

Use of Electronic Patient Messaging by Pregnant Patients Receiving Prenatal Care at an Academic Health System: A Retrospective Cohort Study

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Use of Electronic Patient Messaging by Pregnant Patients Receiving Prenatal Care at an Academic Health System: A Retrospective Cohort Study

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Abstract

Background: Use of electronic medical record (EMR) patient portal messaging has rarely been studied in maternity care.

Objective: This study aimed to estimate changes in patient portal use and intensity in prenatal care before and during the pandemic period.

Methods: In this study, patients seen for prenatal care at a large academic medical center were categorized by the number of secure messages sent during pregnancy as non-users, infrequent (?5), moderate (6-14), or frequent (?15). Monthly portal use intensity rates were computed over 43 months from 2018-2021 before to after the COVID pandemic shutdown. A logistic regression model was estimated to identify patient sociodemographic and clinical subgroups with the highest portal non-use.

Results: Among 12,380 patients, 21.7% never used the portal, and 21.6%, 30.3%, and 26.4% were infrequent, moderate, and frequent users, respectively. Portal use and intensity increased significantly over the study period, particularly after the pandemic. However, non-Hispanic Black, Hispanic, non-English-speaking, and Medicaid-insured patients continued to have significantly lower likelihoods of portal use. Patients with pre-existing comorbidities, hypertensive disorders of pregnancy, diabetes, and a history of mental health conditions were all significantly associated with higher portal use and intensity.

Conclusions: Reducing disparities in messaging use will require outreach and assistance to low use patient groups, including education addressing health literacy and encouraging appropriate and effective use of messaging.

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Original Manuscript

Use of Electronic Patient Messaging by Pregnant Patients Receiving Prenatal Care at an Academic Health System: A Retrospective Cohort Study

Abstract

Background: The COVID-19 pandemic has accelerated the utilization of telemedicine and mobile apps potentially changing our historic model of maternity care. In the context of mobile health (mhealth), MyChart is a widely adopted mobile application utilized in healthcare settings, specifically for its role in facilitating communication between healthcare providers and patients with its messaging function within a secure patient portal. However, previous studies analyzing portal use in obstetric populations have demonstrated significant socio-demographic disparities in portal enrollment and messaging, specifically showing that non-Hispanic black, black, uninsured, and poor patients were less likely to use patient portals.

Objective: The study aimed to estimate changes in patient portal use and intensity in prenatal care before and during the pandemic period and to identify sociodemographic and clinical disparities that continued during the pandemic.

Methods: This was a retrospective cohort study using electronic medical record (EMR) and administrative data from our health system Enterprise Data Warehouse. Records were obtained for the first pregnancy episode of all patients who received antenatal care at eight academically-affiliated practices and delivered at a large urban academic medical center hospital from January 1, 2018 to July 22, 2021 in Chicago, IL. The study includes all patients 18 years or older who attended at least three clinical encounters during pregnancy at the practices which used the EMR portal. In this study, patients seen for prenatal care at a large academic medical center were categorized by the number of secure messages sent during pregnancy as non-users, infrequent (≤ 5), moderate (6-14), or frequent (≥ 15). Monthly portal use intensity rates were computed over 43 months from 2018-2021 before, during and after the COVID pandemic shutdown. A logistic regression model was estimated to identify patient sociodemographic and clinical subgroups with the highest portal non-use.

Results: Among 12,380 patients, 21.7% never used the portal, and 21.6%, 30.3%, and 26.4% were infrequent, moderate, and frequent users, respectively. Portal use and intensity increased significantly over the study period, particularly after the pandemic. The number of non-using patients decreased between 2018 and 2021, from 28.3% in 2018 to only 13.0% in the first seven months of 2021. Conversely, the number of patients with 15 or more messages doubled from 18.2% in 2018 to 37.5% in 2021-22. The youngest patients, non-Hispanic Black and Hispanic patients, and particularly the non-English speaking patients had the highest odds of continued non-use ($P < .01$). Patients with pre-existing comorbidities, hypertensive disorders of pregnancy, diabetes, and a history of mental health conditions were all significantly associated with higher portal use and intensity ($P < .01$).

