Individual QI projects from single institutions

OPEN

Patient Portal Enrollment for Discharged Pediatric Emergency Department Patients: A Multidisciplinary Quality Improvement Project

Sarah C. Isbey, MD; Sephora N. Morrison, MD*; Sonya M. Burroughs, MD†; Jaclyn N. Kline, MD**

ABSTRACT

Introduction: Patient portal enrollment following pediatric emergency department (ED) visits allows access to critical results, physician documentation, and telehealth follow-up options. Despite these advantages, there are many challenges to portal invitation and enrollment. Our primary objective was to improve patient portal enrollment rates for discharged pediatric ED patients. **Methods:** A multidisciplinary team of staff from two ED sites developed successful portal enrollment interventions through sequential Plan-Do-Study-Act cycles from October 2020 to October 2021. Interventions included a new invitation process, changes to patient paperwork on ED arrival, staff portal education, and changes to discharge paperwork and the portal website. The team utilized statistical process control charts to track the percentage of eligible discharged patients who received a portal invitation (process measure) and enrolled in the patient portal. **Results:** Before the study's initiation, less than 1% of eligible patients received patient portal invites or enrolled in the patient portal. Statistical process control charts revealed significant changes in enrollment and baseline shift at both a large academic ED campus and a satellite ED site by May 2021. Improvements in invitation rates were also observed at both campuses. Changes were sustained for over 6 months at both locations. **Conclusions:** High-reliability interventions and a multidisciplinary approach allowed for significant and sustained improvement in patient portal invitation and enrollment rates in eligible pediatric ED patients. Future study will examine enrollment patterns across patient demographics and further high-reliability interventions.
(Pediatr Qual Saf 2024;9:e718; doi: 10.1097/pq9.0000000000000718; Published online April 3, 2024.)

INTRODUCTION

In 2009, the Health Information Technology for Economic and Clinical Health Act published meaningful use rules stating that the electronic health record should be used for effective health information exchange.[1] Patient portals offer communication between patients or their guardians and healthcare teams, provide laboratory and radiology results, and allow for self-scheduling of appointments.[2] Since the 21st Century Cures Act (Cures Act) in April 2021, immediate access to results and patient documentation has further increased portal utility.[3] Patient portal access improves patient satisfaction and customer retention.[2,4,5] These measures became more important during the Coronavirus Disease pandemic of 2019 (COVID-19). Pediatric emergency department (ED) patient visit numbers dropped precipitously with the onset of the pandemic, leading EDs to think innovatively about care delivery, including telehealth options.[6,7] Access to a patient portal can increase these alternate care options and facilitate return to school and work.[5,6,8]

Patient portal invitation and sign-up are particularly challenging in the pediatric population. Prior studies have reported significant differences in portal access based on race and patient age,[9–12] both in adult and pediatric populations. Among those accessing a patient portal, laboratory results are some of the most accessed results; this became critical during the COVID-19 pandemic because patients require testing and verified results for return to work and school.[10,13,14] Recent studies have shown that since the pandemic onset, patients highly favor protected health information digitization, and the current healthcare climate may represent a pivotal time for patient portal uptake.[5,12]

*From the *Division of Emergency Medicine, Children's National Hospital, The George Washington University School of Medicine and Health Sciences, Washington, DC; and †Clinical Informatics, Children's National Hospital, Washington, DC.*

**Corresponding Author. Address: Sarah Isbey, MD, 111 MI Avenue NW, Washington, DC 20010*
Email: sisbey@childrensnational.org

Supplemental digital content is available for this article. Clickable URL citations appear in the text.
Presented (as poster) at American Academy of Pediatrics, October 2021.

Disclosure: The authors have no financial interest to declare in relation to the content of this article.

To cite: Isbey SC, Morrison SN, Burroughs SM, Kline JN. Patient Portal Enrollment for Discharged Pediatric Emergency Department Patients: A Multidisciplinary Quality Improvement Project. Pediatr Qual Saf 2024;9:e718.

Received for publication September 12, 2023; Accepted January 17, 2024.

Published online April 3, 2024

DOI: 10.1097/pq9.0000000000000718

Before our project's initiation, patient portal invitations were not routinely sent from the ED, and enrollment was difficult for families. Given the literature showing the importance of the portal, our team felt it was imperative to improve this process. The aim of this quality improvement (QI) initiative was to increase the percentage of eligible ED patients who enroll in the patient portal within 10 days of ED discharge from less than 1% to 5% by May 31, 2021, and sustain for 6 months. We chose 5% as a target, as we wanted to first assess for incremental change as we implemented a new process.

