7</p>	<p>NPPU: Are you interested in PP? Are there reasons why you do no use PP?</p>		<p>Coded with Technology acceptance model driven codes</p>	<p>PP users felt the PP was user friendly except the registration part NPPU reported PP looked to difficult to use and font size was too small</p> <p>PPU and NPPU users reported anxiety related to computers. PPU shared there is a learning curve to use</p> <p>PPU thought the greatest benefit was communicating with provider. NPPU preferred telephone communications</p>	<p>Small sample size, not generalizable especially to less educated or lower income.</p> <p>Harm: none</p> <p>Feasibility FG questions provided, could be replicated with PP in another setting. However, functionality may vary with other PP systems</p> <p>Utility to PICOT This study highlights the characteristics of pts that are more likely to be NPPU, perhaps revealing pts less likely to be engaged</p>

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<p>Risling et al. (2018) Defining empowerment and supporting engagement using the patient views from the citizen health information portal: Qualitative study</p> <p>Country: Canada</p> <p>Funding: University of Saskatchewan</p> <p>Bias: None listed</p>	<p>Roger's diffusion of innovations theory</p>	<p>Qualitative, interpretive description</p> <p>Purpose: explore participants view on PP usage and feeling of empowerment</p>	<p>N= 26</p> <p>Demographics Female= 18 Male= 8 Majority age 60-69 Majority of participants had a chronic illness</p> <p>Setting Residents of Western Canadian province using PP</p> <p>Inclusion English speaking Participants of the Citizen Health Information Portal</p>	<p>Themes of Empowerment Identified: Being heard: -Knowing more- access to more information -Seeing what they (the provider) see- access to health data</p> <p>Moving forward: -Owning future steps- engaging in self-care behaviors -Promoting future care- desire to use PP</p>	<p>Semi structured interviews</p>	<p>Line-by-line coding of data within transcription of interview Explore commonalities and differences Reflective memos</p>	<p>PP influenced patient empowerment by making participants feel like they know more with the information provided in PP and by allowing the patient to see what providers see such as lab results</p> <p>PP had no clear impact on clinical outcomes</p> <p>Improving relationship with provider improved engagement</p>	<p>LOE VI</p> <p>Strengths identifies gap in literature exploring empowerment</p> <p>Weakness Specific to Citizen Health Information Portal No comparison to non-PP users Small sample size</p> <p>Harm: none</p> <p>Feasibility Interview questions not explicitly states, would be difficult to replicate</p> <p>Utility to PICOT Directly related to intervention, pts who are PPU feel more empowered/engaged</p>
<p>Stewart et al. (2020) The promise of patient portals</p>	<p>Framework for patient engagement</p>	<p>Design: Qualitative, grounded theory</p>	<p>n= 40</p> <p>Demographics Men: 32 (80%)</p>	<p>How do online PP support patient engagement for</p>	<p>Semi structured phone interviews</p>	<p>Interviews were recorded and transcribed</p>	<p>PP impact on patient-healthcare team relationship</p>	<p>LOE: VI</p> <p>Strength: Participants felt very</p>

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Citation	Theoretical/ Conceptual Framework	Design/ Method/ Sampling	Sample/Setting	Major Variables/ Research Questions	Measurement/ Instrumentation	Data Analysis	Findings/ Themes	Level of Evidence; Application to practice/ Generalization
<p>for individuals living with chronic illness: Qualitative study identifying pathways of patient engagement</p> <p>Country: USA</p> <p>Funding: Center for Healthcare Organization and Implementation Research</p> <p>Bias: None listed</p>		<p>Purpose: Explore how PP facilitate engagement in patients with diabetes</p>	<p>Ethnicity: 33 (85%) white Mean age: 65.9</p> <p>Setting Phone interviews</p> <p>Inclusion Veterans who use PP My HealtheVet Respond to survey inquiring if interested in participating Diabetes</p> <p>Exclusion No mental health illness</p>	<p>individuals living with diabetes?</p>		<p>Double-coded for multiple themes by several coders Coded of deducting and inductive themes</p>	<p>Feelings of empowerment with PP use PP for collaboration PP and care plan changes PP communication for clarification</p> <p>PP messaging challenges PP med refill challenges</p> <p>PP has no effect on clinical outcomes</p> <p>Inferred improved patient satisfaction with PP usage</p> <p>Provider feedback on PP improved engagement</p>	<p>positive about PP usage</p> <p>Weakness: participants were already enrolled in My HealtheVet PP/already engaged Specific to veterans with diabetes No comparison to non-PP users Small sample size</p> <p>Harm: none</p> <p>Feasibility: Interview questions not explicitly states, would be difficult to replicate</p> <p>Utility to PICOT Directly related to intervention, pts who are PPU feel more empowered/engaged</p>