Conclusions: Reducing disparities in messaging use will require outreach and assistance to low use patient groups, including education addressing health literacy and encouraging appropriate and effective use of messaging.

Keywords: patient portal; secure messaging; telehealth; health literacy; health disparities

Introduction

As health systems have adopted electronic health records, patient portal platforms, including widely utilized mobile applications such as MyChart, have proliferated in both primary care and medical specialties, including obstetrics [1,2]. A patient portal is a secure web-based interface connected to the personal electronic health record. Through the patient portal, individuals are able to review their health record, schedule appointments, refill prescriptions, and conduct secure direct messaging with health care providers [3]. The advent of mobile applications such as MyChart, recognized as the #1 medical application in terms of downloads on the Apple App Store and amassing more than 10 million downloads on Google Play, underscores the portability of these features, facilitating secure communication between patients and healthcare providers. Patient portals, augmented by mobile applications such as MyChart, provide patients with a resource where they can readily communicate with providers and actively participate in their health care [4]. The COVID-19 pandemic has accelerated the utilization of telemedicine and eHealth potentially changing our historic model of maternity care [5].

Patient portal use has been steadily increasing since the 2009 Health Information Technology for Economic and Clinical Health (HITECH) Act and government financial incentives motivating adoption of required meaningful use of technology such as electronic patient portals [6]. Since patient portals have become more common in medical care, several studies have analyzed the effects of patient portals on clinical outcomes. In outpatient, primary care practices, the non-obstetrics literature has provided evidence that electronic portal use is associated with improved patient satisfaction and patient-provider communication [6]. Secure messaging within electronic patient portals has also been associated with positive clinical outcomes, for instance, in diabetes management patients who used the secure messaging feature were found to have lower Hemoglobin A1c values[7-14]. Additionally, pilot studies analyzing portal use in obstetric populations have suggested that portals can be a useful tool for management of complex medical comorbidities. A study evaluating portal usage and glucose control in an obstetric population found that patients who were active portal users were less likely to have within goal glycemic control, suggesting that pregnant patients with suboptimal glycemic control may have been more readily engaged in secure messaging with providers[15]. However, previous studies analyzing portal use in obstetric populations have demonstrated significant socio-demographic disparities in portal enrollment and messaging, specifically showing that non-Hispanic Black, Black, uninsured, and poor patients were less likely to enroll in and use patient portals [13]. The rapid expansion of patient portals raise concern that disparities in health outcomes and healthcare access may be further exacerbated due to disparities in technology

access and electronic health literacy which has been demonstrated in prior research [5,6]. Because of findings from previous studies that have suggested associations between patient portal use and improved clinical outcomes, there is a need to gain a deeper understanding of usage patterns and the factors influencing the use of patient portals during pregnancy [6-15].

It was therefore of interest to evaluate our health system's use of an obstetric patient portal in the context of the rapid expansion of telemedicine since after the start of the 2020 COVID-19 pandemic. The study aimed to estimate changes in patient portal use and intensity in prenatal care before and during the pandemic period and to identify sociodemographic and clinical disparities that continued during the pandemic.

Methods

This was a retrospective cohort study using electronic medical record (EMR) and administrative data from our health system Enterprise Data Warehouse. Records were obtained for the first pregnancy episode of all patients who received antenatal care at eight academically-affiliated practices and delivered at a large urban academic medical center hospital from January 1, 2018 to July 22, 2021 in Chicago, IL. The study includes all patients 18 years or older who attended at least three clinical encounters during pregnancy at the practices which used the EMR portal. The study was approved by the Institutional Review Board of Northwestern University.

Trends in Patient Portal Use and Message Frequency

Our health system faculty practices use EpicCare EMR and MyChart, the associated commercial patient portal. Patients can view records, review laboratory and imaging results, message providers, schedule appointments, and request medication refills via MyChart. During a clinical encounter, a provider can generate an individualized access code designated for portal enrollment or patients can self-enroll online in the portal via email without a prior access code. To gain access for portal use and functions, patients must activate their MyChart account through the portal website. The patient can then access MyChart through Web-based interfaces or mobile apps. A formal mechanism for declining the MyChart invitation is unavailable and all patients are considered to be enrolled in the portal, thus we were unable to analyze patients who were provided with a MyChart invitation but chose not to use the portal.