METHODS

Context

We conducted this study at two campuses associated with a large, freestanding academic children's hospital with over 300 beds. Our hospital is the only quaternary care pediatric referral center serving a population exceeding half a million children under the age of 18 in our area.[15] Our larger, main campus ED has 43 beds and over 100,000 patient visits per year. A smaller satellite ED site has 14 beds and over 30,000 patient visits per year. Both ED sites are continuously staffed with pediatric emergency medicine physicians, and general pediatricians, residents, nurse practitioners, and physician assistants. Registration staff is always on-site. Before this project, there was no formal portal invitation process for ED patients. At the start of this project, we trained our patient registration staff how to send invitations. In an ideal workflow, each patient who registers in the ED is emailed an active link for patient portal enrollment during their visit. Although the registration staff is primarily responsible for invitations, any provider or nurse can send an invitation.

All patients discharged from the ED were included. Patients who were admitted were excluded to avoid confounding results with inpatient portal enrollment initiatives; deceased patients were also excluded. From October 2020 to March 2021, patients aged 13 to 17 were excluded, as proxy invitations for parents required a call for invitation. Following the implementation of the Cures Act, our institutional policies changed regarding invitation processes for patients aged 13 to 17, which allowed parental invitation with automatic restriction of privileged information. Therefore, from April 2021 onward, all ages were included in our analysis. Because registration staff cannot visualize enrollment status from the invitation page, prior portal enrollment was not an exclusion criterion. This project was undertaken as a QI initiative and, therefore does not constitute human subjects research and does not require oversight of the institutional review board.

Before initiating our project, we developed a specific, measurable aim statement to increase the percentage of discharged ED patients who subsequently enroll in the patient portal by 10 days after discharge from less than 1% to greater than 5% and sustain that improvement for 6 months. We chose 10 days as our cutoff for portal enrollment as patients receive the initial invite and 2 reminders by 10 days. We collected baseline weekly data before the start of interventions and tracked weekly invite and enrollment percentages after intervention initiations. A multidisciplinary QI team was created, including ED physicians, an ED physician assistant, an ED nurse, Clinical Informatics physicians and staff, and ED registration staff. The team convened in September 2020 for the first meeting, just before the go-live of the portal invitation process. The team completed a process map of the patient flow from initial registration through discharge.[16,17] We created a fishbone diagram in addition to this process map to identify possible causes of failures in the system. (**See figure 1, Supplemental Digital Content,** which shows the Fishbone diagram created by our multidisciplinary team to show possible root causes and areas of challenge regarding the enrollment process for the patient portal. **http://links.lww.com/PQ9/A543**.) Based on these failures and review of current literature, we identified key drivers and targeted interventions to address these drivers (Fig. 1).

Interventions

At go-live in October 2020, ED registration staff gained access to the patient portal invitation process. Several interventions based on our key driver diagram were initiated to target patient invitation rates and patient portal enrollment rates (**See table, Supplemental Digital Content 2,** which shows study interventions, including date of intervention and corresponding number on control chart figures, with a brief description of each intervention. **http://links.lww.com/PQ9/A544**.) Three distinct groups of interventions emerged throughout the project: patient registration interventions, educational interventions, and information technology infrastructure changes.

Interventions on Patient Registration

Patient registration staff were educated about the portal invite process before project initiation. In March 2021, article intake forms were updated. These forms are used by staff during times of high census to improve information collection, including pertinent portal invite information. In August 2021, our team implemented an improved invitation process for staff with fewer "clicks" and clearer confirmation for the registration staff that an invitation was sent.

Educational Interventions

We launched education initiatives for all providers, including specific education initiatives for the physician staff (January 2021) and the APP (Advanced Practice Provider) staff (February 2021). The standard process is for registration staff to invite all patients, but after obtaining baseline data, we empowered our faculty and APP staff to send invites as a backup process. Additionally, our APP staff completes results follow-up calls, and fields patient phone calls daily. We educated

