

Improving Point-of-Care Ultrasound Documentation and Billing Accuracy in a Pediatric Emergency Department

Carrie Ng, MD*; Asha S. Payne, MD†; Amit K. Patel, MD‡; Rosemary Thomas-Mohtat, MD†; Angela Maxwell, MD†; Alyssa Abo, MD†

Abstract

Objective: The performance and interpretation of point-of-care ultrasound (POCUS) should be documented appropriately in the electronic medical record (EMR) with correct billing codes assigned. We aimed to improve complete POCUS documentation from 62% to 80% and improve correct POCUS billing codes to 95% or higher through the implementation of a quality improvement initiative. **Methods:** We collected POCUS documentation and billing data from the EMR. Interventions included: (1) staff education and feedback, (2) standardization of documentation and billing, and (3) changes to the EMR to support standardization. We used P charts to analyze our outcome measures between January 2017 and June 2018. **Results:** Six hundred medical records of billed POCUS examinations were included. Complete POCUS documentation rate rose from 62% to 91%, and correct CPT code selection for billing increased from 92% to 95% after our interventions. **Conclusions:** The creation of a standardized documentation template incorporated into the EMR improved complete documentation compliance. (*Pediatr Qual Saf* 2020;4:e315; doi: 10.1097/pq9.0000000000000315; Published online 21 July, 2020.)

INTRODUCTION

Point-of-care ultrasound (POCUS) is an essential tool for pediatric emergency medicine (PEM) physicians.¹⁻³ Prior studies have shown that POCUS improves diagnostic accuracy in many settings and decreases the length of stay for patients in the emergency department (ED).⁴⁻⁸ POCUS is akin

to any procedure performed in the provision of medical care to patients, and as such, should be performed and documented with images archived appropriately. Similarly, POCUS documentation should support the billing for services provided.⁹ Formal policy statements have been published regarding the ideal components of any pediatric ED-based POCUS program.^{1,2,10,11}

Correct and complete documentation of services provided is essential as it follows Medicaid rules and regulations and reduces improper payments.¹² Documentation is generally considered complete if it includes the following 6 components: the indication for the examination, the technique used, the type of study performed, the examination findings, the provider's overall impression of the investigation, and the faculty performing the examination.¹³ Soremekun et al¹⁴ showed the potential direct impact of documentation on revenue generation. They used an optimal documentation rate of 95% to predict that an ED-based POCUS program could generate a positive revenue margin within 5 years of establishment.¹⁴ They also found that only 35% of diagnostic POCUS scans had documentation to support billing.¹⁴ Hall et al¹⁵ found that only 0.7% of emergency medicine practitioners received POCUS reimbursements. The authors hypothesized that this might be from low use of POCUS or the practice of performing POCUS examinations without archiving or billing (termed "ghost scans").¹⁵ "Ghost scans" refers to POCUS examinations where providers obtain images for

From the *Department of Pediatrics, Section of Emergency Medicine, Texas Children's Hospital, Baylor College of Medicine Houston, Tex; †Department of Pediatrics and Emergency Medicine, Children's National Hospital/George Washington University School of Medicine and Health Sciences Washington, DC; and ‡Department of Pediatrics, Division of Emergency Medicine, Nemours Children's Hospital/University of Central Florida College of Medicine, Orlando, Fla.

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*Corresponding author. Address: Carrie Ng, MD, Texas Children's Hospital, 6621 Fannin St., Suite A210, Houston, TX 77030
PH: 832-824-7856; Fax: 832-825-5424
Email: cxng2@texaschildrens.org

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medical decision making. However, they may not store the images or document the performance or interpretation of those images in the medical record. Since the images from these examinations are not archived or documented, they cannot be billed. The authors were not able to surmise the rate of documentation or billing from the dataset.¹⁵

Several centers were able to improve POCUS documentation and transfer of charges to coders for billing using commercially available workflow solutions.^{16,17} However, at our institution, these products were unavailable. We do, however, have internal processes to assess documentation and billing. Billing coders audit medical charts to determine the accuracy of the billing code as well as the documentation to ensure it supports the bill charged. Through these audits, it was evident that our POCUS documentation was not consistently complete. The workflow for POCUS documentation at that time was not standardized. Some providers were documenting their POCUS examination findings in the medical decision-making section of their primary ED clinical notes, while others wrote separate free text addendum notes. At our institution, the providers also had to select the current procedural terminology (CPT) codes for billing, either memorize the specific codes for particular POCUS examinations or consult their references, leading to inaccurate billing charges. To address these issues, we developed and implemented a QI initiative to improve POCUS documentation and the accuracy of the charges billed. The primary aim was to improve the rate of complete POCUS documentation from 62% to 80%. Second, we aimed to improve the percentage of correct POCUS billing codes from 92% to a level of 95% accuracy or higher.