Only patient portal use for communication with obstetric providers (physicians, nurse practitioners, certified nurse midwives, or nurses within the Department of Obstetrics and Gynecology) was considered active use for this study. Communication with non-prenatal care

providers was excluded from this analysis, as we solely analyzed messaging use within the patient's prenatal practice. Patients were considered enrolled in the portal if they had an account at the time of delivery. Portal enrollment was not specifically analyzed in this study. Patients were considered portal users if they sent at least one secure message during pregnancy. Portal users were further categorized by intensity, which was classified by the number of secure messages sent during pregnancy as infrequent (≤ 5), moderate (6-14), or frequent (≥ 15). The categorization of portal use into infrequent, moderate or frequent categories was determined by assessing patient portal usage patterns within our clinic's prenatal practices. Patients sending fewer than 5 secure messages were classified as infrequent users, signifying limited engagement with the portal. Those send between 6 and 14 messages were categorized as moderate users, indicating moderate level of portal interaction. Patients sending more than 15 secure messages were considered frequent users, reflective active and regular portal engagement. These specific cutoff points were chosen to distinguish between different levels of patient portal engagement. Our data did not permit identification of 'threads' across messages involving multiple messages on the same issue, as this would require natural language processing of message texts which could identify specific issue content and the duration of threads across a given prenatal time interval.

Patient Portal Use by Patient Sociodemographic and Clinical Characteristics

Patient sociodemographic and clinical data were categorized using hospital administrative data and International Classification of Diseases (ICD-10) diagnosis and procedure codes, as well as prenatal visits, characterized as <9 , 9-12 or >12 . Maternal age was categorized as <20 , 20-24, 25-29, 30-34, 35-39, and ≥ 40 years at the time of prenatal care enrollment. Race and ethnicity were categorized as Hispanic, Non-Hispanic Black, Non-Hispanic White, Asian and Other/unknown. Additional sociodemographic characteristics that were collected included non-English language preference, antenatal care insurance status (Medicaid versus private/other), and residential ZIP code. Maternal residential zip codes in Illinois were matched to census zip code tabulation areas (ZCTAs) using the 2020 American Community Survey for the percentage of households living at or below the poverty level Individuals were categorized as living in ZCTA areas with $< 5\%$, 5%-9.99%, 10%-19.99%, or $> 20\%$ of households living at or below the poverty level, or being non-Illinois residents [16].

In addition to multifetal gestation and prior cesarean delivery, parity was categorized as either nulliparous, one, or two or more pregnancies. Maternal BMI at birth was categorized as normal

weight (≤ 24 kg/m²), overweight (25–29 kg/m²), or obese (≥ 30 kg/m²). We used ICD-10 data from the delivery admission to characterize the prevalence of any of a number of chronic conditions including cardiac disease, bleeding disorder, pulmonary hypertension, chronic renal disease, GI disease, HIV/AIDS, bariatric surgery, asthma, connective tissue or autoimmune disease, neuromuscular disease, and thyrotoxicosis. We also categorized patients as having a history of depression or severe mental illness (schizophrenia, bipolar disorder or psychosis), or substance use. We found that hospital ICD-10 coders had incorrectly coded *both* gestational and pre-existing diabetes and hypertension for a substantial number of delivery admissions. We therefore characterized diabetes and hypertension codes as either uniquely pre-existing only, gestational only, or coded for both.

Statistical Analysis

Monthly messaging intensity rates were computed to assess changes before and after the March 2020 pandemic. We determined the significance of bivariate differences in messaging frequency using chi square tests. We estimated a logistic regression model of the likelihood of zero portal use for patients who delivered from April 2020, during the 15 months after the end of the pandemic shut down in March 2022. Analyses were performed using IBM SPSS Statistics Version 28 (Armonk, NY).