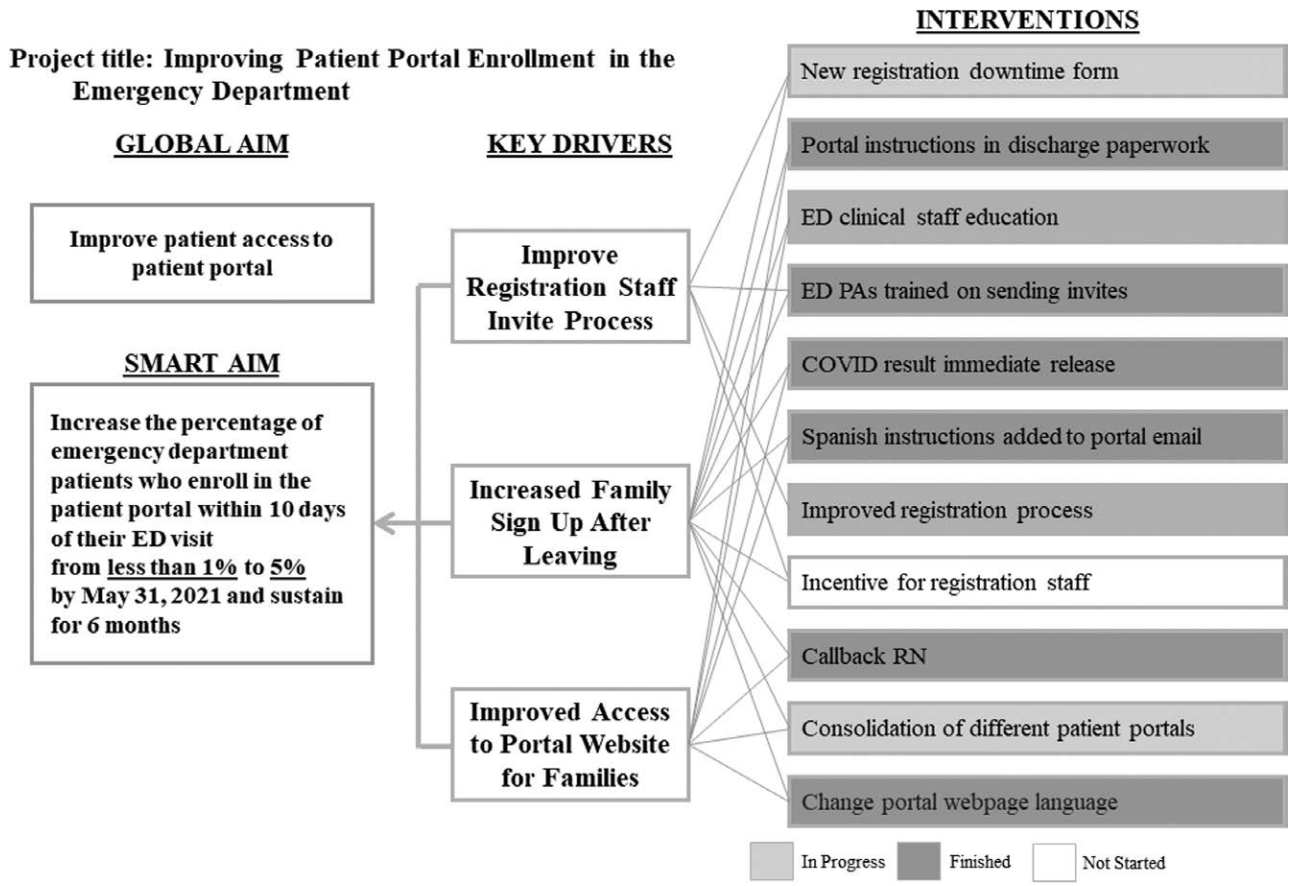

Fig. 1. Key driver diagram of patient portal enrollment initiative in the ED including all pertinent interventions.

staff through several initiatives, including presentations regarding portal functionality and demonstrations of how to send patient portal invites. Staff also received an enrollment instruction manual. A few staff received one-on-one lessons on the portal invite process. Repeat education after new faculty and APP hiring also occurred (July 2021). We also utilized a follow-up nurse to educate families about the portal and assist with portal enrollment (August and September 2021). This follow-up RN called all canceled admissions, sedations, and high-acuity discharges 5 days a week. This RN was asked to highlight the portal's functions and, if the patient or their family had not previously received a portal invite, send an invite in real-time.

