

# Evaluation of Adherence to Emergency Department Point-of-Care Ultrasound Documentation and Billing Following Intervention

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## Abstract

**Background:** Over the past few years, both the scope and utility of point-of-care ultrasound (POCUS) have tremendously expanded in the clinical setting. Despite this growth, few studies have evaluated the compliance, documentation, and billing of POCUS in the emergency department (ED). The objective of this study was to evaluate the compliance of billing and documentation of POCUS and determine if a single, individualized e-mail feedback can help improve billing and documentation. **Methods:** We performed a 6-week prospective review of ED POCUSs performed. Following this review, all emergency physicians were sent an individualized e-mail regarding their ultrasound performance including the total number of ultrasounds, ultrasounds per shift, and breakdown of specific ultrasound types. Following this intervention, we collected data from an additional 6 weeks regarding ultrasound billing performance. **Results:** A total of 1532 POCUS scans were recorded for data collection. Eight hundred and five scans were enrolled in the preintervention group and 727 scans in the postintervention group. Twelve different types of POCUS scans were recorded. The preintervention group had documented 484/805 scans resulting in a 60.1% (confidence interval [CI] 56.7%–63.5%) documentation ratio. The postintervention group had documented 521/727 resulting in a 71.7% (CI 68.2%–74.9%) documentation ratio. **Conclusion:** The implementation of timely quality assurance with continuous billing reminders is essential for the maintenance and fiscal sustainability of an emergency medicine ultrasound program. Future studies should further elucidate and quantify the financial impact of modifiable factors within EDs' ultrasound documentation and billing practices.

**Keywords:** Point-of-care ultrasound, ultrasound billing, ultrasound documentation

## INTRODUCTION

Point-of-care ultrasound (POCUS) is defined as bedside ultrasonography conducted and reviewed in real-time. Over the past few decades, both the scope and utility of POCUS have tremendously expanded in the clinical setting.<sup>[1]</sup> With the growth of POCUS, image archival, quality assurance (QA), credentialing, documentation, and reimbursement have formalized and refined the process to ensure compliance and adequacy. Efforts to expand POCUS can be seen in the development of online resources, ultrasound fellowships, and the introduction of POCUS into medical education.<sup>[2,3]</sup> Currently, POCUS is taught as part of the standard curriculum in a number of medical schools. The Accreditation Council on Graduate Medical Education

in emergency medicine list ultrasound education as one of the 23 milestones.<sup>[3–5]</sup>

While the majority of researches in ultrasonography has placed emphasis on diagnosis, clinical outcome, and clinical utility, few studies have evaluated the documentation, billing, and financial impact of POCUS in the emergency department (ED).<sup>[2,6,7]</sup> Adhikari *et al.* demonstrated the financial impact of a formalized POCUS workflow with image archival, QA, billing, and documentation.<sup>[2]</sup> Flannigan *et al.* also demonstrated a significant increase in POCUS billing, documentation, and compliance after

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the implementation of an automated US workflow process.<sup>[8]</sup> The American College of Emergency Physicians has even published a formal policy on emergency ultrasound documentation addressing ICD-9 coding, payer policy, and reimbursement.<sup>[5]</sup> However, despite these advances, significant issues remain in documentation and billing for POCUS.

With the expansion and formalization of POCUS in emergency medicine, there is a need for appropriate documentation and billing. Failure to complete appropriate documentation for ultrasounds performed results in a reduction in physician compensation.<sup>[2,9]</sup> Given the potential to elevate patient care, improve safety, and increase department revenue, there is great incentive to document and bill for ultrasound scans performed. A systematic review of techniques shown to alter practice methods of clinicians demonstrates that active interventions targeting various barriers to change are more effective than passive approaches.<sup>[10]</sup> Utilizing this method, studies have shown that personalized peer-comparison feedback provided to emergency medicine residents can increase the number of ultrasound scans performed per shift.<sup>[11]</sup> Other workflow solutions show that implementing a task force has also been shown to positively affect ultrasound documentation for coding and billing over a 6-month period.<sup>[12]</sup> The objective of this study was to evaluate the compliance of billing and documentation of POCUS at a single academic ED. The second objective is to determine if a single, individualized performance feedback can help improve billing and documentation performance.