Results

Trends in Portal Use and Message Frequency

A total of 12,380 patients were eligible for inclusion. In the total study period, 21.7% of patients were non-portal users, 21.6% were infrequent users, 30.3% were moderate users, and 26.4% were frequent users. Figure 1 displays portal usage rates by delivery date over the 43-month study period, denoting April 2020 (Month 28) as the full onset of the COVID-19 pandemic. There was a modest trend towards increased use in the first study years, followed by a rapid increase in use and a correspondingly dramatic reduction in non-use after the onset of the COVID-19 pandemic. The number of non-using patients decreased between 2018 and 2021, from 28.3% in 2018 to only 13.0% in the first seven months of 2021. Conversely, the number of patients with 15 or more messages doubled from 18.2% in 2018 to 37.5% in 2021-22.

Patient Portal Use by Sociodemographic and Clinical Characteristics

Table 1 displays patient characteristics by messaging intensity. The proportion of those with no portal use was correlated with the number of prenatal visits. Of the 19.6% of study patients with eight or fewer visits, 46.2% were non-users overall, as compared to only 10.8% non-users of the 36.5% of the sample with 12 or more visits. Those with the most prenatal visits had over three times the proportion of frequent messaging than those with the fewest visits. Higher parity was similarly correlated with lower message intensity.

Portal use was more frequent among those who were older, with the lowest messaging intensity among the youngest patients under age 25, who represented only 5.5% of all births. The highest messaging intensity was among patients over 30. Non-Hispanic Black patients had the highest proportion of non-use (44.0%) followed by Hispanic patients (35.4%) and non-English speaking patients (44.8%). While only 14% of the patient population, those with Medicaid had the highest proportion of non-use (63.3%) of any patient subgroup, and there was a clear poverty level gradient in messaging intensity across ZCTA areas.

Figure 2 presents change in portal use over time for patients with sociodemographic and clinical characteristics associated with high rates of portal non-use who delivered after April 2020. Patients with Medicaid births had a 21.6% reduction in their non-use rate post-pandemic. Similar large increases occurred for all the groups profiled including those with fewer prenatal visits, as well as younger, minority and poorer patients.

Odds of Pandemic Portal Non-use

Our logistic model of non-use, based on the 4,277 patients with post-pandemic deliveries, showed that the number of visits and parity remained strongly correlated with the likelihood of no portal use (Table 2). Those with <8 visits were 97% more likely to have been non-users than those with >12 prenatal visits, patients with 2+ parity were over three times more likely to be non-users than nulliparous patients. Confirming bivariate results for the whole period, the youngest patients, non-Hispanic Black and Hispanic patients, and particularly the non-English speaking patients had the highest odds of continued non-use. Patients with gestational diabetes were significantly more likely to be portal users, while patients with other comorbid conditions and those with pre-existing mental health conditions were also more likely to use the portal.

This study follows the STROBE guidelines for reporting observational research.

Table 1. Obstetric Patient Electronic Medical Record Portal Use by Number of Messages Sent during Pregnancy Patients with at Least Three Prenatal Visits*
N=12,380 Patients with Deliveries 1/2018-7/22/2021

	Sample Column Percent	Row Percent No Messages	Row Percent ≤5 Messages	Row Percent 6-14 Messages	Row Percent ≥15 Messages
All Patients	100 N=12,380	21.7 N=2681	21.6 N=2680	30.3 N=3754	26.4 N=3265
Delivery Year					
2019-2020	28.4	28.3	24.5	29.0	18.2
2020-2021	34.5	24.3	23.0	29.6	23.0
2021-7/2022	37.0	14.1	18.2	32.0	35.7
Prenatal Visits					
<9	19.6	46.2	21.5	21.2	11.1
9-12	43.9	19.7	23.7	31.5	25.1
>12	36.5	10.8	19.2	33.9	36.1
Route of Delivery					
Vaginal Delivery	74.6	21.4	22.4	31.0	25.2
Cesarean Section	25.4	22.5	19.4	28.3	29.9
Prior Cesarean Section	14.4	28.6	21.3	27.7	22.4
Multiple Gestation	3.6	26.3	20.5	25.9	27.2
Parity					
0	58.7	15.0	20.0	32.6	32.5
1	27.9	25.8	24.6	29.7	20.0
2+	13.4	42.4	22.9	21.9	12.8
Sociodemographic Characteristics					
Age					
<20	0.6	70.3	24.3	2.7	2.7
20-24	4.9	54.1	22.0	13.3	10.6
25-29	15.2	31.1	24.2	26.6	18.1
30-34	42.5	17.7	21.9	33.3	27.0
35-39	29.8	16.9	20.5	32.1	30.5
40+	7.1	18.6	18.7	26.9	35.9
Race/Ethnicity					
Asian/Pacific Islander	10.2	16.8	19.2	33.9	30.1
Hispanic	13.1	35.4	22.6	24.0	18.0
Non-Hispanic Black	14.3	44.0	20.6	20.1	15.4
Non-Hispanic White	50.4	13.3	21.7	33.8	31.1
Other/unknown	12.1	19.2	23.6	31.6	25.6
Medicaid	14.0	63.3	20.2	10.3	6.2
Non-English speaking	3.2	44.8	18.0	23.0	14.2
Zip-code Household Poverty					
<5%	39.2	14.9	20.6	34.6	29.9
5-9.99%	24.0	19.1	22.4	31.2	27.3