Interventions Involving Health Technology

Multiple information technology-related interventions occurred over the length of the project. COVID-19 laboratory results were moved from a 1–3 day lag to immediate release for patient and parent use (November 2021). After this change, discharge instructions were edited to highlight the patient portal and the immediate availability of COVID-19 test results (December 2021). Concurrently, we changed the landing page for the patient portal to reflect which portal site would allow access to ED visit information, as our institution had separate patient portal sites for general pediatric ambulatory care and subspecialty/inpatient care at the time of this project. The portal email invitation was updated to include all information in both English and Spanish (August 2021).

Data Collection

We measured invite and enrollment percentages weekly with frequent team meetings to review data and plan interventions. Dates of key external influences, including the implementation of the Cures Act (April 2021) and significant changes in ED volumes (June 2021), were noted. To calculate invite percentages, we looked at weekly data for each location. A patient was counted as receiving an invite if they were sent an invitation between the time of registration up to 7 days after discharge. A patient was counted as enrolling in the patient portal if they claimed the patient portal invite any time between time of registration and 10 days after discharge. At the project's initiation, we reviewed randomly chosen financial identification numbers to ensure that patient chart records for portal invitation and portal enrollment matched our dataset output. We did not find discordant data in our review.

Analysis

To analyze our data, statistical process control (SPC) charts were created using weekly data. Significant shifts

in the measures (ie, special cause variation) were prospectively identified using traditional rules for patterns on SPC.[18] In all cases for the p-charts in this project, special cause variation and subsequent center-line shift occurred when eight consecutive measurements were above or below the center line. All SPC charts were created using QI Macros for Excel, version 2019.03 (Know Ware International Inc. Denver, Colo.).

RESULTS

From October 4, 2020, to October 30, 2021, our larger ED site had 49,846 unique patient visits eligible for invitation and 50,609 unique visits eligible for enrollment. Our smaller satellite ED site saw 20,749 unique patient visits eligible for invitation and 22,052 unique visits eligible for enrollment. Baseline rates were calculated for the first 8 weeks of invite functionality (6469 unique visits across the 2 sites). At study initiation, baseline portal enrollment rates were 0.9% and 1% at larger and smaller campuses, respectively (Fig. 2). After the first three interventions (including immediate release of COVID results, portal discharge paperwork standardization, and an updated portal website), both the main and satellite sites experienced a shift in the center line for enrollment percentages (0.9%–3.1% and 1.0%–5.4%, respectively)

At our larger campus, further improvements in enrollment were seen after education initiatives for both physician staff meetings and the physician assistant/nurse practitioner staff meetings, with a second shift in the center line surrounding these interventions (3.1%–8.1%). We experienced a decrease in enrollment percentages and subsequent drop in our center line after changes to the invitation process were implemented following the Cures Act in April 2021 (8.1%–5.9%). After repeated education initiatives and the utilization of a follow-up registered nurse (RN), we saw sustained improvement in enrollment percentages and a fourth center-line shift (5.9-10%). With updates to improve and streamline the invitation process, this improvement was sustained despite discontinuation of the follow-up RN. Improvement from baseline was maintained for 13 months after the initial center-line shift.

Our smaller campus experienced a similar pattern of improvement, though the first center-line shift lagged our main campus. Educational initiatives sustained this center-line shift until a subsequent decrease in the percentage following Cures Act implementation (5.4%–2.8%). There was significant and sustained improvement despite increased ED volumes with repeated education and follow-up RN implementation (2.8%–10.7%). There was a notable decrease in enrollment after discontinuation of the follow-up RN program, which was not observed at the larger campus; enrollment became more variable without this program in place.

Invitation rates were tracked as a process measure. At study initiation, baseline portal invitation rates were low (2.7% and 4.6% at the larger and smaller campuses, respectively) (Fig. 3). At our larger campus, sustained improvement was seen with four center-line shifts toward the goal. An expected decrease in the invite percentage was seen with changes in the invitation process following the Cures Act, with subsequent increases with further initiatives to 34%, which was maintained despite no additional interventions. At our smaller campus, similar patterns were seen. However, an improvement in invitation percentages and center-line shift occurred after more interventions had taken place, and there was a drop in the percentage and subsequent center-line shift down around the time of the Cures Act (19.5%–15.6%). As seen at the larger campus, the following interventions were associated with improvements in invite rates and two additional center-line shifts (18.3% and 29.9%). This final center-line shift was maintained.

DISCUSSION

Summary and Interpretations

This single-center QI initiative improved patient portal enrollment in the pediatric ED and showed sustained improvement using multiple interventions with iterative improvements. Our most effective interventions involved education for ED clinical staff, improvements to the patient website, streamlining the invite process for patient access staff, and implementing a dedicated callback nurse to assist families after discharge.

