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Research and Applications

Disparities in Pediatric Patient Portal Activation and Feature Use

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ABSTRACT

Objective: Disparities in adult patient portal adoption are well-documented; however, less is known about disparities in portal adoption in pediatrics. This study examines the prevalence and factors associated with patient portal activation and the use of specific portal features in general pediatrics.

Materials and methods: We analyzed electronic health record data from 2012 to 2020 in a large academic medical center that offers both parent and adolescent portals. We summarized portal activation and use of select portal features (messaging, records access and management, appointment management, visit/admissions summaries, and interactive feature use). We used logistic regression to model factors associated with patient portal activation among all patients along with feature use and frequent feature use among ever users (ie, ≥1 portal use).

Results: Among 52 713 unique patients, 39% had activated the patient portal, including 36% of patients aged 0–11, 41% of patients aged 12–17, and 62% of patients aged 18–21 years. Among activated accounts, ever use of specific features ranged from 28% for visit/admission summaries to 92% for records access and management. Adjusted analyses showed patients with activated accounts were more likely to be adolescents or young adults, white, female, privately insured, and less socioeconomically vulnerable. Individual feature use among ever users generally followed the same pattern.

Conclusions: Our findings demonstrate that important disparities persist in portal adoption in pediatric populations, highlighting the need for strategies to promote equitable access to patient portals.

Key words: pediatrics, patient portal, digital divide, electronic health record

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BACKGROUND AND SIGNIFICANCE

Patient engagement and empowerment can facilitate improved clinical outcomes in health care delivery.[1] Health care organizations have implemented strategies to promote patient engagement through their electronic health records (EHR) systems, including offering patients access to patient portals.[2,3] Mixed patient satisfaction has been reported, with greater satisfaction associated with specific portal features, such as messaging.[4] Although there is limited evidence that portal use improves clinical outcomes, emerging evidence suggests an association between higher messaging activity and improved outcomes for metabolic diseases.[5] Meanwhile, several reviews have highlighted the existence and widening of patient-level disparities in portal activation and utilization patterns among adult patients.[2,6,7]

Pediatric portal activation rates have ranged from 1% to 64%, with recent studies reporting higher rates.[8–10] Although previous studies suggest that portal activation rates vary by age, insurer, income level, and race/ethnicity,[9,10] less is known on what patient-level factors are correlated with the use of specific portal features. Since portal use has been associated with improved outcomes,[3] further understanding of portal use metrics is warranted. Specifically, it is important to examine the frequency of portal use as frequent use may indicate higher patient engagement in health management. Addressing this gap may help inform interventions that optimize portal use among vulnerable populations of children, adolescents, and their families. To address this gap, the current study aimed to identify the rates and patient-level correlates of (1) portal activation, (2) ever use of portal features, and (3) frequent use of those features.

MATERIALS AND METHODS

Setting and sample

This study was conducted in a large academic health system located in North Central Florida that utilizes the Epic EHR system (Epic Systems, Verona, WI). The health system institutional review board approved the study protocol. At this institution, clinic staffs provide patients and/or parents with a portal activation code via email. If the account is not activated within 90 days the patient must request a new code. Patients 18 years and older may also sign up online without an activation code.

Parents of patients under 18 are offered a proxy portal account. In the case of children aged 0–11 years, parents may perform several tasks through the portal, including sending messages to the clinical team and viewing clinical notes. Upon turning 12 years old, adolescents can create their own adolescent portal account, allowing them to independently perform these same tasks. For parents of adolescents, their proxy accounts allow restricted access to adolescents' records to maximize confidentiality. Although parents can request an appointment for the adolescent, they are restricted from reading notes or messaging the clinician.

Data source

We obtained patient-level data from the EHR, including sociodemographic variables (age, sex, race, ethnicity, primary insurer, and socioeconomic vulnerability) and portal use measures, for all pediatric primary care patient visits between September 1, 2012 and July 30, 2020. We geocoded patient addresses to identify residential census tract, which was linked to the socioeconomic vulnerability (SEV) measure. All variables were assessed at the time of the most recent visit.

We identified 52 713 unique records. No more than 3% of the data had missing values for race and ethnicity. A total of 2.2% of patients lived outside of Florida and were not geocoded. Among Florida residents, 1679 gave a postal office box and 31 declined to give a residential address. These records could not be assigned to a census tract or SEV value. The remaining 43 221 records with residential addresses were geocoded to residential streets and census tracts.