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Table A3

Synthesis Table

Author	Hefner et al.	Hoogenbosch et al.	Lyles et al.	Ochoa et al.	Nahm et al.	Portz et al.	Risling et al.	Stewart et al.	Szilagyi et al.	Wedd et al.
Year	2019	2018	2020	2020	2017	2019	2018	2020	2020	2019
LOE	VI	V	V	VI	II	VI	VI	VI	II	VI
Design	QL/ ES	QL/ CSS	QT/ GT	QT/ RP CSS	RCT	QL/ DS	QL/ ID	QL/ GT	QT/RCT	QT/ RP CSS
Framework	HBM	UTA	PIS	SCT	SCT	TAM	RDI	FPE	HBM	SCT
No Evident Bias	X	X	X	X	X	X	X	X		X
USA	X		X	X	X	X		X	X	X
Netherlands		X								
Canada							X			
Size	17	439 PPU: 141 NPPU: 298	52 articles	13,483 PPU: 5,648 NPPU: 7,853	74	24 PPU: 14 NPPU: 9	26	40	164,205	710 PPU: 375 NPPU: 335
Female (%)		PPU: 55.3 NPPU: 49.3		PPU: 43.7 NPPU: 56.3	71.6	PPU: 80 NPPU: 56	69.2	20	58.3%	PPU: 23.5 NPPU: 19.7
Mean Age		PPU: 50 NPPU: 54		PPU: 54.3 NPPU: 55.6	57.4	PPU: 76.4 NPPU: 82.7	60-69 <i>age provided in categories</i>	65.9	46.2	PPU: 50.6 NPPU: 52.1
PP Reminders									X	
Chart Reviews				X					X	X

Key: CSS- cross sectional study DL- digital literacy DS- descriptive study DV- dependent variable ES- exploratory study FG- focus group FPE-framework for patient engagement FTF- face-to-face GT- grounded theory HBM- health belief model HL- health literacy ID- interpretive description LOE- level of evidence NPPU- non patient portal user PIS- Principles of implementation science PP- patient portal PPU- patient portal user QL- qualitative QT- quantitative RDI- Roger’s diffusion of innovations theory RP- retrospective SCT- Social Cognitive Theory SM- secure messaging TAM- technology acceptance model tx- transplants UNOS- United Network for Organ Sharing UTA- Unified theory of acceptance and use of technology ↑- increased ↓- decreased ▲- more likely to utilize patient portal ▼- less likely to utilize patient portal —- no effect

Questionnaire		X			X			X	
Interviews						X	X		
Full-text Review			X						
FG	X					X			
FTF Education					X				
Communication	↑				↑	▲		▲	
Younger Age		▲		▲					▲
Minorities				▼		▼			▼
Insured									▲
Higher HL		▲	▲						↑
Lower DL	▼		▼		▼	▼			
Chronically Ill		▲					▲		
Vaccine Uptake								↑	
Engagement			↑				↑	↑	
Satisfaction		↑						↑	
Empowerment							↑	↑	
Clinical Outcomes							—	—	—