Prior pediatric studies have focused on enrollment within subspecialty or primary care populations.[19,20] Both single-center retrospective reviews of portal use in large pediatric institutions found that messaging and test result review were the most heavily used functions, with variable portal use for appointment scheduling.[19,20] After an ED visit, these functions are especially pertinent as patients reconnect with their primary teams or share test results with their pediatrician. Additionally, portal access for COVID-19 test results likely led to increased use.[21]

More broadly, health information access has changed significantly since the Cures Act. Recent studies assessing pediatric caregivers' and pediatric patients' opinions on the portal have been positive and highlighted improved understanding of patient health and communication.[22] This improved access highlights the importance of successful invitation and enrollment after an ED visit. However, there are significant variations in access by age, race, ethnicity, and language in pediatric and adult patients that should be considered for future work in this area.[12,23] To our knowledge, this is the first study examining patient portal enrollment in the pediatric ED focusing on improving both the invitation and enrollment processes. Prior pediatric specific work has focused largely on subspecialty enrollment, showing differences in invitation and enrollment rates based on clinic site, ethnicity, race, and language.[9,11] Our work builds on these prior studies by examining patients within the unique ED

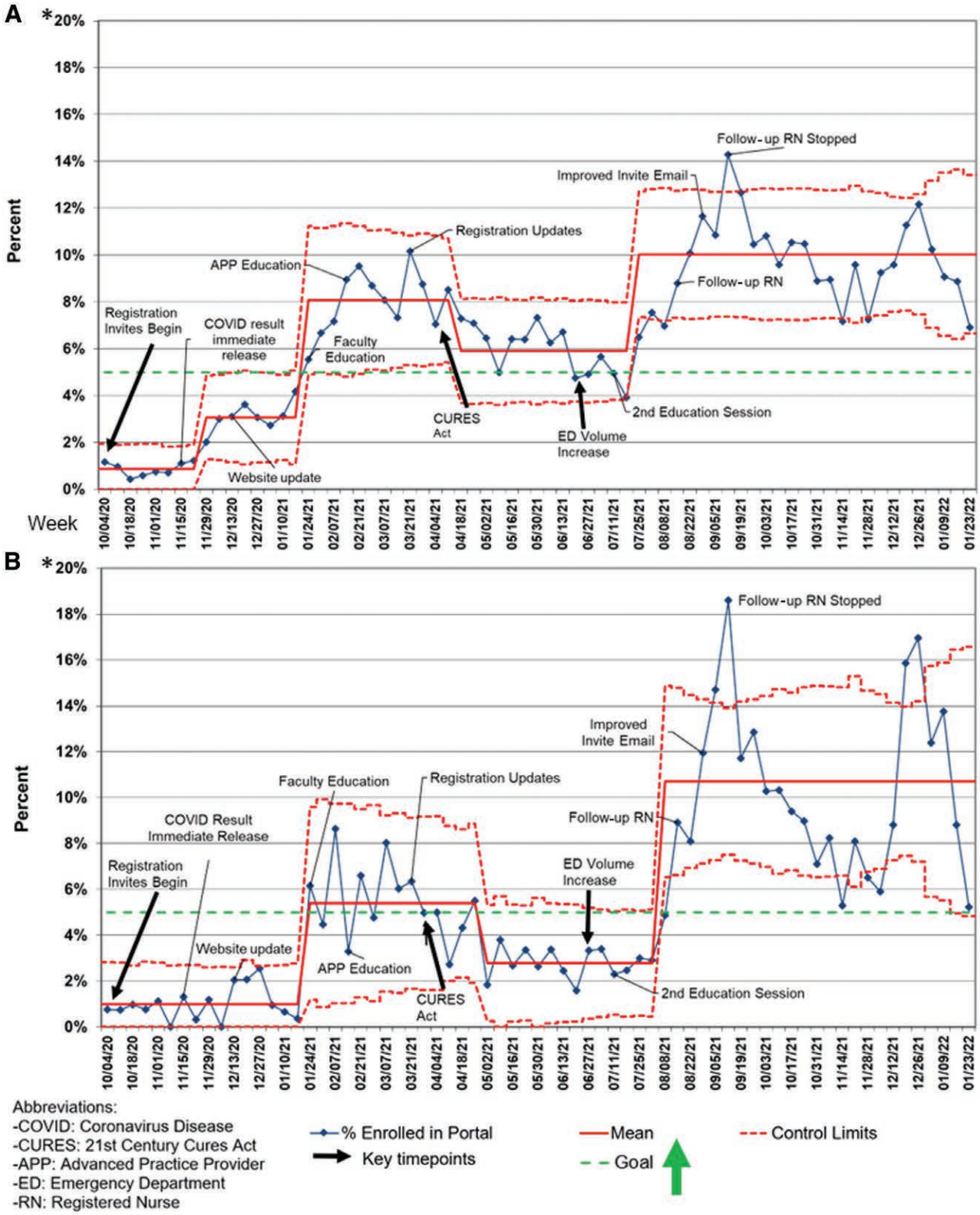

Fig. 2. P-chart SPC chart demonstrating weekly percentage of eligible patients newly enrolled in the patient portal within 10 days of discharge from the ED at a larger freestanding children's hospital (A) and a smaller satellite ED site (B). Project goal was to increase this percentage (arrow) with a goal of 5% or more at each site. *Y*-axis ends at 20% for size and ease of interpretation. Percent of Eligible Patients Enrolled per Week