10-19.99%	25.1	27.8	22.9	26.1	23.3
20%	8.7	42.7	21.3	19.9	16.2
Non Illinois resident	3.0	18.5	19.9	33.6	28.0
Clinical Characteristics					
Body Mass Index at Delivery					
<18.5	11.1	18.9	21.2	31.2	28.7
18.5-29.9	38.7	17.7	23.1	32.2	27.1
>30	44.4	25.2	20.7	28.8	25.4
Anemia	12.6	28.9	19.4	25.1	26.6
Diabetes					
Pre-existing diabetes	2.4	24.1	14.1	24.4	37.5
Gestational diabetes	8.8	11.8	14.3	32.6	41.4
Pre-existing diabetes and gestational diabetes	2.7	19.0	10.8	28.9	41.3
Hypertension					
Pre-existing hypertension	5.4	27.5	18.8	23.1	30.7
Gestational hypertension	5.5	24.8	18.9	28.7	27.6
Pre-existing hypertension and gestational hypertension	2.6	26.3	14.6	28.2	31.0
Preeclampsia	1.1	27.7	17.7	22.0	32.6
Pre-existing comorbidity^a	15.9	20.3	29.7	27.6	31.4
History of Depression or Severe Mental Illness	31.9	16.9	18.5	30.2	34.5
Substance Use	2.5	36.2	17.6	22.1	24.0

*All comparisons $P < 0.01$ except preeclampsia.

^a Cardiac disease, bleeding disorder, pulmonary hypertension, chronic renal disease, gastrointestinal disease, HIV/AIDS, bariatric surgery, asthma, connective tissue or autoimmune disease, neuromuscular disease, and thyrotoxicosis, history of depression or severe mental illness (schizophrenia, bipolar disorder or psychosis), or substance use.

Table 2. Logistic Regression Results for Post-pandemic Obstetric Patient Non-use of Electronic Medical Record Portal Messaging
N=4277 Patients with Deliveries from April, 2020 to July 22, 2021

	OR (95% CI)
Year of Delivery	
2019-2020	
2020-2021	
2021-2022	REFERENCE
Sociodemographic Characteristics	
Age	
<20	3.58 (2.02-6.33)
20-24	1.90 (1.50-2.40)
25-29	1.24 (1.06-1.45)