Analytical variables

We used a retrospective, observational, and pooled cross-sectional design to assess the patient-level characteristics related to portal activation and use. We examined portal activation status among all patients. Among activated accounts, ever use (ie, at least one instance of portal utilization) and frequency of use were assessed for each of the portal features of interest.

We assessed the following patient covariates: age, sex, race, ethnicity, primary insurer, and socioeconomic vulnerability. Age was treated as a categorical variable, and age groups were defined as 0–11 years (younger children with parents using the portal), 12–17 years (adolescents whose parents are proxies), and 18–21 years (young adults who have full portal access without parental involvement). These age groups have been previously used in related research at the same health system.[21] We combined Medicare, Medicaid, and other public insurance plans into a "public" insurer group. For "private" insurers, we combined all commercial plans. All other plans (eg, worker's compensation) were categorized as "other." Socioeconomic vulnerability (SEV) is one component of the Centers for Disease Control and Prevention (CDC)'s Social Vulnerability Index. SEV is calculated using census tract-level data on income, poverty, education, and employment rates.[11] SEV was grouped into quartiles and treated as an ordinal variable.

Categorization of portal features was informed by a previous study that assessed correlates of portal activation and use among adult patients.[12] These categories include: medical record access and management (eg, viewing lab results and updating medications), appointment management, messaging, and visit/admission summaries. We also formed a dichotomous variable ("interactive feature use") that represents if the patient's account had ever accessed features that require information to be entered since these features are assumed to require greater patient engagement. Interactive feature use included updating patient information, completing questionnaires, requesting medication renewals, and sending messages.

Data analyses

We reported patient characteristics using descriptive statistics. Missing data were treated as a separate category per variable. We conducted bivariate analyses with the Pearson's chi-square test for all categorical variables. After identification of associations that were significant in the unadjusted analyses, we conducted a logistic regression analysis to control for possible confounding variables on the outcome variable. We then conducted five different logistic regression models to assess correlates of utilization for each of the four portal activities and interactive feature use among ever users. To investigate correlates of frequent portal use among ever users, we conducted an additional five logistic regression models that categorized portal use into quartiles. For each portal activity studied, we defined frequent users as all those in the top 25% for that feature. We considered $P < .05$ as the threshold for statistical significance. Bivariate and multivariate analyses were completed with Stata SE 16.0 (Stata-Corp LP, College Station, TX), and geocoding was completed with ArcGIS StreetMap Premium (ESRI, Redlands, CA). Data were obtained in 2020 and analyzed in 2021.

RESULTS

Among unique patient records ($n = 52\ 713$), most patients were between 0 and 11 years old (73.3%), white (55.4%), non-Hispanic (88.6%), and privately insured (47.1%). Overall, 38.6% of patients had activated portal accounts. Among patients with activated accounts, 9.8% had never used the portal. About one-third (36.0%) of adolescents had their own portal account.

Portal activation

In unadjusted analyses, significant differences in activation rates were observed across age groups, sex, race, insurer, and SEV.

Table 1. Sample characteristics and adjusted logistic regression results for pediatric patient portal activation ($N = 52\,713$)

Variables	Patients with portal accounts ($n = 20\,335$; 39%)	Patient without portal accounts ($n = 32\,378$; 61%)	P	Adjusted OR	95% CI	P
Age (years)			**<.001**			
0–11	13 902 (68.4%)	24 714 (76.3%)		Ref		
12–17	4329 (21.3%)	6352 (19.6%)		1.26	1.20–1.31	**<.001**
18–21	2104 (10.3%)	1312 (4.1%)		3.08	2.86–3.32	**<.001**
Sex			**<.001**			
Female	10 039 (49.4%)	15 709 (48.5%)		Ref		
Male	10 296 (50.6%)	16 669 (51.5%)		0.96	0.92–0.99	**.018**
Race			**<.001**			
White	11 664 (57.4%)	17 530 (54.1%)		Ref		
Black	5132 (25.2%)	9496 (29.3%)		0.91	0.87–0.95	**<.001**
Other	3133 (15.4%)	4524 (14.0%)		1.08	1.03–1.14	**.002**
Unknown	406 (2.0%)	828 (2.6%)		0.78	0.69–0.88	**<.001**
Ethnicity			.253			
Not Hispanic or Latino	17 957 (88.3%)	28 743 (88.8%)		—	—	—
Hispanic or Latino	1840 (9.0%)	2876 (8.8%)		—	—	—
Patient refused/unknown	525 (2.6%)	775 (2.4%)		—	—	—
Primary insurer			**<.001**			
Private	11 298 (55.6%)	13 515 (41.7%)		Ref		
Public	7431 (36.5%)	13 520 (41.8%)		0.73	0.70–0.76	**<.001**
Other	1606 (7.9%)	5343 (16.5%)		0.36	0.34–0.39	**<.001**
Social vulnerability			**<.001**			
Top 25% (least vulnerable)	3284 (16.1%)	4249 (13.1%)		Ref		
26–49%	4597 (22.6%)	6717 (20.7%)		0.92	0.87–0.98	**.009**
50–74%	3358 (16.5%)	6186 (19.1%)		0.80	0.75–0.85	**<.001**
7–100% (most vulnerable)	5330 (26.2%)	11 216 (34.6%)		0.73	0.69–0.78	**<.001**
Unknown	3766 (18.5%)	4010 (12.4%)		1.37	1.28–1.46	**<.001**