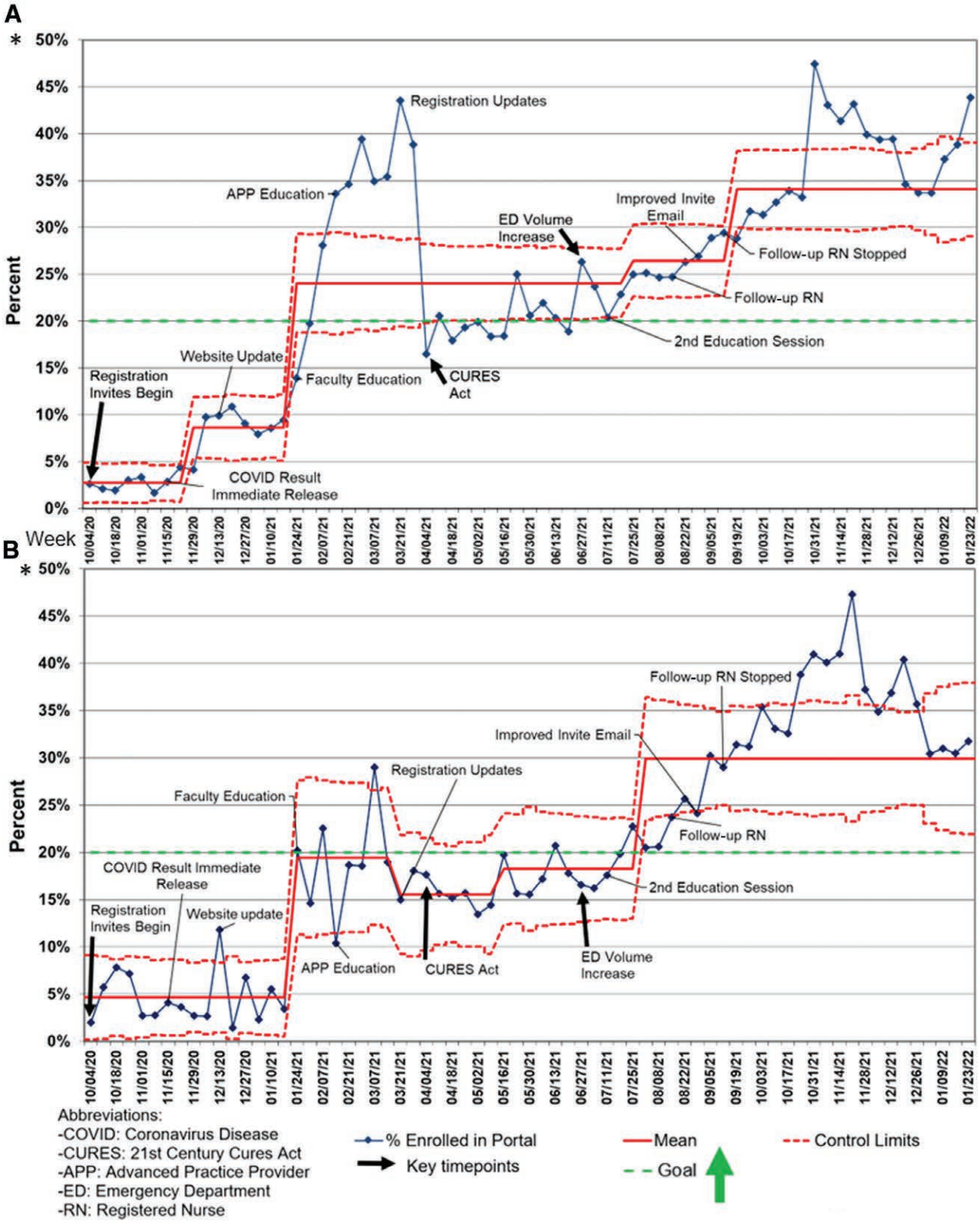

Fig. 3. P-chart SPC chart demonstrating weekly percentage of eligible patients invited to the patient portal within 7 days of discharge from the ED at a larger freestanding children's hospital (A) and a smaller satellite ED site (B). Project goal was to increase this percentage (arrow) with a goal of 20% or more at each site. *Y*-axis ends at 50% for size and ease of interpretation. Percent of Eligible Patients Enrolled per Week

environment, using a multidisciplinary team and multiple levels of interventions to improve enrollment percentages.

Impact of the Interventions

Several targeted interventions were implemented in iterative cycles. In our single-center experience, repeated educational interventions, updates to the portal website, and implementation of a follow-up nurse to assist families at callback were most closely correlated temporally to center-line shifts in portal enrollment. Initial center-line shift was achieved more quickly at our larger main campus than our smaller satellite site. Our team found enrollment patterns closely mimicked invite patterns. We hypothesize that this earlier increase in invitations (and corollary earlier increase in enrollment) is due to more engagement with our main campus registration staff early in the project.

Repeated educational interventions were also associated with center-line shifts at both sites, at least in part due to direct instruction on how to enroll patients. The APP team is particularly instrumental in the invite process as they often field calls from families with portal and result-related questions. Prior work has shown increased enrollment when directed interaction around the portal takes place.[24,25] Increases were also seen when a follow-up nurse was implemented for similar results review and follow-up planning. This engagement with families aligns with previously identified desired portal functions and increased portal use.[14,24,25]