30-34	REFERENCE
35-39	0.90 (0.79-1.03)
40+	0.84 (0.67-1.06)
Race/Ethnicity	
Asian/Pacific Islander	1.00 (0.82-1.22)
Hispanic	1.58 (1.33-1.87)
Non-Hispanic Black	1.83 (1.52-2.20)
Non-Hispanic White	REFERENCE
Other/unknown	1.18(0.99-1.40)
Medicaid insurance	4.27(3.64-5.01)
Non-English speaking	2.52(1.93-3.31)
Zip-code Household Poverty	
<5%	REFERENCE
5-9.99%	1.03 (0.89-1.19)
10-19.99%	1.14 (0.98-1.31)
20%	1.15 (0.93-1.43)
Non Illinois resident	1.00 (0.73-1.37)
Clinical Characteristics	
Anemia	0.95 (0.81-1.12)
Body Mass Index at Delivery	
<18.5	REFERENCE
18.5-29.9	0.87 (0.74-1.0`)
>30	0.96 (0.82-1.12)
Diabetes Coding	
Pre-existing diabetes	0.77 (0.53-1.12)
Gestational diabetes	0.34 (0.27-0.43)
Pre-existing diabetes and gestational diabetes	0.63 (0.44-0.90)
Hypertension Coding	
Pre-existing hypertension	1.16(0.91-1.79)
Gestational hypertension	1.11(0.88-1.41)
Pre-existing hypertension and gestational hypertension	1.09(0.86-1.38)
Preeclampsia	0.94(0.58-1.54)
Pre-existing comorbidity^a	0.81(0.69-0.94)
History of Depression or Severe Mental Illness	0.69(0.61-0.78)
Prenatal Visits	
<8	REFERENCE
9-12	0.33(0.29-0.38)
>13	0.19(0.16-0.22)
Route of Delivery	
Vaginal	REFERENCE
Cesarean Section	1.03(0.89-1.19)
Prior Cesarean Section	0.95(0.80-1.12)
Multiple Gestation	1.25(0.95-1.64)
Parity	
0	REFERENCE

1+	2.67(2.35-3.03)
2+	4.13(3.51-4.86)
Substance Abuse	1.33(0.96-1.82)

Figure 1. Pregnant Patient Portal Messaging Intensity
N=12,380 Patients with at Least Three Prenatal Visits with Deliveries 1/2018-7/22/2021

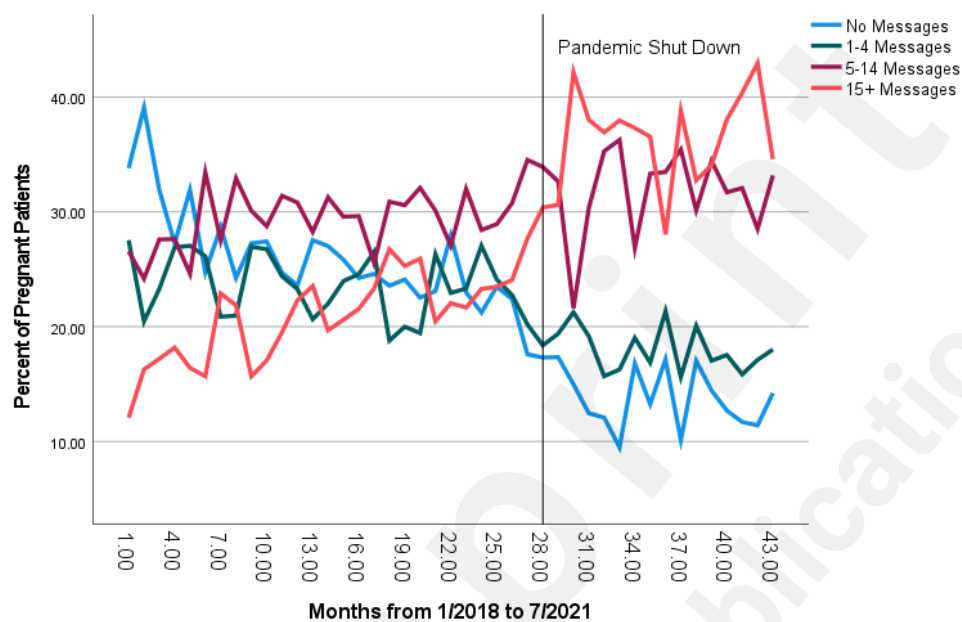
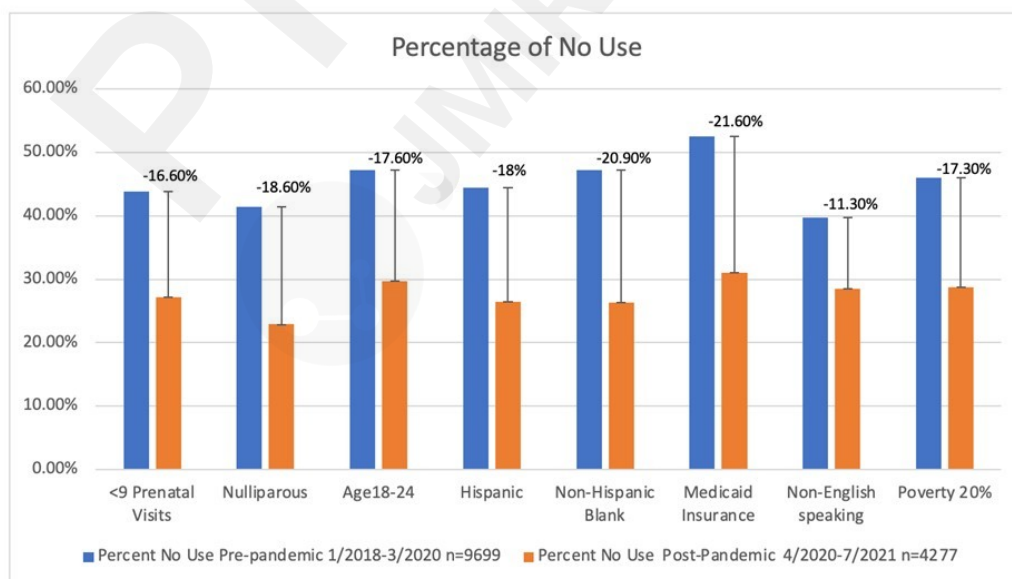


