An Educational Intervention with a Radiology-Based Ordering Checklist Can Expedite the Evaluation of Acute Pulmonary Embolism

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*The views expressed are those of the author(s) and do not reflect the official policy or position of the US Army, Defense Health Agency, Department of Defense, or the US Government*
Multiple systems-based issues lead to delayed PE imaging and pose patient safety concerns.
Initial research and data collection showed delays in PE imaging*

Root cause analysis to determine factors leading to delayed PE imaging

PE ordering checklist created and distributed to providers

Checklist presented to key specialties, ACR Appropriateness Criteria discussed

Results and feedback collected

*Our project defines “PE Imaging” to include CT Pulmonary Angiogram (CT-PA) and Deep Venous Thrombosis Extremity Ultrasound Exams (DVT US)
Key Initial Data and Observations

- Imaging often ordered as “Routine” as opposed to “STAT”

- On average, CT-PA took > 60 mins to complete from when the order was placed

- Delays commonly reported due to IV access, labs, inadequate patient transportation

- No screening chest radiograph obtained
Root Cause Analysis of Factors Leading to Delayed Imaging for Acute PE

**Communication**
- No phone number for ordering provider.
- Radiologist phone number not readily available.
- Radiologist and technologists unaware of order.
- Nursing
- Technologists
- Radiology Support Staff
- Ordering Providers
- Radiologist
- Personnel at satellite clinics

**Technology**
- New electronic medical record.
- Paging system for urgent messaging.
- No cell-phone reception inside hospital.
- Add-on CTPA studies must be protocolled by Radiologist, per SOP.
- CTPA requires specific IV access

**Education**
- Acute PE is an emergency, generally warranting urgent or STAT order, rarely routine.
- If concern for DVT, patients should not ambulate on affected extremity.
- 2 CT Scanners readily available.
- Ultrasound
- Wheelchairs are not readily accessible in clinics.

**Delayed Imaging for Acute PE**
How to obtain Acute PE/DVT Imaging

CT-PA
Order name: “CT Angio Pulmonary”

- ORDER “STAT”
- Place your callback number in “Reason for exam”
- IV Access: 18-20 Gauge AC
- Order PA/LAT Chest X Ray; Consider labs (HCG & GFR)
- Call the Radiologist
  - M-F (0730-1600): 0-0000
  - Off hours: 0-0000 or page 0000

DVT US
Order name: “US Lower Ext Venous Duplex...”

- ORDER “STAT”
- Place your callback number in “Reason for exam”
- Call the Radiologist
  - M-F (0730-1600): 0-0000
  - Off hours: 0-0000 or page 0000
- Transport: Wheelchair or bed/gurney mandatory

Questions?

You or your support staff will be contacted when exam is ready to be performed.

If study is positive, radiologist will notify ordering provider by phone within 60 minutes

Department of Radiology - Process Improvement Project
Methods

• Hardcopy and electronic poster distributed to the hospital and satellite clinics

• In-person presentation given to key specialties/residency programs

• ACR Appropriateness criteria discussed as tool with ordering providers

• Post intervention anonymous data collected via PACS
Key Results

- More CT-PA exams ordered as STAT

- Order to CT-PA scan time increased by 20 minutes, dropping from 67 minutes to 46 minutes*

- No significant change in DVT US order to scan time.

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<th>Pre intervention (n=50)</th>
<th>Post intervention (n=39)</th>
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<tbody>
<tr>
<td>Percent of STAT orders for CTPA</td>
<td>68%</td>
<td>90% *</td>
</tr>
<tr>
<td>Median time to imaging for CTPA</td>
<td>67 minutes</td>
<td>46 minutes</td>
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STAT orders for CTPA demonstrated a statistically significant increase from 68% to 90% (p=0.02). The median OST decreased by 21 minutes, from 67 minutes to 46 minutes.

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<th>Pre intervention (n=64)</th>
<th>Post intervention (n=80)</th>
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<tr>
<td>Percent of STAT orders for DVT</td>
<td>61%</td>
<td>63%</td>
</tr>
<tr>
<td>Median time to imaging for DVT</td>
<td>31 minutes</td>
<td>42 minutes</td>
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DVT ultrasound studies demonstrated no significant change in the percentage of STAT orders (61% to 63%) nor in median OST (31 vs 42 minutes).

*Order to scan time refers to the difference between the time ordering provider requested the exam and the time the technologist marked the exam as being completed.
Discussion

• Several systems-based issues delay the evaluation of Acute PE

• An ordering checklist and educational intervention can improve the appropriate ordering of CTPA’s

• Ordering checklist may expedite the overall evaluation of Acute PE

• Qualitative benefits difficult to quantify: inter-departmental cooperation and patient safety
Thank you for your time!

Questions and Feedback Appreciated!

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References