As a pediatric institution, the invitation process has additional complexities for patients under 18 years old, as a parent or guardian must be added to the account and subsequently invited. Prior studies have shown concern with protecting adolescent confidentiality with guardian access to the portal.[26,27] This is an important consideration as patient age impacts invitation and enrollment procedures, but interventions specifically for this population were outside this project's scope. Despite challenges with the Cures Act and guardian enrollment, invitation rates quickly rebounded to previous levels with sustained improvement. Many of the most effective interventions are transferrable to other sites and types of practices, including adult centers, as adult enrollment is less burdensome than pediatric.

Limitations

This project involved a single institution at 2 ED sites. Care should be taken in generalization to the ambulatory and inpatient settings, which may have different practices. Nonpediatric settings may also have differing enrollment processes, though they should be simplified for patients not requiring guardian verification. In addition, possible biases based on patient age, race, insurance status, and patient-preferred language were not examined in this study. Future portal enrollment and invitation work should include these important factors in the analysis.

Conclusions

This single-center QI initiative demonstrated sustained improvement in patient portal enrollment in the pediatric ED for discharged patients following multiple iterative interventions. Challenges included implementation of a new process and mid-project changes to portal regulations in the setting of the Cures Act. Continued work to sustain these improvements, targeting additional increases in enrollment and including varied patient settings, would add further to the literature.

