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

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Problem Statement

Multiple systems-based issues lead to delayed PE imaging and pose patient safety concerns.

Project Overview

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
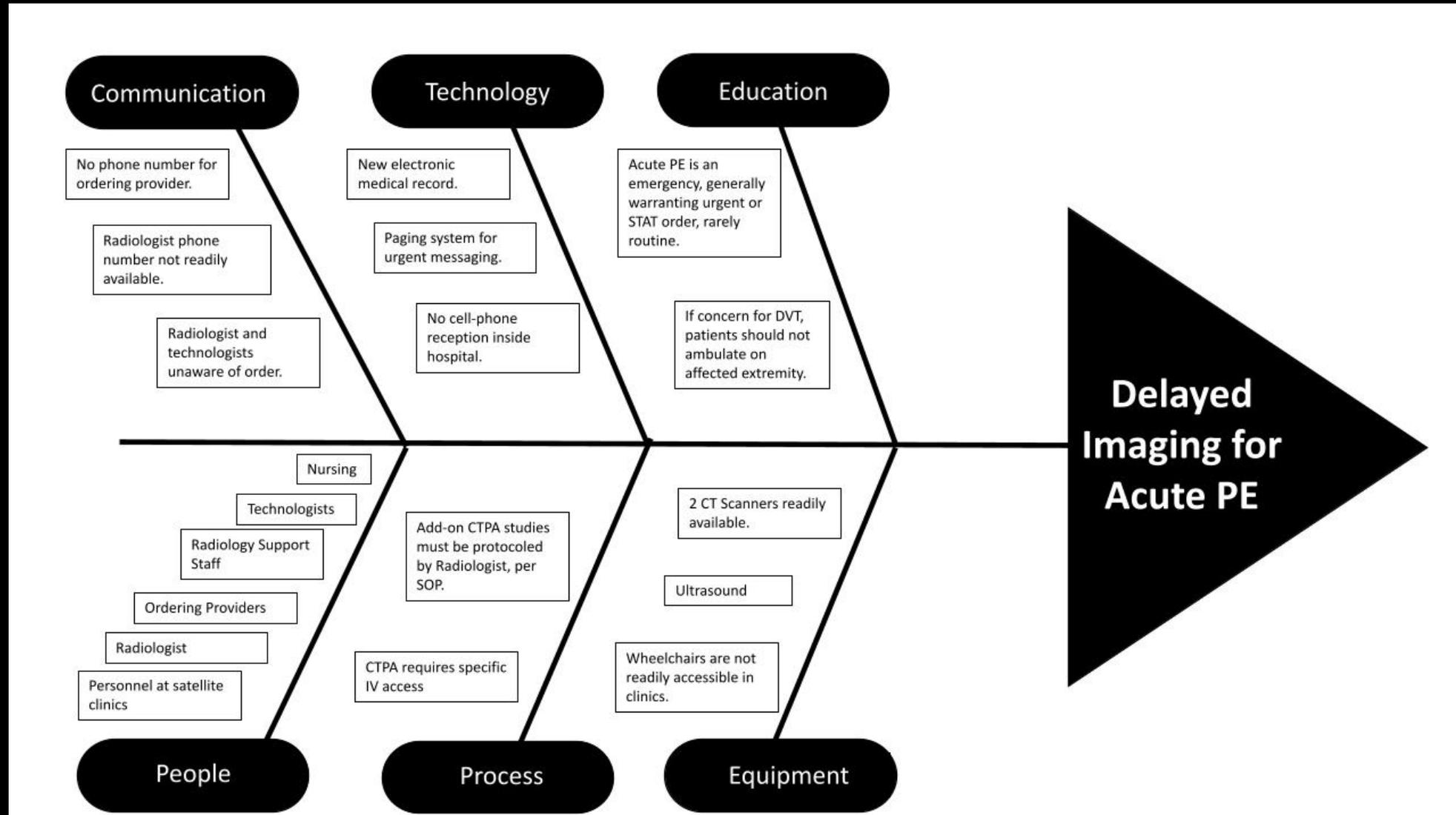
How to obtain Acute PE/DVT Imaging

If you are located at an outside clinic, please call Radiologist _prior_ to ordering study

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 **decreased by 20 minutes**, dropping from 67 minutes to 46 minutes*

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

	Pre intervention (n=50)	Post intervention (n=39)
Percent of STAT orders for CTPA	68%	**90% ***
Median time to imaging for CTPA	67 minutes	**46 minutes**

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.

	Pre intervention (n=64)	Post intervention (n=80)
Percent of STAT orders for DVT	61%	63%
Median time to imaging for DVT	31 minutes	42 minutes

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

1. Smith SB, Geske JB, Maguire JM, Zane NA, Carter RE, Morgenthaler TI. Early anticoagulation is associated with reduced mortality for acute pulmonary embolism. Chest. 2010;137(6):1382-1390. doi:10.1378/chest.09-0959
2. American College of Radiology. "ACR–NASCI–SIR–SPR practice parameter for the performance and interpretation of body computed tomography angiography (CTA)." (2017).
3. Expert Panels on Cardiac and Thoracic Imaging:, Kirsch J, Brown RKJ, et al. ACR Appropriateness Criteria® Acute Chest Pain-Suspected Pulmonary Embolism. J Am Coll Radiol. 2017;14(5S):S2-S12. doi:10.1016/j.jacr.2017.02.027
4. Expert Panel on Vascular Imaging:, Hanley M, Steigner ML, et al. ACR Appropriateness Criteria® Suspected Lower Extremity Deep Vein Thrombosis. J Am Coll Radiol. 2018;15(11S):S413-S417. doi:10.1016/j.jacr.2018.09.028
5. Wright C, Elbadawi A, Chen YL, et al. The impact of a pulmonary embolism response team on the efficiency of patient care in the emergency department. J Thromb Thrombolysis. 2019;48(2):331-335.
6. Root, Christopher W., et al. "Multidisciplinary approach to the management of pulmonary embolism patients: the pulmonary embolism response team (PERT)." Journal of multidisciplinary healthcare 11 (2018): 187.