Figure 2. Change in the Proportion of Patients with Highest No Portal Use after the April 2020 Pandemic Shutdown



Discussion

This study was undertaken to guide efforts to improve prenatal portal use by addressing what were already known to be significant socioeconomic disparities in use. We found that messaging frequency significantly increased over the 43-month study period. Most notably there was a decline in non-use in the immediate post-pandemic period, approximately cutting in half the previous non-user population from 25.8% to 13.9%. However, pandemic non-use remains concentrated among patients with fewer prenatal visits, higher parity, public insurance, of younger age, non-English speaking, poorer and who identified as non-Hispanic Black or Hispanic. As hypothesized, patients with high-risk clinical conditions, such as history of depression or severe mental illness, pre-existing comorbidities, gestational or pre-existing diabetes, were more likely to use the portal and to be frequent messengers.

The socioeconomic disparities found in this cohort are consistent with prior literature analyzing patient portal use and messaging in obstetric and non-obstetric populations. It has been suggested in several studies that those who identify as non-white, are low income, and publicly insured are less likely to use the portal than their counterparts[6,17-21]. Numerous studies have demonstrated that non-Hispanic Black, Hispanic, poor and publicly insured or uninsured patients were less likely to activate and use portal messaging. A study of more than 1700 primary care patients receiving care at Kaiser Permanente Georgia showed that compared to non-Hispanic white participants non-Hispanic Black patients were less likely to register for electronic patient portals, even after controlling for differences in education, income, or internet access, which were also associated with portal registration [6]. Previous studies have shown conflicting conclusions regarding the associations of high-risk clinical characteristics and portal use intensity. For example, two studies within a primary care setting found that patients with chronic conditions and conditions associated with increased morbidity utilized the portal more often than healthier patients[8,21]. However, another study in a similar primary care setting conversely found that patients with fewer medical problems used the portal more often than patients with chronic conditions [22].

Potential Value of Increasing Patient Portal Use in Obstetrics

During the COVID-19 pandemic, health care providers have increasingly relied on telehealth and electronic communication methods for healthcare delivery and patient care [6,18,19]. Telehealth and electronic patient communication were especially important for obstetrics, due to the necessity to continue scheduled prenatal care visits and screenings. The findings in this study demonstrate that

messaging may have become a more important care function in the post-pandemic period despite the return to in person visits.

The antenatal period represents a critical time when healthcare engagement may influence both maternal and infant outcomes, however disparities in antenatal portal use have been identified. Several studies that analyzed portal use in the setting of gestational diabetes demonstrate greater portal use in antenatal patients who have chronic conditions and are at higher risk for pregnancy complications, however, other studies suggest that medically high-risk obstetric patients were less likely to enroll and use the portal [15,20,23-26]. This cohort's findings align with the former, demonstrating that participants with high risk clinical conditions, including pre-existing co-morbidities, pre-existing mental illness, and gestational diabetes are more likely to use the portal and use the portal frequently.