METHODS

Context

Children's National Hospital is an academic, tertiary care hospital located in an urban center. Together with its satellite site, United Medical Center, the pediatric ED has over 120,000 pediatric emergency visits per year. The Division of PEM consists of over 60 attending physicians. While some were credentialed in specific POCUS applications, only 5 PEM attendings were credentialed in all POCUS applications at the time of the study. This QI initiative only included these 5 POCUS fellowship-trained PEM attendings. The main site also hosts a fellowship program for PEM POCUS. Our institution has been archiving POCUS images since 2014 and billing for approximately 500 examinations per year between both sites. Of those, about 26% were focused assessment with sonography for trauma, bowel, abdominal wall, or general abdomen examinations; 19% were soft tissue or musculoskeletal studies of an extremity; 13% were limited echocardiography; 12% were lung or chest wall examinations; 6% were head and neck examinations, and 25% were other examinations. We used 2 Zonare One Pro ultrasound machines (Mindray, Mountain View, CA) for image acquisition. Electronic medical record (EMR) documentation occurred in Cerner (North Kansas City, MO). OsiriX (Pixmeo, Bernex, Switzerland) was used for image archiving and software processing.

Intervention

Using Improvement Science methodology, we assembled a group of key stakeholders, consisting of PEM POCUS physicians and a QI expert, who also served as the statistician for the project. The PEM POCUS physicians are

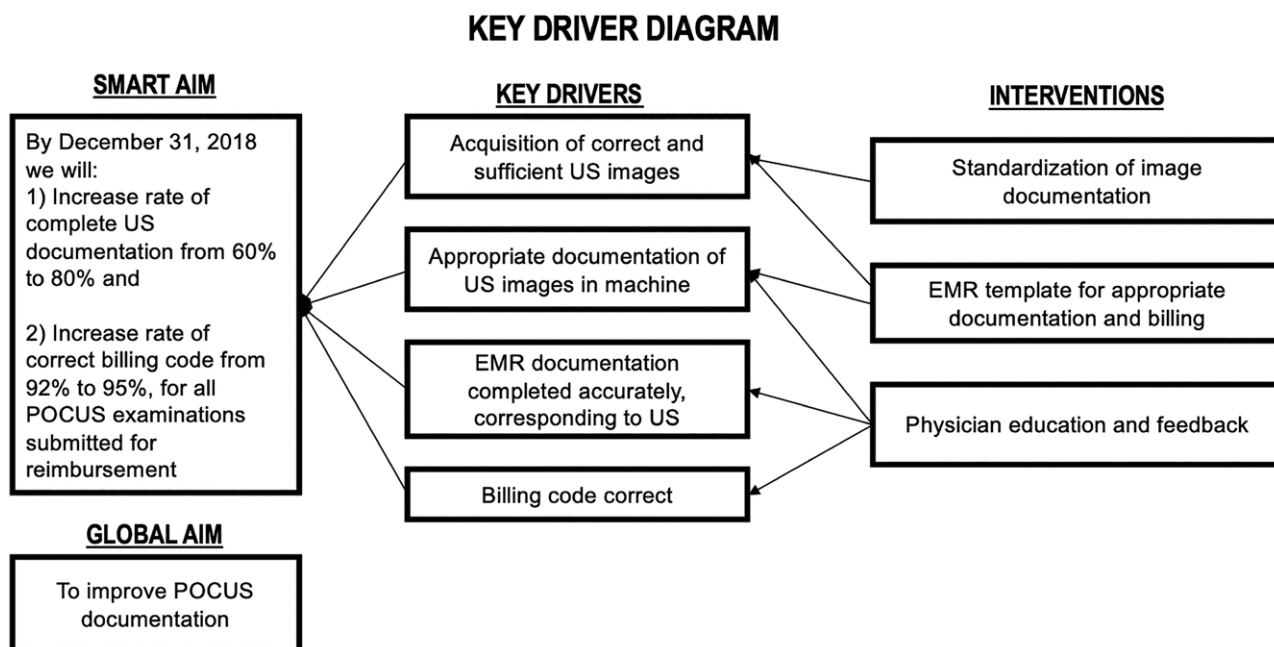


Fig. 1. Key driver diagram.

credentialed to bill for POCUS studies by the hospital and are not certified by an external body. We built a key driver diagram to display the project aims, to document our theories related to improvement, and to track high-level interventions (Fig. 1). The team met regularly throughout this study to monitor for improvements. Please note that we did not address the first intervention listed in the key driver diagram, “Acquisition of correct and sufficient US images.”

This project consisted of 3 primary interventions to improve documentation and billing: (1) staff education and feedback, (2) standardization of documentation and billing, and (3) changes to the EMR to support standardization. We began with an awareness campaign among the 5 POCUS-credentialed PEM faculty on the need to improve documentation, which included email communications introducing the project and different components of this study. Next, we conducted in-person training sessions with these 5 POCUS-credentialed providers on how to correctly document the POCUS examinations and complete the billing form in the EMR.