## MATERIALS AND METHODS

### Study design

The study was approved by the site Institutional Review Board (approval number: 2017-4921). We performed a 6-week prospective review of 12 types of POCUSs completed in the ED between January 16, 2019, and May 13, 2019. Ultrasound images were obtained at the discretion of the treating physician if indicated for patient care. The treating physician interpreted the images at bedside and all images were permanently archived into our hospital-wide picture archive and communication system. Images were retrospectively reviewed with an OsiriX image viewer (a commercially available digital imaging and communications software program to view medical imaging information) and documented at weekly QA sessions. During weekly QA sessions, the accuracy of the images was assessed. If any discrepancies were found, the faculty or fellow was notified by e-mail. During these sessions, educational scans were identified and removed from the analysis. Next, the documented medical record for each patient was reviewed to determine if a POCUS was documented and billed [Figure 1].

Although attendings are ultimately responsible for all charting and documenting, resident physicians can place procedure notes with cosign to be done by an attending. The billing department bills for service by finding a documented procedure note. If there is no procedure note,

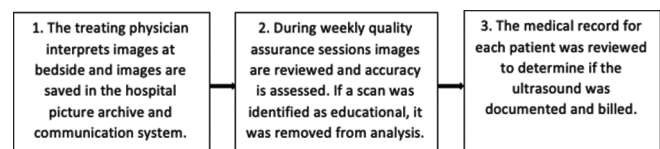
it is assumed a procedure was not performed. A list of all medical record numbers for patients that had documentation for a POCUS was obtained monthly from our billing department. This list included extended focused assessment with sonography for trauma, cardiac echocardiography, biliary ultrasound, renal ultrasound, soft-tissue ultrasound, thoracic/pulmonary ultrasound, obstetric and gynecologic ultrasound, ocular ultrasound, inferior vena cava ultrasound, small-bowel obstruction abdominal ultrasound, abdominal aortic aneurysm ultrasound, and general abdominal ultrasound [Table 1].

### Study setting and population

We reviewed POCUS images, medical records, and ultrasound documentation at a level-1 trauma center ED with a patient volume of 57,000 ED visits per year. The ED hosts a 3-year emergency medicine residency with nine residents per class and 22 core ED faculties. The ED also has a 1-year POCUS fellowship with two emergency ultrasound fellows. Our ultrasound program began in 2001 and started documenting and billing ultrasound procedures in 2004. All faculty and fellows are credentialed by the site ultrasound director to perform and interpret POCUS scans. To be credentialed, each faculty member must demonstrate the ability to perform and interpret each scan type. In addition, each faculty must perform 25 scans of each scan type for independent image interpretation. All ultrasounds were performed at the discretion of the treating physician for patient care purposes.

### Study protocol

During weekly ultrasound QA review sessions, the medical record and ultrasound type for each set of reviewed images was documented and recorded. The patient's medical records and encounters were reviewed to confirm the scan was clinically indicated. The list of medical record numbers and image types was cross-referenced to a list of documented and billed POCUSs obtained from our medical records and



**Figure 1:** Illustration of the workflow and how point-of-care ultrasounds were documented and evaluated

**Table 1: List of point-of-care ultrasounds that can be documented and billed for**

Types of point-of-care ultrasounds	
eFAST	Obstetric/gynecologic
Cardiac echocardiography	Ocular
Biliary	Inferior vena cava
Renal	Small-bowel obstruction
Soft tissue	Abdominal aortic aneurysm
Thoracic/pulmonary	General abdominal
eFAST: Extended focused assessment with sonography for trauma	

billing department. At our institution, documented ultrasound procedure notes are signed by the treating physician and constitute a stand-alone, billed procedure independent of the history and physical examination. Data were collected at six consecutive QA sessions between January 16, 2019, and February 26, 2019, for the preintervention arm of the study. On March 1, 2019, each emergency medicine faculty or fellow was sent an individualized e-mail regarding their ultrasound performance. This included the total number of ultrasounds, ultrasounds per shift, and breakdown of specific ultrasound types. The data breakdown included the percentage of ultrasounds that were performed, documented, and billed. In the e-mail, there was a simple reminder to faculty and fellows to document scans that were performed. On March 13, 2019, we resumed data collection every other week for a total of six additional weeks of data collection. Data collection concluded on May 29, 2019.

### Data analysis

Data were collected by research assistants present at weekly QA meeting sessions. Final documentation and billing are the responsibility of faculty and fellows; therefore, only faculty and fellows were included in the analysis. Medical records were recorded in a data encrypted spreadsheet (Microsoft Excel 2016, 32-Bit Edition; Microsoft Corp), and image type was interpreted by the site ultrasound director. A list of performed ultrasound scans and type was then cross-referenced to a list of documented and billed ultrasound scans provided by the hospital billing department.

Frequencies are reported as percentage and 95% confidence intervals (CI). The documentation ratio was compared using Pearson's Chi-square or Fisher's exact test if required. A  $P < 0.05$  was considered statistically significant. Data were analyzed using IBM SPSS Statistics, version 26.0 for windows (1 New Orchard Road, Armonk, New York 10504-1722, United States).