[a]Bold font indicates statistical significance ($P < .05$).

No differences were seen across ethnicity groups. In adjusted models, higher odds of portal activation were observed among adolescents and young adults when compared to parents of younger children, and lower odds were observed for male patients, Black or African American patients compared to white patients, patients with public insurance when compared to private insurance, and patients in the highest SEV quartile (most vulnerable) when compared to the lowest SEV quartile (Table 1).

Portal ever use and frequent use

Ever use of portal features ranged from 30% (visit/admission summaries) to 78% (records access and management) (Table 2). Table 3 displays the results of adjusted analyses of ever use for each of the activities examined among patients who ever used the portal ($N = 18\,342$). Results of adjusted analyses for frequent use of each of the activities studied are detailed in Table 4.

Records access and management

Higher odds of ever use of records access and management were observed among adolescents and young adults when compared to parents of young children and those having public insurance when compared to private insurance. Higher odds of frequent usage of this feature were observed among young adults when compared to parents of younger children and lower odds were observed among adolescents when compared to parents of the younger, male sex, Black or African American patients when compared to the white race, and those having public insurance compared to private insurance.

Appointment management

Higher odds of using appointment management features were observed among adolescents and young adults compared to parents of younger children and lower odds were observed among Black or African American race and those having public insurance when compared to private insurance. Higher odds of frequent use of these features were observed among young adults compared to parents of younger children, and being in the top 50–74% quartile of SEV when compared to the top 25% quartile. Lower odds of frequent use of these features were observed among adolescents when compared to parents of younger children, male sex, Black or African American patients when compared to the white race, and having public insurance when compared to private insurance.

Messaging

Higher odds of secure messaging ever use were observed among young adults when compared to younger children and lower odds were observed among adolescents when compared to parents of younger children, male sex, Black or African American race when compared to whites, and those having public insurance when compared to private insurance. Higher odds of frequent messaging were observed among young adults when compared to parents of younger children and lower odds were observed among adolescents when compared to parents of younger children, male sex, Black or African American race when compared to the white race, and those having public insurance when compared to private insurance.

Visit/admission summaries

Higher odds of ever use of visit/admission summary features were observed among young adults when compared to parents of younger

Table 2. Ever use of patient portal features by age group among patients with activated accounts

Functionality	Younger children 0–11 years (*N* = 13 902)	Adolescents 12–17 years (*N* = 4329)	Young adults 18–21 years (*N* = 2104)	Total (*N* = 20 335)
Records access and management	10 291 (74.0%)	3525 (81.4%)	1942 (92.3%)	15 758 (77.5%)
Appointment management	8993 (64.7%)	3083 (71.2%)	1850 (87.9%)	13 926 (68.5%)
Messaging	8409 (60.5%)	2357 (54.4%)	1621 (77.0%)	12 387 (60.9%)
Visit/admission summaries	3909 (28.1%)	1228 (28.4%)	1047 (49.8%)	6184 (30.4%)
Interactive feature use	9738 (70.0%)	2998 (69.3%)	1764 (83.8%)	14 500 (71.3%)
Any feature use[a]	12 243 (88.1%)	4039 (93.3%)	2060 (97.9%)	18 342 (90.2%)

[a]Defined as use of any of the four features studied.