Then, our team standardized the EMR documentation for billing and coding by working directly with an EMR representative to develop a template for each POCUS

application and improved billing charge ticket. Our team invested approximately 30 to 60 minutes in developing each template for different applications, but currently, there are resources available to expedite the process.³ The documentation template for a POCUS examination was updated within the EMR to include prompts to ensure complete documentation. Initially, a printed template was placed on each of the US machines until the EMR was updated. Afterward, the updated documentation template contained pre-written phrases to select and sections to fill out, which facilitated the efficient completion of POCUS documentation (Supplemental Digital Content 1, available at <http://links.lww.com/PQ9/A196>). The charge ticket in the EMR was also updated to include a written description of the CPT codes. This update allowed the provider to correctly identify the appropriate CPT code based on the description rather than relying on memory or other external sources to determine the appropriate CPT code (Supplemental Digital Content 2, available at <http://links.lww.com/PQ9/A196>). We educated POCUS credentialed providers on how to use these templates for complete documentation and billing. Specific feedback was also given to POCUS credentialed PEM faculty regarding commonly made billing errors and missing documentation.

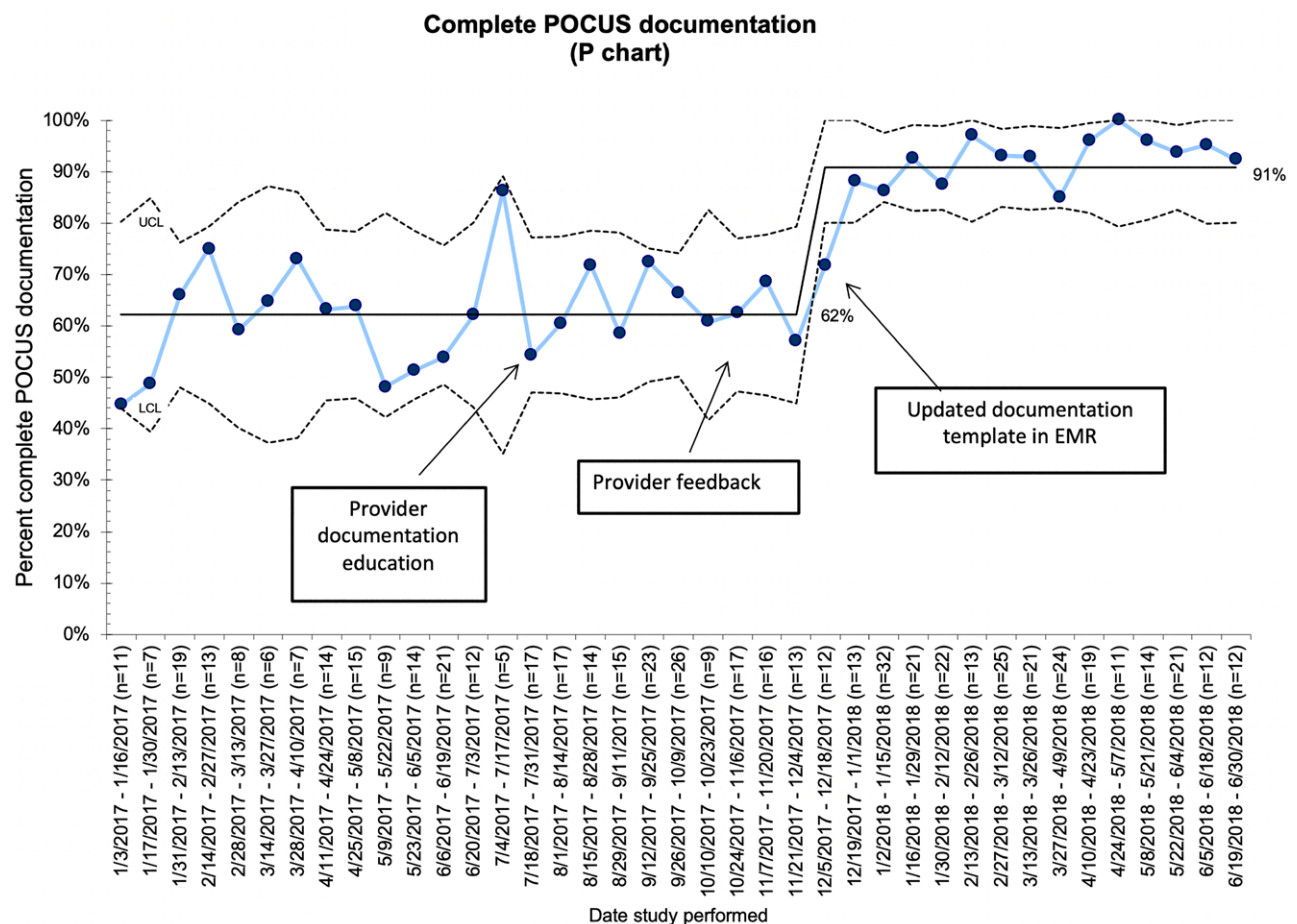


Fig. 2. P-chart of percent of complete POCUS documented.

