R-SCAN Increasing the Percentage of High Yield CT Pulmonary Angiograms for PE Through Educational Collaboration Between Radiology and Emergency Departments

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Background:
• Radiology and Emergency Medicine Departments are independent and collaborate only usually to benefit patients. One of the most important areas of collaboration is the CT pulmonary angiogram (CT PA). This non-invasive test is quick and can be used to diagnose pulmonary embolism and assist in the emergency department’s (ED) clinical decision-making.
• There has been growing consent of overutilization which expose patients to unnecessary, radiation intensive, and cost. Moreover, changes in health care reimbursement have incentivized decreasing imaging utilization while maintaining high-quality metrics that support the use of obtaining costly exams such as for a CT PE. This has subsequently led to the development of clinical algorithms that can assist in decreasing unnecessary examinations and provide quality metrics.

Objectives:
• Implement R-SCAN tool with the goal of increasing the percentage of high yield CT PA studies ordered from the Emergency Department.
• Increase the percentage of D-Dimer ordered in patients with low PE risk score which would decrease the number of low yield exams.

Methods and Materials
We first retrospectively analyzed 100 random CT pulmonary angiogram studies ordered from the Emergency Department post collaboration from February 2017 to March 2017. We then performed a prospective study. D-Dimer testing at Mayo Clinic cost $90. To determine if an intervention was needed for each ordered CT pulmonary angiogram study were derived from medical record review. Patients with indeterminate results or prior pulmonary emboli were excluded from the study. Patients were included if they had signs and symptoms suggestive of PE. We developed a clinical decision tree using the American College of Radiology (ACR) tool created by the American College of Radiology (ACR) to assist in performing quality improvement. We also used the SCAN tool with the American College of Radiology (ACR) to assist in performing quality improvement.

Intervention
We developed a clinical decision tree using the American College of Radiology (ACR) tool created by the American College of Radiology (ACR) to assist in performing quality improvement. We also used the SCAN tool with the American College of Radiology (ACR) to assist in performing quality improvement.

Comparison of Pre and Post Intervention Data

<table>
<thead>
<tr>
<th>High Yield Exams Ordered</th>
<th>Pre-Intervention</th>
<th>Post-Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-Dimer ordered</td>
<td>52</td>
<td>72</td>
</tr>
<tr>
<td>D-Dimer if not ordered</td>
<td>120% increase</td>
<td></td>
</tr>
<tr>
<td>No D-Dimer ordered</td>
<td>48</td>
<td>25</td>
</tr>
<tr>
<td>No D-Dimer if not ordered</td>
<td>25% decrease</td>
<td></td>
</tr>
</tbody>
</table>

Step 1 Decision Tree for Patient with Clinical Suspicion for PE

1. D-Dimer: Value greater than 500 ng/mL was considered positive.
2. Modified Wells' Score: ≥4 was considered as High Risk.
3. Utility of D-Dimer: 
   - No D-Dimer ordered: less than 0.5% of clinical scenarios where the diagnosis of PE is unlikely.
   - D-Dimer ordered, 120% increase in the number of D-Dimer ordered, 25 of which were positive. (P=0.004)

Conclusion
Our educational collaboration increased in decreasing the number of low yield CT PE studies in patients ordered by the Emergency Department.

The ordering of D-Dimers was increased in clinical scenarios deemed low yield as determined by the Mayo Clinic R-SCAN Appropriateness Tool. Out of the 100 post collaboration studies analyzed, 43 had a Wells' score >4 and 72 were considered high yield (R-SCAN).

Again no studies deemed low yield (n=28) were positive for PE. This represented a 33% increase in high yield CT pulmonary angiograms ordered studies. 150% increase in the number of D-Dimer ordered, and a 79% increase in the number of D-Dimer ordered.

These results further emphasize the importance of data-driven educational collaboration between radiologists and clinicians.

Future Goals and Lessons Learned

Discourage overutilization

• Consider collecting data at all months to see if progress maintained.
• Interspecialty collaboration is challenging, but necessary for systemwide change.
• Finding and solving is important when collaborating (example: appropriately ordered exam versus high yield exam).

References