Using Algorithms to Educate and Optimize Appropriate Use of Cross-Sectional Body Imaging among First Year Radiology Residents: A Pilot Study

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IMPORTANT

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Purpose
- Errors in ordering and protocoling diagnostic exams lead to “non diagnostic” exam interpretation, requiring repeat studies, which will increases radiation and additional IV contrast exposure.
- Upon review of protocol practices, it was determined that the first year residents received informal “on the job” training from upper level residents which led to increased protocoling errors.
- The purpose of the study is to provide an algorithm for the radiology residents to reduce cross sectional imaging protocoling errors.

Methods
- 50-75 protocols per day are entered into the electronic medical record (EMR) by the first year residents.
- After the first week of protocoling with the guidance of an upper level resident only, first year residents were then asked to complete a 10-question pre-intervention quiz to assess their accuracy in protocoling several specific clinical scenarios.
- The residents were then given a CT protocoling algorithm on a single laminated sheet to guide them through the protocoling process for the remaining 3 weeks of their rotation.
- The same 10-question quiz was administered to the first year residents while using the CT protocol algorithm worksheet.
**CT Chest**

*Without Contrast*

**Low Dose Pulm Nodule**

- **Solitary Pulmonary Nodule**
  - Lung Ca. Screening
  - (>55 yo, >30 pack-years smoking, No Hx of Lung Ca)

- **Assess Lymphadenopathy, Abscess, Hx Lung Ca.**

- **R/O Pneumonia, Cough, Chest Pain, Abnormal CXR**

- **CT Chest Without Contrast**
- **CT Chest With IV Contrast**
- **Routine Chest CT**

- **CTCAP**
  - With IV Contrast Only

- **Routine Combo Study**
  - Chest/Abdomen/Pelvis

- **CT Abdomen**
  - W/IV Contrast Only
  - Liver/Pancreas Multiphase

- **CT Abdomen**
  - (W/IV Contrast)
  - Liver/Pancreas Adrenal, Renal Mass Multiphase

- **Back to Main**

**Oncology**

- **New Malignancy**
  - f/u abnormal US or CT lesion
  - Hx of hepatitis B/C with cirrhosis for HCC surveillance

- **Most Malignancies**

- **Most Head and Neck Ca.**

- **Known HCC, Neuroendocrine + Liver Mets, Localized Pancreas Ca. Surveillance**

- **CT Abdomen**
  - W/IV Contrast
  - Liver, Pancreas, Adrenal, Renal Mass Multiphase

- **Back to Main**
Post-op, Suspect Ureteral Injury/Leak/Fistula; Macroscopic Hematuria; Microscopic Hematuria + >50 yo, Hx Urothelial Ca or RCC

Flank Pain; Microscopic Hematuria <50 yo, Nephrolithiasis

CT Pelvis
W/O Contrast
CT Cystogram

CT Abdomen/Pelvis
W/ PO (Gastroview) and IV Contrast (+/- Rectal Contrast if Indicated By Hx)
Routine Abdomen/Pelvis
Results

◦ We compared the individual responses between pre- and post-intervention quizzes.

◦ For simple clinical scenarios, such as a patient with flank pain radiating to the groin, the pre-and post intervention quiz showed 100% correct response rate.

◦ For more complex protocols, such as possible acute appendicitis or oncology surveillance exams, responses were variable but showed overall improvement from the pre- to post-intervention quiz.

◦ A few questions showed response changes from correct to incorrect after algorithm use, indicating possible differences in individual resident learning and integration of the algorithm.

Conclusions

◦ Our results demonstrate overall reduction in first year protocoling error rates using a detailed but easy to use protocoling decision support type algorithm.

◦ The study identified residents who had incorrect protocol responses that were corrected, or who went from initially pre-intervention correct responses to post-intervention incorrect responses indicating possible differences in individual resident learning and integration of the algorithm.

◦ These latter residents could benefit from focused teaching to improve protocoling accuracy.

◦ The study is ongoing to include more first year residents throughout the year.

◦ The simple branching logic of these protocoling algorithms suggests the possibility of development of an integrated EMR protocoling decision support, similar to that utilized by referring clinicians.

◦ As this quality study demonstrates, resident errors still occur even with the use of a printed algorithm and can adversely impact patient care.