Measures

The primary outcome measure was the completion rate of POCUS documentation, and the goal was to raise it from 62% to 80%. Documentation was considered complete if it included the following 6 components: the indication for the examination, the technique used, the type of study performed, the findings on the exam, the provider's overall impression of the investigation, and the faculty performing the examination. Any concerns about the documentation interpretation were discussed, reviewed, and collectively reconciled by 3 authors (A.A., A.K.P., and C.N.).

A secondary outcome was to improve the POCUS billing code accuracy for all patients billed for a POCUS examination. The study team included these patients because those are the exams that are used for medical decision-making and also require complete documentation for the bill charged. Educational scans, which were not billed, were excluded from this intervention.

Data Collection

The study team generated a list of all patients who received billed POCUS examinations by the POCUS credentialed PEM faculty in the study period from our institution's databases. We reviewed and analyzed 610 charts, but we excluded 10 because they had no documentation. Data

regarding elements that were included in the documentation were recorded. All the variables we collected for this study are shown in Supplemental Digital Content 3 (<http://links.lww.com/PQ9/A196>). The patients who received billed POCUS examinations were divided among the POCUS fellowship-trained authors (A.A., A.K.P., A.M., C.N., R.T.M.). They reviewed the documentation individually and recorded information in Research Electronic Data Capture study data sheets.¹⁸

For the secondary outcome, the study team also collected data regarding the billing codes used for each POCUS. The appropriateness of the billing code for each examination was determined by referencing the American College of Emergency Physicians' ultrasound billing guidelines.¹³ Any concerns about the appropriateness of a billing code were discussed, reviewed, and reconciled collectively by 3 of the authors (A.A., A.K.P., and C.N.).

Data Analysis

We used statistical process control charts, specifically P charts, to analyze our primary and secondary outcome measures. We created the P charts using QI Charts V.2.0.23 (Process Improvements Products, Austin, TX) for Microsoft Excel 2013 (Microsoft Corp., Redman, WA). The baseline period was from January 2017 to June 2017, and the intervention period was from July 2017 to June 2018.

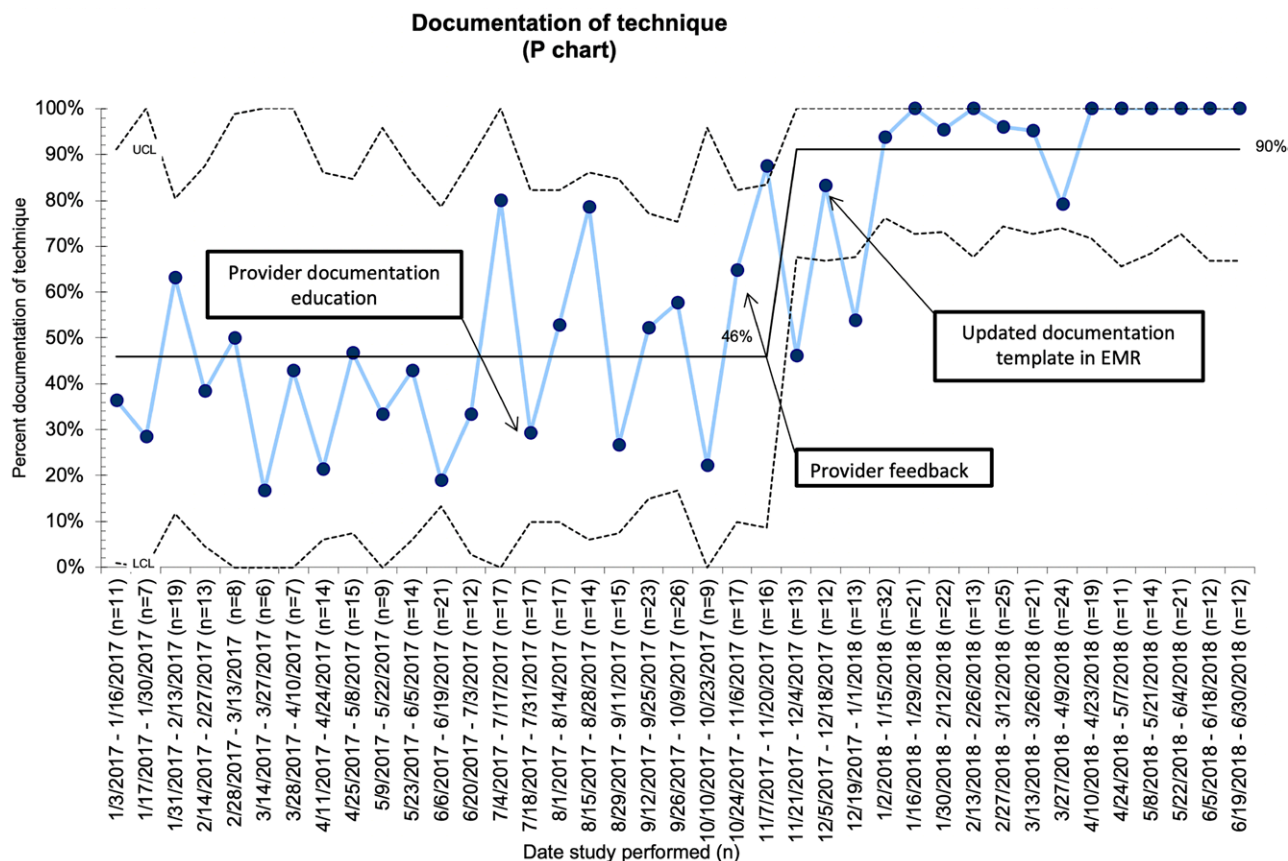


Fig. 3. P-chart of percent of POCUS technique documented.