Table 3. Adjusted odds ratios in multivariate analyses of correlates of patient portal feature use among ever users

Variables	Records access and management		Appointment management		Messaging		Visit/admission summaries		Interactive feature use	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Age (years)										
0–11	Ref		Ref		Ref		Ref		Ref	
12–17	**1.56****	1.43–1.70	**1.38****	1.28–1.49	**0.80****	0.75–0.86	1.03	0.96–1.12	0.98	0.91–1.06
18–21	**4.31****	3.65–5.10	**4.11****	3.58–4.72	**2.32****	2.08–2.59	**2.61****	2.37–2.87	**2.29****	2.02–2.59
Sex										
Female	Ref		Ref		Ref		Ref		Ref	
Male	0.98	0.92–1.05	0.97	0.92–1.03	**0.90****	0.85–0.95	**0.92***	0.86–0.98	**0.92***	0.87–0.98
Race										
White	Ref		Ref		Ref		Ref		Ref	
Black	1.43	0.90–1.07	**0.82****	0.76–0.89	**0.71****	0.66–0.76	**0.80****	0.73–0.86	**0.87****	0.81–0.94
Other	**1.25****	1.13–1.38	1.06	0.97–1.15	1.03	0.95–1.12	1.06	0.98–1.16	**1.19****	1.09–1.30
Unknown	0.94	0.75–1.18	**0.48****	0.39–0.59	**0.47****	0.38–0.57	**0.50****	0.39–0.65	1.04	0.83–1.29
Primary insurer										
Private	Ref		Ref		Ref		Ref		Ref	
Public	**1.16****	1.08–1.26	**0.91***	0.85–0.97	**0.83****	0.78–0.89	**0.73****	0.68–0.78	1.04	0.97–1.11
Other	**1.09***	0.77–1.00	**0.92****	0.72–0.91	**0.72***	0.65–0.80	**0.80****	0.72–0.90	**0.88***	0.78–0.99
Social vulnerability										
Top 25% (least vulnerable)	Ref		Ref		Ref		Ref		Ref	
26–49%	1.01	0.91–1.12	1.01	0.92–1.11	1.01	0.92–1.11	1.02	0.92–1.12	0.97	0.88–1.07
50–74%	1.03	0.92–1.15	1.04	0.94–1.15	1.02	0.93–1.13	1.01	0.91–1.12	0.98	0.89–1.09
75–100% (Most vulnerable)	1.06	0.95–1.20	1.03	0.93–1.15	1.02	0.92–1.13	0.96	0.87–1.07	1.02	0.91–1.13
Unknown	**0.89***	0.79–1.00	1.05	0.95–1.16	1.04	0.94–1.15	1.06	0.96–1.18	**0.88***	0.79–0.98

[a]Boldface indicates statistical significance (*P < .05, **P < .01, ***P < .001).
OR: odds ratio; CI: confidence interval.

children and lower odds were observed among male sex Black or African American race when compared to whites, and those having public insurance when compared to private insurance. Higher odds of utilizing visit and admission summary features frequently were observed among young adults compared to parents of younger children and lower odds were observed among male sex, Black or African American patients when compared to whites, and those having public insurance when compared to private insurance.

Interactive feature use

Higher odds of interactive feature ever use were observed among young adults compared to parents of younger children and lower odds were observed among male sex and Black or African American patients when compared to whites. Higher odds of frequent interactive feature use were observed among young adults compared to

parents of younger children and lower odds were observed among adolescents when compared to parents of younger children, male sex, Black or African American race when compared to the white race, and those having public insurance when compared to private insurance.

DISCUSSION

This study identified patient characteristics associated with patient portal activation as well as the use of portal features among general pediatric populations. Portal activation was less likely for patients who were younger, male, Black, publicly insured, and more socioeconomically vulnerable. Individual feature use among ever users generally followed the same pattern, with the exception of socioeconomic vulnerability. This research demonstrates that disparities ob-

Table 4. Adjusted odds ratios in multivariate analyses of frequent patient portal feature use among ever users

