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

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Purpose

To study differences in downstream imaging utilization following Emergency Department ultrasound examinations interpreted by radiologists versus those interpreted by nonradiologists.
Background

• Point-of-care ultrasound (POCUS) by nonradiologists is an evolving care model increasingly used in the emergency department (ED) in the evaluation of their patients.

• Reasons include ultrasound’s advantages over other imaging modalities such as lower cost, no radiation exposure and increased throughput.

• Evaluation of this pathway must consider not only the benefits of POCUS in the ED, but also the potential impact on the use of healthcare resources.

• One measure of resource use is the number of downstream imaging examinations required for final diagnosis following an initial US examination in the ED.

• The number of downstream examinations after initial ED US can be compared for radiologist interpreted US examinations and nonradiologist interpreted US examinations using Medicare claims data.
Methods

• We used 5% Medicare Research Indentifiable Files (RIF) from 2009 to 2014 and identified patients in the ED setting where the patient underwent an initial US examination.
• We determined whether that initial US examination was interpreted by a radiologist or nonradiologist.
• We then summed all subsequent imaging examinations occurring within 7, 14, and 30 days of initial US for those patients.
• The differences in the mean number of downstream imaging for radiologists and nonradologists were calculated.
• We also compiled descriptive statistics on the patient populations seen by radiologists and non-radiologists and performed chi-square tests to examine differences between race, gender, age, and the patients’ prospective Charlson commodity index (CCI) score.
Results

• 200,357 ED US events from 2010 to 2014 were identified.
• 163,569 (81.6%) were interpreted by radiologists.
• 36,788 (18.4%) were interpreted by nonradiologists.

• ED patients undergoing initial US examinations interpreted by nonradiologists underwent 1.08, 1.22, and 1.34 more imaging studies at 7, 14, and 30 days subsequent to the initial ED US, respectfully, as compared to those ED SU examinations initially interpreted by radiologists (p<0.01).

• For both radiologists and nonradiologists, there was a statistically significant decrease in subsequent imaging over time, with each year resulting in 0.08 fewer imaging examinations (P<0.001) 14 days after the ED ultrasound event.
### Mean Number and 95% Confidence Interval of Subsequent Imaging Studies Patients Underwent by Interpreting Specialty of Initial ED Ultrasound

<table>
<thead>
<tr>
<th>Days after ED Ultrasound Visit</th>
<th>Interpreting Specialty</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>All Years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Difference</td>
<td>1.08*</td>
<td>1.09*</td>
<td>1.10*</td>
<td>1.13*</td>
<td>1.02*</td>
<td>1.08*</td>
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<tr>
<td></td>
<td>Difference</td>
<td>1.26*</td>
<td>1.24*</td>
<td>1.25*</td>
<td>1.25*</td>
<td>1.13*</td>
<td>1.22*</td>
</tr>
<tr>
<td>30 days</td>
<td>Non-Radiologist</td>
<td>6.03 [5.86, 6.20]</td>
<td>5.69 [5.54, 5.84]</td>
<td>5.62 [5.47, 5.77]</td>
<td>5.57 [5.43, 5.71]</td>
<td>5.41 [5.28, 5.54]</td>
<td>5.65 [5.58, 5.71]</td>
</tr>
<tr>
<td></td>
<td>Difference</td>
<td>1.45*</td>
<td>1.33*</td>
<td>1.35*</td>
<td>1.39*</td>
<td>1.22*</td>
<td>1.34*</td>
</tr>
</tbody>
</table>

* Indicates P < 0.01

Multivariate regression analysis demonstrated no significant differences in co-morbidities between the two groups.
Discussion

• Under the recent Medicare Access and CHIP Reauthorization Act legislation of 2015, a “cost” category related to resource use will be included in calculating physician reimbursement demonstrating how resource use is being identified by policy makers as an increasingly important outcome measure.

• While point-of-care US has the potential reduce additional and often more costly imaging, studies demonstrating this potential have been limited to narrowly focused clinical scenarios.

• Our data demonstrate in the aggregate that when radiologists interpret the initial ultrasound examination, subsequent use of imaging resources was significantly less than when the initial ED ultrasound examination was interpreted by nonradiologists.
Explaining the Differences

• ED physicians may perform more limited US examinations which may inherently lead to increased downstream imaging.

• Incomplete documentation of the initial ED US examination in the EMR or adequate documentation but separate from patient’s other imaging records may lead to repeat examinations.

• The ED POCUS examination may not have been the most appropriate initial imaging choice.

• Radiologists and sonographers receive significantly more training in US physics, image acquisition and managing technical obstacles than nonradiologists and other physicians may lack of confidence in the interpretations of nonradiologists leading to repeat examinations.
Limitations

- We used only billed fee-for-service encounters in 5% of the Medicare population and recognize these results may not be generalizable to the population as a whole.
- Our data set does not differentiate between community and academic institutions where institutional policy may influence the volume additional imaging.
- Our data do not differentiate between examinations performed and interpreted versus examinations only interpreted by the provider billing Medicare.
- Our data did not assess whether the performance of a “limited” ultrasound by a nonradiologist leads to more downstream imaging; however, this may be an area for future work.
- Finally, some limited US exams may be performed in the ED without submitting a claim to Medicare.
Future Considerations

• Who does what in the ED: What are the variations and similarities in the examinations radiologists and nonradiologists bill in the ED?

• What are the services and diagnoses that lead to higher frequencies of downstream imaging and are there differences in downstream imaging when those examinations are interpreted radiologists and nonradiologists?
Conclusion

• Although the use of POCUS by nonradiologists in the ED continues to grow, downstream imaging is significantly less when initial ED ultrasound examinations are interpreted by radiologists as compared to nonradiologists.

• While the causes of this difference are not clear, the reliance on “limited” US examinations by nonradiologists or a lack of confidence in the interpretations of nonradiologists may potentially explain this increase in follow-up imaging examinations.

• Resource use will be a critical metric in federal healthcare reform and should be evaluated with all emerging care pathways.

• Efforts toward improving documentation of findings and archiving of images as well as development of more robust quality assurance programs could all be beneficial.
References