Ethical Considerations

We undertook this project as a Quality Improvement Initiative at Children's National, and we applied to the Institutional Review Board. However, the project did not constitute human subjects research, and as such, it was not under the oversight of the Institutional Review Board.

RESULTS

Of the 610 medical records reviewed, we included 600 for the billed POCUS examinations. Ten examinations were excluded since they did not have any documentation in the EMR. After creating a standardized POCUS documentation template in the EMR, the rate of complete POCUS documentation increased from 62% at baseline to above 90% (Fig. 2).

Sub-analysis of the individual documentation components noted that the most significant improvement came from improvements in the documentation of the technique and the type of exam. The documentation of the method used for the examination (eg, probe, B mode, M mode, color) increased from 46% to 90% (Fig. 3). Similarly, documentation of the type of exam (eg, transthoracic, transabdominal) performed also improved from 43% to 89% (Fig. 4). Both components improved after updating the EMR templates for documentation and billing.

We noted an improvement in the documentation of POCUS impression from 52% to 80%, with a transient decrease in the rate of documentation of the clinical impression of the ultrasound examination to 39% after educating providers on proper documentation (Fig. 5).

There were no significant improvements in the other aspects of documentation, such as the indication for the examination, the exam findings, and who performed the exam.

The most significant improvement in billing the correct POCUS CPT code came after updating the charge ticket in the EMR with words describing the examinations adjacent to the CPT code numbers themselves (Supplemental Digital Content 2, <http://links.lww.com/PQ9/A196>). The baseline rate of correct CPT code selection for billing was 92%, but with the introduction of the updated charge ticket in the EMR, the percent improved to 95% (Fig. 6).

DISCUSSION

Summary

By standardizing the documentation and billing template in the EMR, we achieved our aims of increasing complete POCUS documentation and charge ticket accuracy. The success of these interventions increased the opportunities