Variables	Records access and management		Appointment management		Messaging		Visit/admission summaries		Interactive feature use	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Age (years)										
0–11	Ref		Ref		Ref		Ref		Ref	
12–17	**0.85*****	0.78–0.93	**0.63*****	0.57–0.69	**0.74*****	0.68–0.81	0.99	0.91–1.08)	**0.72*****	0.66–0.79
18–21	**2.55*****	2.31–2.81	**1.65*****	1.49–1.83	**2.01*****	1.82–2.22	**2.40*****	2.17–2.66)	**1.95****	1.76–2.15
Sex										
Female	Ref		Ref		Ref		Ref		Ref	
Male	**0.80*****	0.75–0.86	**0.82*****	0.77–0.88	**0.86*****	0.81–0.92	**0.91***	0.85–0.98)	**0.87*****	0.81–0.92
Race										
White	Ref		Ref		Ref		Ref		Ref	
Black	**0.70*****	0.64–0.76	**0.73*****	0.67–0.80	**0.64*****	0.58–0.69	**0.79*****	0.72–0.86	**0.65*****	0.59–0.70
Other	0.96	0.88–1.05	0.95	0.87–1.05	0.94	0.86–1.03	0.99	0.90–1.09)	0.94	0.86–1.02
Unknown	**0.36*****	0.26–0.50	**0.39*****	0.29–0.54	**0.32*****	0.23–0.44	**0.48*****	0.35–0.67	0.36	0.27–0.49
Primary insurer										
Private	Ref		Ref		Ref		Ref		Ref	
Public	**0.88*****	0.81–0.94	**0.91***	0.84–0.98	**0.86*****	0.80–0.92	**0.71*****	0.65–0.76	**0.85*****	0.79–0.91
Other	**0.60*****	0.52–0.69	**0.53*****	0.46–0.62	**0.61*****	0.53–0.69	**0.83****	0.73–0.95	**0.61*****	0.54–0.70
Social vulnerability										
Top 25% (least vulnerable)	—	—	Ref		Ref		—	—	Ref	
26–49%	—	—	1.04	0.93–1.16	1.01	0.95–1.11	—	—	1.00	0.90–1.11
50–74%	—	—	**1.16***	1.03–1.29	1.07	0.96–1.19	—	—	1.08	0.97–1.20
75–100% (most vulnerable)	—	—	1.01	0.90–1.14	0.95	0.85–1.07	—	—	0.95	0.85–1.06
Unknown	—	—	1.08	0.96–1.21	1.13	1.01–1.26	—	—	1.11	0.99–1.24

[a]Boldface indicates statistical significance (*$P < .05$, **$P < .01$, ***$P < .001$).

OR: odds ratio; CI: confidence interval.

served in patient portal adoption and the use in adults are also present in pediatric populations.

The patient portal activation rate in our sample was lower than a recent study conducted in another academic healthcare system.[10] This may be partially explained by the fact that our sample had a higher proportion of publicly insured patients, who are less likely to use patient portals. Our findings that portal activation may not lead to subsequent portal utilization are consistent with prior studies.[10,13] These findings highlight the need to identify reasons for nonuse among patients with portal accounts and design strategies to enhance patient engagement after portal enrollment.

The observed disparities in portal activation and use by age, race, sex, primary insurer, and socioeconomic vulnerability are consistent with other studies among adult and pediatric populations,[9,14–16] suggesting that these disparities are pervasive and require mitigation. The disparities observed in this study may have several causes. Research has found that racial minorities and patients with lower socioeconomic status are less likely to be offered patient portal enrollment.[17,18] Patients may face logistical challenges to completing the activation process, face language or literacy barriers, see little benefit to using the portal, fear that the portal may negatively impact their relationship with their physician, or have concerns about data security and privacy.[19,20] Many recommendations for reducing these disparities have been proposed, including more intensive and tailored portal promotion, designing materials that are appropriate for patients with low literacy levels, and implementation of universal portal access policies.[20]

We found that portal activation was more likely among adolescents and young adults than parents of younger children. Over one-third of adolescent patients had access to their own account. This rate is higher than findings from previous studies in healthcare systems with minimal restrictions on parent proxy access.[9,21] This points to the importance of ensuring confidentiality to enhance adolescent engagement with patient portals. These findings highlight the need for consistent guidelines for protecting adolescent privacy in patient portals.[22,23]

Our findings should be interpreted under the following limitations. First, this study used data from one health system, limiting its generalizability. Second, we utilized patient-level data as opposed to granular data on patient portal visits, preventing us from determining which portal visits were made by adolescents or parents with proxy access. Third, the study site used an adolescent portal model that aims to protect adolescent confidentiality. Results may not generalize to organizations that utilize other patient portal privacy models.[24]

CONCLUSION

This study revealed that, among a general pediatrics population, important patient-level disparities exist in patient portal activation, as well as in ever use and frequent use of examined portal features. Further research is needed to identify reasons patients do not activate or use patient portal accounts to better improve patient engagement via the portal among children, adolescents, and young adults.

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AUTHOR CONTRIBUTIONS

RGS conceptualized the study. JHL, ON, LAT, and RGS drafted the manuscript. All authors participated in the analyses and interpretation of data. JH, HDC, RA, JB, and CAH provided critical revisions to the manuscript. All authors approved the submission.

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DATA AVAILABILITY

The data underlying this article are available in the Dryad Digital Repository.

CONFLICT OF INTEREST STATEMENT

None declared.

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