### RESULTS

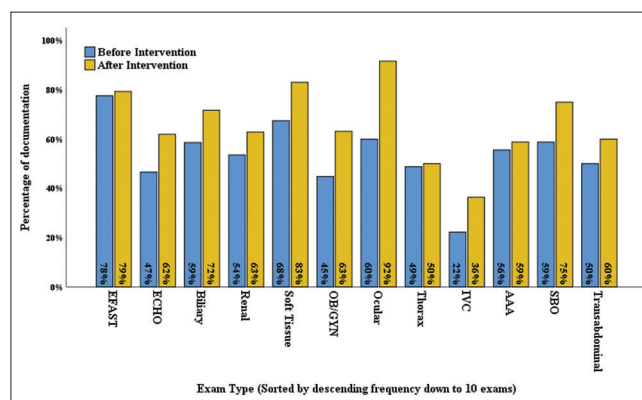
A total of 1532 POCUS scans were recorded for data collection. Eight hundred and five scans were enrolled in the preintervention group and 727 scans in the postintervention group. The average age of patients was 45.8 in the preintervention group and 47.1 in the postintervention group. Overall, men made up 53.1% of the preintervention group and 51.2% of the postintervention group. While 28 unique physicians were used to collect data, nine physicians had performed 51.8% of the studied US scans (52.7% of the preintervention group and 51.2% of the postintervention group). Twelve different types of POCUS scans were recorded. The preintervention group had documented 484/805 scans resulting in a 60.1% (CI 56.7%–63.5%) documentation ratio. The postintervention group had documented 521/727 resulting in a 71.7% (CI 68.2%–74.9%) documentation ratio. The faculty and fellows had similar work hours in both the pre-and post-intervention groups. Among the nine physicians that performed 51.8% of

the scans, the change in improvement was 10.7% which is not statistically significant from the overall group (11.6%). The difference in preintervention and postintervention documentation ratio was statistically significant ( $P < 0.001$ ). Moreover, these changes were also statistically significant in echo (15.3%,  $P = 0.014$ ), biliary (13.1%,  $P = 0.049$ ), soft tissue (15.6%,  $P = 0.039$ ), and ocular (31.7%,  $P = 0.003$ ) scans [Figure 2].

### DISCUSSION

The establishment and viability of POCUS are closely intertwined with documentation and billing. As POCUS becomes more utilized in the ED, there is a greater emphasis on its financial impact. Currently, POCUS revenue is split into a professional fee and a technical fee. The professional fee is billed by the physician group and the technical fee is billed by the hospital.<sup>[5,13]</sup> The bills are generated by a documented procedure note in the emergency medical record. The generation of a billable procedure note is often specific to each site and is required by the Centers for Medicare and Medicaid Services. Given the changing landscape of our health-care system, it is essential departments identify the metrics that result from performing and interpreting POCUS in the ED. Our study data indicate that direct e-mail intervention to physicians performing ultrasound can have a positive impact on compliance, billing, and documentation.

To date, our study is the first to evaluate and quantify the financial implication of feedback on ultrasound billing and physician compliance. Previously, Flannigan *et al.* demonstrated that the implementation of an automated workflow for POCUS improved technical and professional fees by 96% and 78%, respectively.<sup>[8]</sup> Our study differs by taking an already established program and providing individualized feedback. Both studies illustrate many barriers exist in the ultrasound billing process. This includes the establishment of web-based archival system, physician training, timely QA, ED coder training, physician credentialing, and optimization of billing workflow.<sup>[2,14]</sup> In this study, we evaluated compliance with billing and documentation before and after intervention.



**Figure 2:** Graphic illustration of individual ultrasound scan documentation percentage before and after intervention

The specific intervention was a personalized e-mail with specific ultrasound performance data for each physician. This included percentage of total ultrasounds performed and billed, broken down by scan type. This simple intervention resulted in an 11.6% improvement in compliance. This statistically significant improvement suggests that personalized feedback and performance data may be beneficial to improve compliance and documentation.

In the review of missed opportunities for billing and documentation, we found some logistical difficulties we had not anticipated. For example, in academic teaching institutions, resident physicians may perform an ultrasound for their own evaluation but not document or notify the attending physician. The scan may be saved into the web-based archival system and then reviewed in QA, but not be documented in the electronic record. We also incidentally found reluctance for attendings to document ultrasounds on patients that were received as hand off or patients undergoing additional imaging such as radiology performed ultrasound or CT scan. While these findings may be site-specific, it is likely they are occurring at many institutions. More research and data need to be collected to better understand barriers to the documentation and billing of ultrasound.