Implications for Improving Patient Communication with Providers in Obstetrics

With secure messaging patients can discuss a variety of topics, such as a change in condition, a new condition, laboratory results, and prescription concerns. A clinical example of impact of secure messaging is with the management of gestational diabetes mellitus (GDM). In this patient population, secure messaging serves as a platform for health care providers to stimulate patient engagement and self-management during a very disruptive obstetric complication.

Upon diagnosis of GDM, patients are bewildered how to alter lifestyle habits, shop and prepare for meals, let alone monitor blood glucose to keep their child safe. Unlike an office visit, secure messaging allows health care providers to instantly explain the diagnosis, send patient education tools, guides even YouTube instruction, so the patient can immediately launch into self-care management action. This patient action empowers patients to utilize secure messaging to maintain close communication with the health care providers. Secure messaging solidifies diabetes self- management for weekly review of blood glucoses in order to determine the need for insulin therapy. Another challenge in pregnancy, should insulin therapy be necessary, patients continue to engage in health restoration for self and child. Patient education on insulin administration can be provided via telemedicine or office visit with weekly glucose review for any insulin adjustment-- all through secure messaging for the remainder of the pregnancy. Though the literature has demonstrated telemedicine and mobile health as a modality to improve diabetes control, clinical metric significance or patient satisfaction of secure messaging is scant, but has shown to cause no harm. There is need for more research in this area.

It is clear that patient portals provide an additional avenue for patient provider-communication, however the disparities found in this paper show that the portal is not equally accessible to several socio-demographic groups.

An early obstetrics encounter is the best time to introduce patients to the value and usefulness of the patient portal. Often patients need assistance with setting up the patient portal. A mixed-methods study analyzing factors affecting patient portal use among low income pregnant women demonstrated that 33% of participants did not use the portal because they were unsure how to use the platform [26]. A practice message is always good to send while in the OB office so the patient is comfortable with the EMR messaging application. Discussion of what will be available to the patient such as lab results and appointment reminders can lead to discussing the benefit of sharing blood glucoses on a weekly basis. This can be crucial for medication and nutrition adjustment improve diabetes self-care during pregnancy.

It is apparent that there is a need for innovative strategies and interventions aimed at enrolling Medicaid beneficiaries, those in poverty, young patients, and racial/ethnic minorities. With increased cell phone usage rates among poor women, there is potential to increase portal usage through interventions aimed at portal use via mobile-apps.

Limitations

Given that this is a retrospective study, the associations made in this study can not be assumed to be causal and there is potential for unmeasured confounding. For example, this study did not have direct measures for health literacy, internet access, education level, or self-care behaviors which may play a role in portal use. Additionally, although this sample was large and diverse, patients in this study received care at a large academic tertiary care center and findings may not be fully generalizable to other health settings. Furthermore, portal enrollment was not specifically studied with this dataset, which is a parameter that has potential to highlight further sociodemographic and clinical disparities within portal use. As stated in the methodology, our data did not permit identification of ‘threads’ across messages involving multiple messages on the same issue, which would require natural language processing. This could be an important next step in messaging research.

Conclusion

Portal use has major implications for redesigning obstetric delivery systems. This study documents that portal use and messaging frequency at our center significantly increased in recent years, especially after the COVID 19 pandemic. Obstetric patients with high-risk chronic conditions are now more likely to use patient portals and to message frequently after the pandemic. However,

sociodemographic disparities continue to exist with portal use and intensity. Patient portals have the ability to encourage patient engagement and improve patient provider communication and shared-decision making. Inclusive health literacy strategies developed for obstetric patients, such as training for and encouragement of portal use, may be a strategy to reduce disparities and improve outcomes. Future studies should focus on evaluating health and digital literacy interventions to address disparities in portal use.

Conflicts of Interest

There was no funding for this article, there are no conflicts of interest and de-identified study data are available at reasonable request.

Abbreviations

EMR: electronic medical record

HITECH: Health Information Technology for Economic and Clinical Health

ICD: International Classification of Diseases

ZCTA: zip code tabulation areas

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Supplementary Files

Manuscript with tracked changes.

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