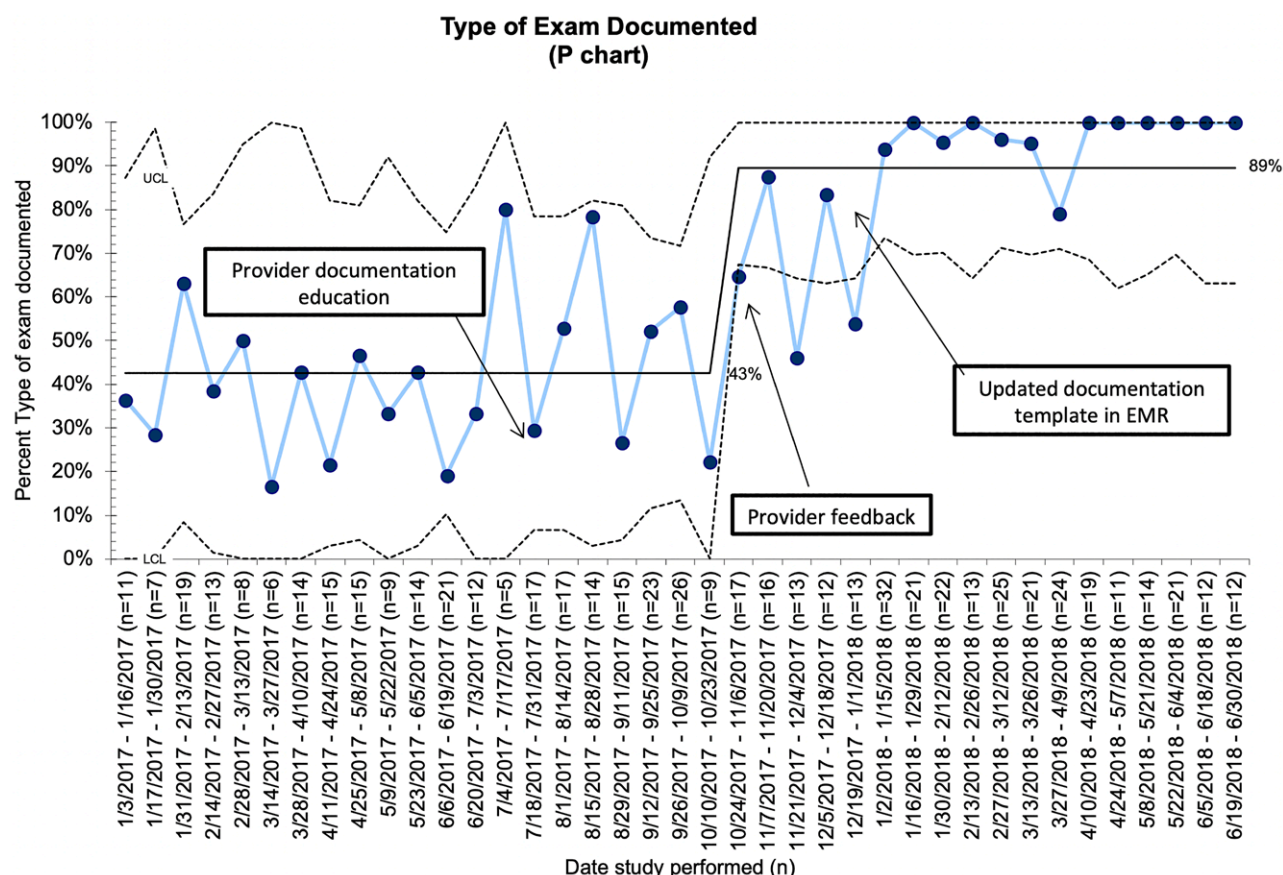


Fig. 4. P-chart of percent of POCUS exam documented.

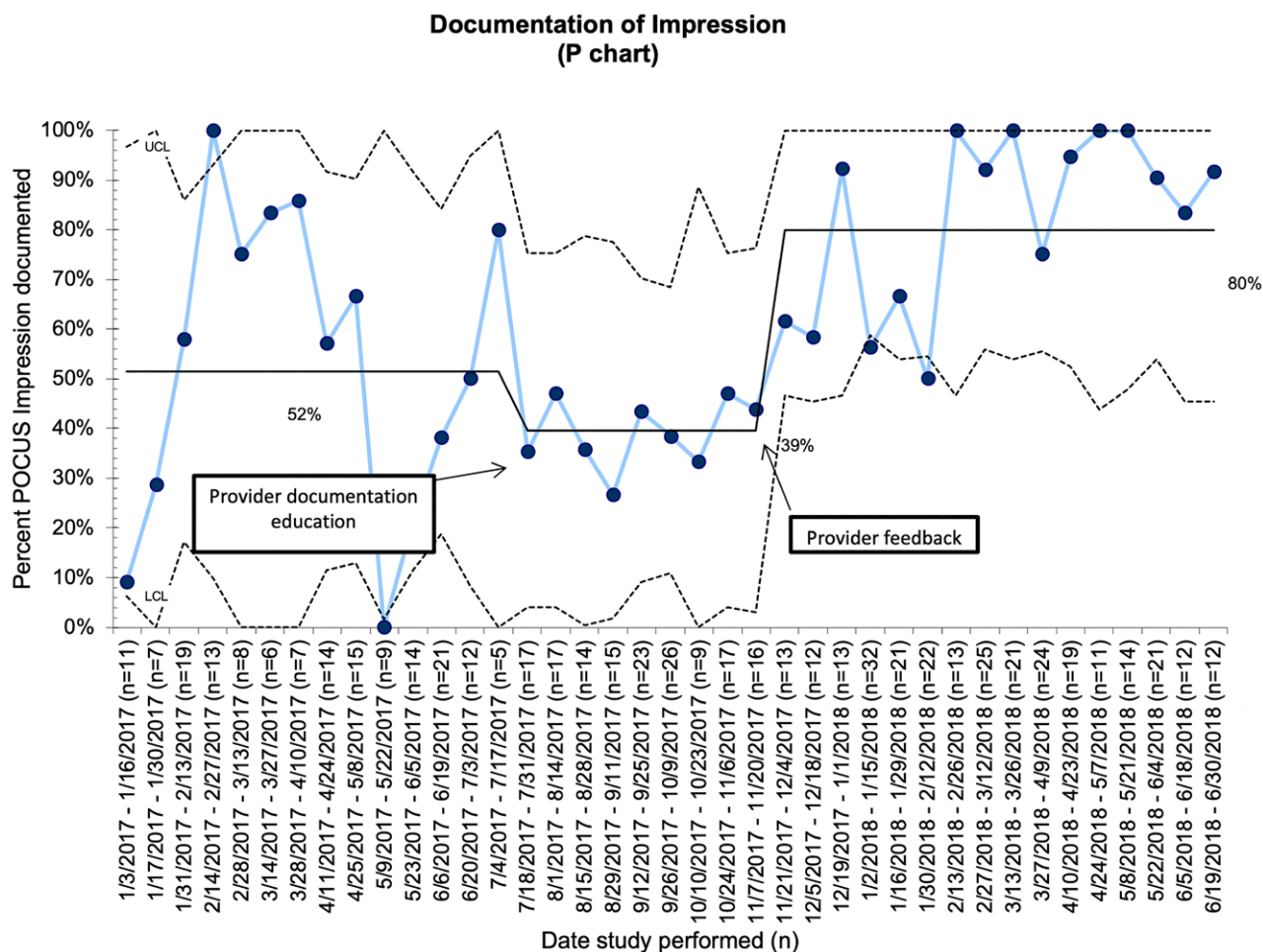


Fig. 5. P-chart of percent of POCUS impression documented.

for POCUS billing and POCUS revenue in our ED, thereby decreasing lost revenue opportunities.