With continued growth and widespread use of POCUS, establishment and maintenance of documentation and billing are required to generate revenue and support infrastructure. The previous studies have demonstrated a return on investment between 1 and 5 years for most ultrasound machine purchases.<sup>[2,6]</sup> Creation of ultrasound subdivisions can be useful for many EDs and provide teaching, credentialing, and feedback to physicians performing ultrasound. Our data have demonstrated a significant improvement in compliance with documentation following a single personalized e-mail intervention. Future large-scale studies are needed to determine the optimal methods and time frame for feedback on ultrasound documentation and billing.

### Limitations

There are several limitations to this study. The study was performed at a single site and was a convenience sample which introduces selection bias. A control group was not used, so it is possible other factors led to a difference in the number of studies performed and documented during this time interval. The data we have reported on studies billed but does not report on change in payment amount. It is unknown if the results are generalizable to other EDs. Our department also has a well-established ultrasound curriculum with credentialed faculty, fellows, and residents. Variability in training, credentialing, and comfort with ultrasound may play a role in compliance with documentation and billing of POCUS. Finally, a single intervention was performed. It is unknown if the effects of this intervention will be lasting or what frequency of intervention is optimal. Future large-scale and longitudinal studies are needed to evaluate POCUS billing and documentation compliance.

## CONCLUSION

The implementation of timely QA with an e-mail reminder may help improve adherence and is essential for the maintenance and fiscal sustainability of an emergency medicine ultrasound program. Future studies should further elucidate and quantify the financial impact of modifiable factors within EDs' ultrasound documentation and billing practices.

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Nil.

### Conflicts of interest

There are no conflicts of interest.

## REFERENCES

1. Becker DM, Tafoya CA, Becker SL, Kruger GH, Tafoya MJ, Becker TK. The use of portable ultrasound devices in low- and middle-income countries: A systematic review of the literature. *Trop Med Int Health* 2016;21:294-311.
2. Adhikari S, Amini R, Stolz L, O'Brien K, Gross A, Jones T, *et al.* Implementation of a novel point-of-care ultrasound billing and reimbursement program: Fiscal impact. *Am J Emerg Med* 2014;32:592-5.
3. Bahner DP, Goldman E, Way D, Royall NA, Liu YT. The state of ultrasound education in U.S. medical schools: Results of a national survey. *Acad Med* 2014;89:1681-6.
4. Moore CL, Copel JA. Point-of-care ultrasonography. *N Engl J Med* 2011;364:749-57.
5. American College of Emergency Physicians. American College of Emergency Physicians. ACEP emergency ultrasound guidelines-2001. *Ann Emerg Med* 2001;38:470-81.
6. Soremekun OA, Noble VE, Liteplo AS, Brown DF, Zane RD. Financial impact of emergency department ultrasound. *Acad Emerg Med* 2009;16:674-80.
7. Shwe S, Witche L, Lahham S, Kunstadt E, Shniter I, Fox JC. Retrospective analysis of eFAST ultrasounds performed on trauma activations at an academic level-1 trauma center. *World J Emerg Med* 2020;11:12-7.
8. Flannigan MJ, Adhikari S. Point-of-care ultrasound work flow innovation: Impact on documentation and billing. *J Ultrasound Med* 2017;36:2467-74.
9. Levinson DR. Medicare Part B billing for Ultrasound. Washington DC: Department of Health & Human Services; 2014.
10. Grimshaw JM, Shirran L, Thomas R, Mowatt G, Fraser C, Bero L, *et al.* Changing provider behavior: An overview of systematic reviews of interventions. *Med Care* 2001;39:12-45.
11. Hempel D, Pivetta E, Kimberly HH. Personalized peer-comparison feedback and its effect on emergency medicine resident ultrasound scan numbers. *Crit Ultrasound J* 2014;6:1.
12. Lewiss RE, Cook J, Sauler A, Avitabile N, Kaban NL, Rabrich J, *et al.* A workflow task force affects emergency physician compliance for point-of-care ultrasound documentation and billing. *Crit Ultrasound J* 2016;8:5.
13. Cardenas E. Emergency medicine ultrasound policies and reimbursement guidelines. *Emerg Med Clin North Am* 2004;22:829-38.
14. Bahner D, Blaivas M, Cohen HL, Fox JC, Hoffenberg S, Kendall J, *et al.* AIUM practice guideline for the performance of the Focused Assessment with Sonography for Trauma (FAST) examination. *J Ultrasound Med* 2008;27:313-8.