

Downstream Imaging Utilization After Emergency Department Ultrasound Interpreted by Radiologists Versus Nonradiologists: A Medicare Claims–Based Study

SA-CME

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Abstract

Objective: To study differences in imaging utilization downstream to initial emergency department (ED) ultrasound examinations interpreted by radiologists versus nonradiologists.

Methods: Using 5% Medicare Research Identifiable Files from 2009 to 2014, we identified episodes where the place of service was “emergency room hospital” and the patient also underwent an ultrasound examination. We determined whether the initial ultrasound was interpreted by a radiologist or nonradiologist and then summed all additional imaging events occurring within 7, 14, and 30 days of each initial ED ultrasound. For each year and each study window, we calculated the mean number of downstream imaging procedures by specialty group.

Results: Of 200,357 ED ultrasound events, 163,569 (81.6%) were interpreted by radiologists and 36,788 (18.4%) by nonradiologists. Across all study years, ED patients undergoing ultrasound examinations interpreted by nonradiologists underwent 1.08, 1.22, and 1.34 additional diagnostic imaging studies at 7, 14, and 30 days, respectively ($P < .01$) compared with when the initial ultrasound examination was interpreted by a radiologist. From 2010 to 2014, the volume of downstream imaging for both radiologists and nonradiologists significantly decreased, with each year resulting in 0.08 fewer imaging examinations ($P < .001$) 14 days after the ED ultrasound event. Despite that decline, differences in downstream imaging between radiologists and nonradiologists persisted over time.

Conclusion: Downstream imaging after an initial ED ultrasound is significantly reduced when the ultrasound examination is interpreted by a radiologist rather than a nonradiologist.

Key Words: Point-of-care ultrasound, emergency department, resource use, health reform

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INTRODUCTION

Diagnostic ultrasound is an important tool in the management of patients in the emergency department (ED) setting. Properly used, ultrasound yields accurate diagnoses for many emergency conditions at a lower cost than other imaging modalities without exposing patients to ionizing radiation [1-13]. Emergency physicians are increasingly performing and interpreting ultrasound examinations, particularly limited ultrasound examinations of the abdomen, retroperitoneum, and chest [14,15]. The potential advantages of these point-of-care examinations include potentially faster turnaround times and improved access to care, especially

during off-hours when access to examinations performed in the radiology department might be limited [7,16-24]. To make diagnostic ultrasound more available to emergency physicians, there have been increases in both the acquisition of ultrasound equipment by EDs as well as the number of pathways for training emergency physicians in basic ultrasound techniques [25-29].

The performance and interpretation of ultrasound by emergency physicians as part of their initial patient evaluation represent an important new model in emergency care compared with the traditional care pathway whereby ED ultrasound examinations are interpreted by radiologists [14,15]. Evaluation of this pathway must consider not only the value of greater ultrasound availability, but also the potential impact on the use of health care resources. Because of the technical limitations of ultrasound, some patients can be expected to undergo additional downstream imaging as part of their full evaluation during an episode of care. However, for many patients, ultrasound provides a definitive diagnosis or a negative result for which no additional imaging is required. Although some studies suggest that ultrasound in the ED limits the initial use of CT in some patients [3,7,9,12,13,18], the overall impact on the use of health care resources when physicians other than radiologists interpret ED ultrasound examinations has yet to be determined. One measure of resource utilization would be to assess the number of downstream imaging examinations required for full diagnostic evaluation of a particular patient when ED ultrasound studies are performed and interpreted by emergency physicians rather than performed under the supervision of radiologists in the hospital radiology department and then interpreted by radiologists. Thus, the objective in this study is to use Medicare claims data to assess potential differences in downstream imaging events after an initial ED ultrasound examination is reported by radiologists versus nonradiologists.

METHODS

We received an exemption from the institutional review board of the ACR for the retrospective use of the administrative claims data used in this study.

We obtained patient-level 5% Research Identifiable Files for years 2009 through 2014 from CMS. The 5% Research Identifiable Files data set contains all fee-for-service claims associated with a 5% national sample of Medicare enrollees.

An ED ultrasound event was defined as any visit for which the place of service was reported as code 23 ("emergency room, hospital") on the claim and the patient also underwent an ultrasound procedure as indicated by the Berenson-Eggers Type of Service code associated with the claim (ie, I3A, I3B, I3C, I3D, I3E, I3F). A small number of patients were found to have undergone multiple ED ultrasound events within a single year. Because the unobserved factors that lead to multiple ED ultrasound events may be confounded with the volume of downstream imaging each patient received, we excluded all but the first ED ultrasound event for such patients. After identifying ED ultrasound episode events, we identified whether the ultrasound procedure was interpreted by a radiologist, defined as when the billing provider's specialty code was reported as either physician/diagnostic radiology, physician/nuclear medicine, or physician/interventional radiology (ie, 30, 36, or 94, respectively) or a nonradiologist (all other reported specialty codes).

We compiled descriptive statistics on the patient populations seen by radiologists and nonradiologists and performed χ^2 tests to examine differences between race, gender, age, and the patients' prospective Charlson comorbidity index (CCI) score. The CCI was calculated using each patient's previous year's claims using well-established algorithms [30]. Because we use the first year of our data to calculate CCI scores for subsequent years, our analysis only spans from 2010 to 2014. To examine the effects of radiologists and nonradiologists interpreting ED ultrasound procedures on downstream imaging utilization, we identified and summed all subsequent imaging events, which we defined as procedures for which the Berenson-Eggers Type of Service code began with *I* (for *imaging*) that occurred within 7 days, 14 days, and 30 days after the initial ED ultrasound. For each year and study window, we calculated the mean number of imaging procedures interpreted by radiologists and nonradiologists and performed a Student's *t* test to examine differences between the means.

Finally, we used a multivariate negative binomial regression model to estimate the effect of radiologists interpreting ED ultrasounds on the volume of downstream imaging for each of the 7-day, 14-day, and 30-day windows where the dependent variable was the number of imaging procedures that occurred in the study window, and the variable of interest was whether the initial ultrasound was interpreted by a radiologist. The regression models also adjusted for the year of the ED event, patient characteristics (ie, gender, race, age, and prospective

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