REFERENCES

1. Sebelius K. HIPAA administrative simplification: enforcement. *Fed Regist*. 2009;74:56123–56131.
2. Skinner A, Thornhill J, Weinberger M, et al. Patient Portals. *Appl Clin Inform*. 2016;07:489–501.
3. Azar II AM. 21st Century Cures Act: Interoperability, Information Blocking, and the ONC Health IT Certification Program. In: *Office of the National Coordinator for Health Information Technology (ONC)*, ed. Federal Registrar, Department of Health and Human Services; 2020:25642–25961.
4. Kruse CS, Bolton K, Freriks G. The effect of patient portals on quality outcomes and its implications to meaningful use: a systematic review. *J Med Internet Res*. 2015;17:e44.
5. Ly S, Tsang R, Ho K. Patient perspectives on the digitization of personal health information in the emergency department: mixed methods study during the COVID-19 pandemic. *JMIR Med Inform*. 2022;10:e28981.
6. Reid S, Bhatt M, Zemek R, et al. Virtual care in the pediatric emergency department: a new way of doing business?. *CJEM*. 2021;23:80–84.
7. Kappy B, McKinley K, Chamberlain J, et al. Leaving without being seen from the pediatric emergency department: a new baseline. *J Emerg Med*. 2023;65:e237–e249.
8. Patel PD, Cobb J, Wright D, et al. Rapid development of telehealth capabilities within pediatric patient portal infrastructure for COVID-19 care: barriers, solutions, results. *J Am Med Inform Assoc*. 2020;27:1116–1120.
9. Bush RA, Vemulakonda VM, Richardson AC, et al. Providing access: differences in pediatric portal activation begin at patient check-in. *Appl Clin Inform*. 2019;10:670–678.
10. Foster B, Krasowski MD. The use of an electronic health record patient portal to access diagnostic test results by emergency patients at an academic medical center: retrospective study. *J Med Internet Res*. 2019;21:e13791.
11. Schultz CL, McCahan SM, Lewis AM, et al. Online patient portal use by caregivers in pediatric oncology: are we widening sociodemographic disparities? *Pediatr Blood Cancer*. 2021;68:e29373.
12. Turer RW, Martin KR, Courtney DM, et al. Real-Time patient portal use among emergency department patients: an open results study. *Appl Clin Inform*. 2022;13:1123–1130.
13. Tsai R, Bell EJ, III, Woo H, et al. How patients use a patient portal: an institutional case study of demographics and usage patterns. *Appl Clin Inform*. 2019;10:96–102.
14. Redelmeier DA, Kraus NC. Patterns in patient access and utilization of online medical records: analysis of mychart. *J Med Internet Res*. 2018;20:e43.
15. Kline JN, Isbey SC, McCollum NL, et al. Identifying pediatric patients with multisystem inflammatory syndrome in children presenting to a pediatric emergency department. *Am J Emerg Med*. 2022;51:69–75.
16. Ogrinc G, Davies L, Goodman D, et al. SQUIRE 2.0 (Standards for QUality Improvement Reporting Excellence): revised publication guidelines from a detailed consensus process. *BMJ Qual Saf*. 2016;25:986–992.
17. Langley GL, Moen RD, Nolan KM, et al. The Improvement Guide: A Practical Approach to Enhancing Organizational Performance. *2nd ed*. San Francisco, Calif.: Jossey-Bass Publishers; 2009.

18. Provost LP, Murray SK. The Health Care Data Guide Learning from Data for Improvement. 1st ed. ed. San Francisco, Calif.: Jossey-Bass; 2011.
19. Szilagyi PG, Valderrama R, Vangala S, et al. Pediatric patient portal use in one health system. *J Am Med Inform Assoc*. 2020;27:444–448.
20. Steitz B, Cronin R, Davis S, et al. Long-term patterns of patient portal use for pediatric patients at an academic medical center. *Appl Clin Inform*. 2017;08:779–793.
21. Turer RW, DesRoches CM, Salmi L, et al. Patient perceptions of receiving COVID-19 test results via an online patient portal: an open results survey. *Appl Clin Inform*. 2021;12:954–959.
22. Kelly MM, Kieren MQ, Coller RJ, Pitt MB, Smith CA. Pediatric Open Notes: Caregiver Experiences Since the 21st Century Cures Act. *Acad Pediatr*. 2023 Oct 2:S1876–2859(23)00368-6.
23. Sangal RB, Powers E, Rothenberg C, et al. Disparities in accessing and reading open notes in the emergency department upon implementation of the 21st century cures act. *Ann Emerg Med*. 2021;78:593–598.
24. Bhashyam AR, Bansal M, McGovern MM, et al. In-hospital enrollment into an electronic patient portal results in improved follow-up after orthopedic surgery: cluster randomized controlled trial. *JMIR Perioper Med*. 2022;5:e37148.
25. Ramsey A, Lanzo E, Huston-Paterson H, et al. Increasing patient portal usage: preliminary outcomes from the mychart genius project. *J Adolesc Health*. 2018;62:29–35.
26. Ip W, Yang S, Parker J, et al. Assessment of prevalence of adolescent patient portal account access by guardians. *JAMA Netw Open*. 2021;4:e2124733.
27. Lee JA, Holland-Hall C. Patient portals for the adolescent and young adult population: Benefits, risks and guidance for use. *Curr Probl Pediatr Adolesc Health Care*. 2021;51:101101.