Interpretation

Before this work, we had multiple challenges ensuring complete documentation after a POCUS examination. We attribute this to the lack of knowledge amongst our providers regarding the necessary elements for complete POCUS documentation. There was no significant improvement after the educational intervention and feedback. As we did not audit the documentation in real-time, the delayed feedback made it difficult for providers to remember the necessary improvements when performing their next POCUS.

Similarly, the accuracy of the billing charges also did not improve solely with educational interventions. Standardization of the EMR template prompted providers to change their documentation patterns. Adding a written description of the CPT also improved charge ticket accuracy by eliminating the limitations of human recall.

The 3 most significant improvements in obtaining the overall aim of complete documentation came from the documentation of the technique (eg, 2-B mode, M-mode),

the type of exam (eg, documenting abdominal exam rather than limited POCUS exam), and the impression of the study. The first 2 improvements were seen after implementing the documentation template as described above, thus, presenting the provider with common pre-written phrases. The final improvement was last to be resolved after teaching the providers that documentation of findings was different from the impression and that both were required to be complete. For example, in a soft tissue study, documentation was only considered complete if it described the image as cobblestoning with no fluid collection (findings) and reported a diagnosis of cellulitis with no signs of abscess (impression).

Our program's work is important as we implemented a free workflow solution and did not have the commercially available workflow system mentioned by prior authors; thus, our initiative is generalizable to programs at a more fundamental level or without resources to invest in commercially available systems.^{16,17} Though our QI initiative only included POCUS fellowship-trained PEM physicians, we believe that our interventions would work for non-POCUS fellowship-trained providers. In future studies, we could also collect data regarding patient care