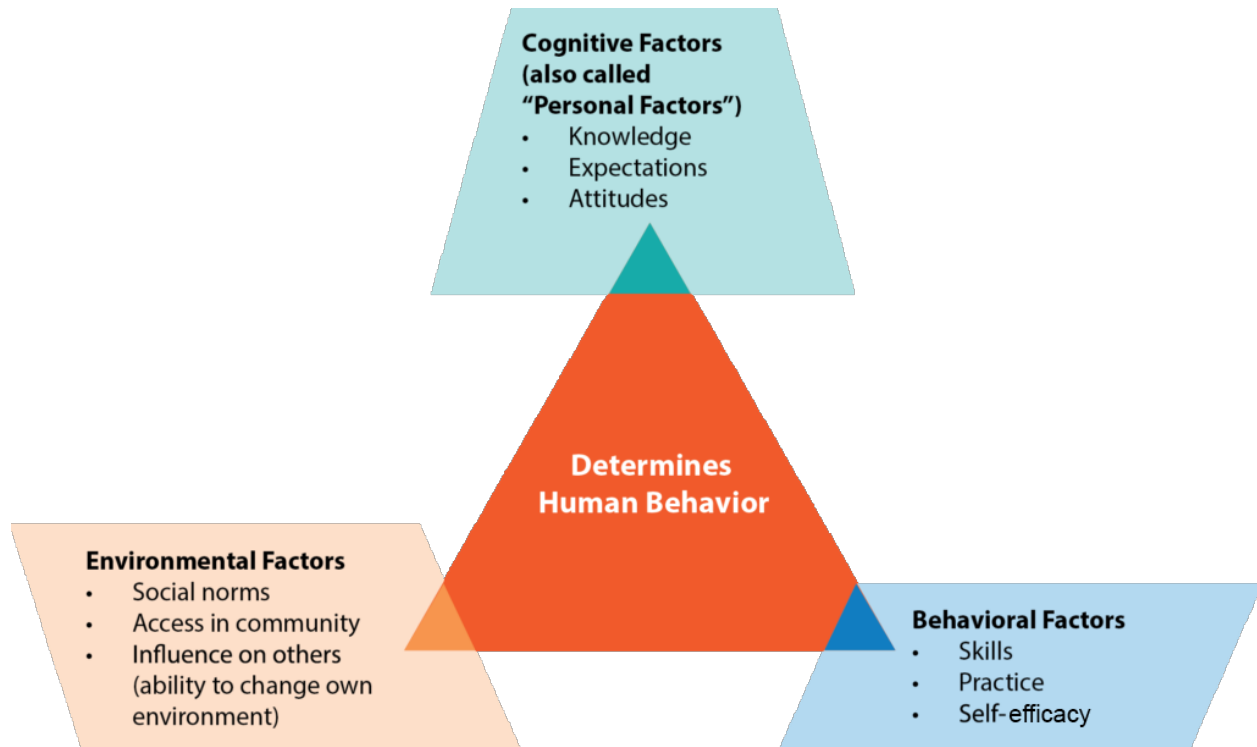
Key: **CSS**- cross sectional study **DL**- digital literacy **DS**- descriptive study **DV**- dependent variable **ES**- exploratory study **FG**- focus group **FPE**-framework for patient engagement **FTF**- face-to-face **GT**- grounded theory **HBM**- health belief model **HL**- health literacy **ID**- interpretive description **LOE**- level of evidence **NPPU**- non patient portal user **PIS**- Principles of implementation science **PP**- patient portal **PPU**- patient portal user **QL**- qualitative **QT**- quantitative **RDI**- Roger’s diffusion of innovations theory **RP**- retrospective **SCT**- Social Cognitive Theory **SM**- secure messaging **TAM**- technology acceptance model **tx**- transplants **UNOS**- United Network for Organ Sharing **UTA**- Unified theory of acceptance and use of technology ↑- increased ↓- decreased ▲- more likely to utilize patient portal ▼- less likely to utilize patient portal —- no effect

Appendix B

Theoretical Framework Models

Figure B1

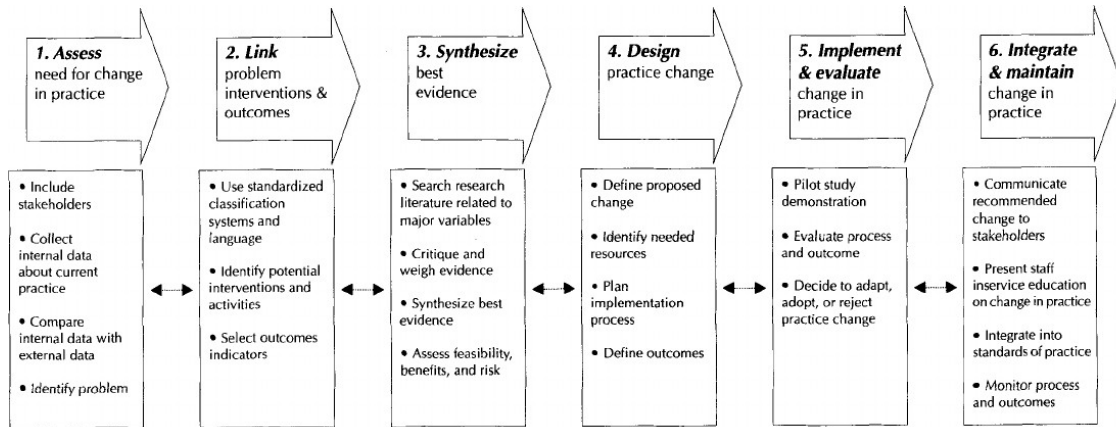
Social Cognitive Theory



(Health Communication Capacity Collaborative, n. d.)

Figure B2

Rosswurm and Larrabee Model



(Rosswurm & Larrabee, 1999)

Appendix C

Budget Table

Phase	Activities	Cost	subtotal	Total
Preparation	Create a video of benefits of patient portal use and instructions on how to use portal	\$0	\$0	\$0
	30 minutes spent with Medical Director/Site Champion to evaluate what she may want to be included in the educational video. Time spent away from patient care/ clinic duties	\$0	\$0	\$0
	Create Quick Response (QR) code to link with video	\$0	\$0	\$0
	Design and print 400 brochures with QR code on it (\$0.14 per page)	\$0.14	\$56	\$60
Delivery	No loss of productivity estimated	\$0	\$0	\$0
Evaluation	SPSS Software	\$47	\$47	\$47
Total				\$107
Funding	Project Facilitator			