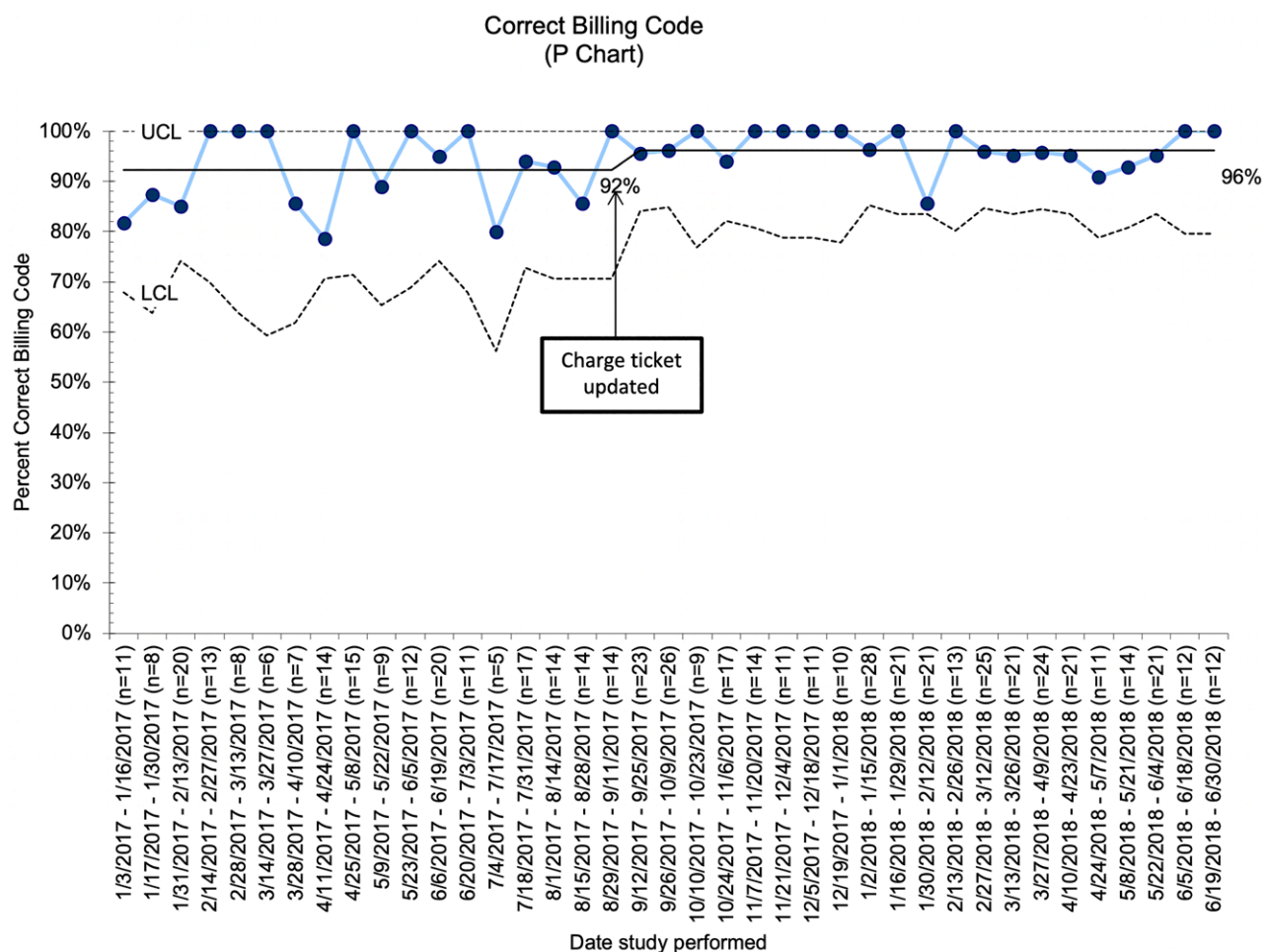


Fig. 6. P-chart of percent of correct billing codes.

outcomes, such as decreasing the need for repeat radiology imaging from the improvement of documentation.

CONCLUSIONS

A QI intervention can increase the rates of complete POCUS documentation. The creation of a standardized, streamlined documentation template incorporated into the EMR improved the complete documentation compliance rate from a baseline of 60% to above 90%. Future goals include incorporating electronic worksheets directly onto the ultrasound machine that can communicate with the EMR and streamlining the EMR tools to provide long-term sustainability.

DISCLOSURE

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

REFERENCES

1. Marin JR, Lewiss RE; American Academy of Pediatrics, Committee on Pediatric Emergency Medicine; Society for Academic Emergency Medicine, Academy of Emergency Ultrasound; American College of Emergency Physicians, Pediatric Emergency Medicine Committee; World Interactive Network Focused on Critical Ultrasound. Point-of-care ultrasonography by pediatric emergency medicine physicians. *Pediatrics*. 2015;135:e1113-e1122.
2. Marin JR, Lewiss RE. Technical report: point-of-care ultrasonography by pediatric emergency medicine physicians. *Pediatr Emerg Care*. 2015;31:525.
3. Marin JR, Abo AM, Arroyo AC, et al. Pediatric emergency medicine point-of-care ultrasound: summary of the evidence. *Crit Ultrasound J*. 2016;8:16.
4. Marin JR, Dean AJ, Bilker WB, et al. Emergency ultrasound-assisted examination of skin and soft tissue infections in the pediatric emergency department. *Acad Emerg Med*. 2013;20:545-553.
5. Iverson K, Haritos D, Thomas R, et al. The effect of bedside ultrasound on diagnosis and management of soft tissue infections in a pediatric ED. *Am J Emerg Med*. 2012;30:1347-1351.
6. Olson AP, Trappey B, Wagner M, et al. Point-of-care ultrasonography improves the diagnosis of splenomegaly in hospitalized patients. *Crit Ultrasound J*. 2015;7:13.
7. Elikashvili I, Tay ET, Tsung JW. The effect of point-of-care ultrasonography on emergency department length of stay and computed tomography utilization in children with suspected appendicitis. *Acad Emerg Med*. 2014;21:163-170.
8. Lin MJ, Neuman M, Rempell R, et al. Point-of-care ultrasound is associated with decreased length of stay in children presenting to the emergency department with soft tissue infection. *J Emerg Med*. 2018;54:96-101.
9. Moore CL. Credentialing and reimbursement in point-of-care ultrasound. *Clin Pediatr Emerg Med*. 2011;12:73-77.
10. Helfgott AM. Coding and billing for transvaginal ultrasound to assess second-trimester cervical length. *Contemp OBGYN*. 2013;58:44-45.

11. Grasu BL, Wolock BS, Sedgley MD, et al. Principles of billing for diagnostic ultrasound in the office and operating room. *J Hand Surg Am*. 2019;44:55–59.
12. Centers for Medicare and Medicaid Services. The federal government managed by the United States Centers for Medicare & Medicaid Services. <https://www.cms.gov/Regulations-and-Guidance/Regulations-and-Guidance.html>. Accessed November 12, 2019.
13. Resnick J, Hoffenberg S, Tayal V, et al. Ultrasound coding and reimbursement document 2009. *Am Coll Emerg Physicians Emerg Ultrasound Sect*. 2009; 1–118.
14. Soremekun OA, Noble VE, Liteplo AS, et al. Financial impact of emergency department ultrasound. *Acad Emerg Med*. 2009;16:674–680.
15. Hall MK, Hall J, Gross CP, et al. Use of point-of-care ultrasound in the emergency department: Insights from the 2012 medicare national payment data set. *J Ultrasound Med*. 2016;35:2467–2474.
16. Lewiss RE, Cook J, Sauler A, et al. A workflow task force affects emergency physician compliance for point-of-care ultrasound documentation and billing. *Crit Ultrasound J*. 2016;8:5.
17. Flannigan MJ, Adhikari S. Point-of-care ultrasound work flow innovation: impact on documentation and billing. *J Ultrasound Med*. 2017;36:2467–2474.
18. Harris PA, Taylor R, Thielke R, et al. Research electronic data capture (REDCap)—a metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform*. 2009;42:377–381.