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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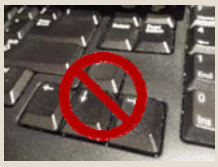


Prev

Next

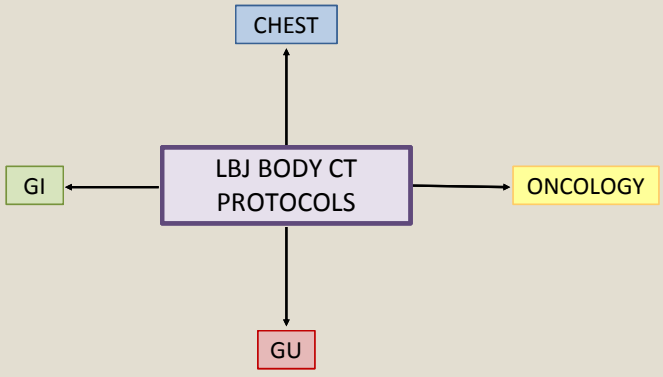
Purpose

- 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.

Prev Next



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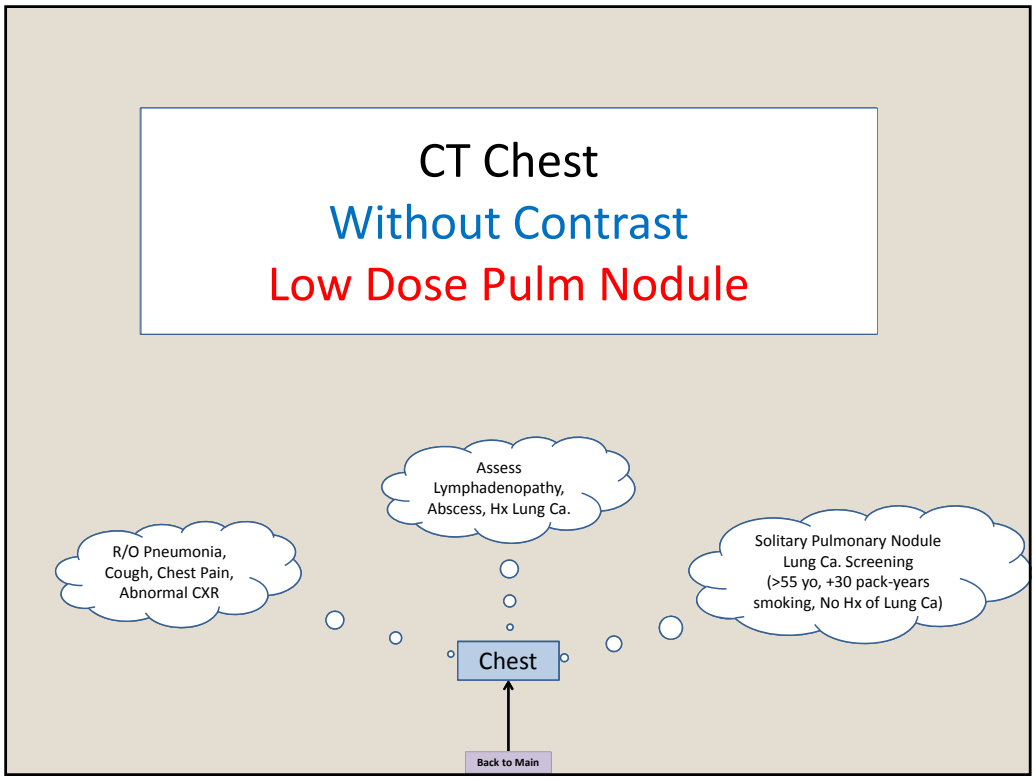
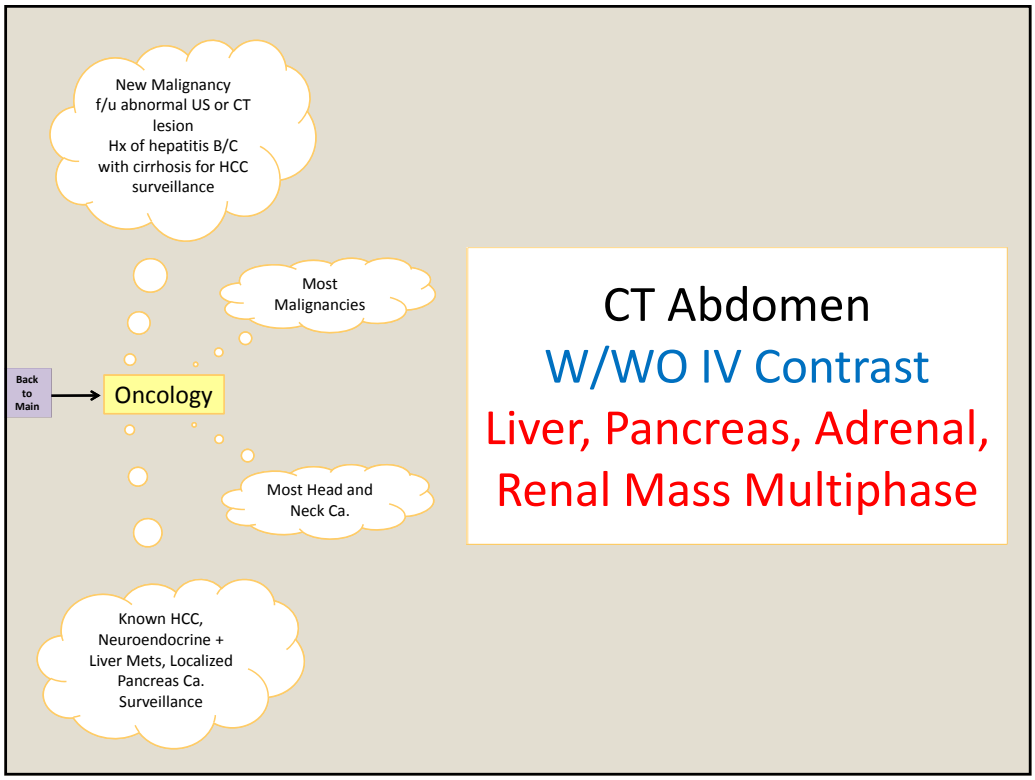
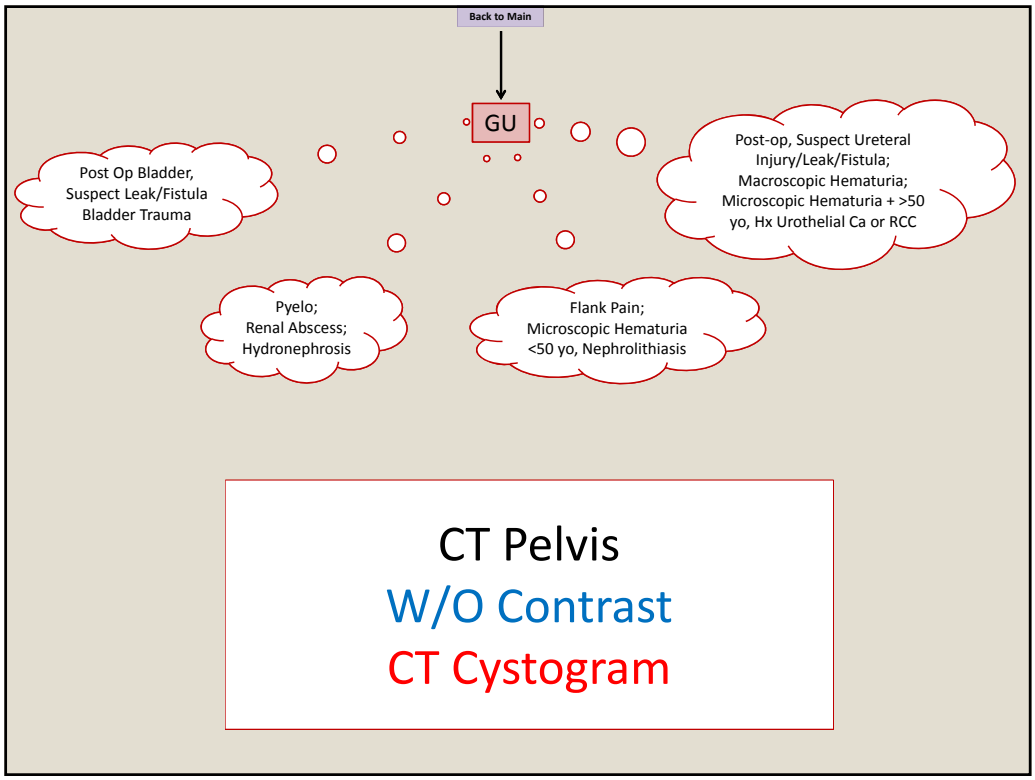
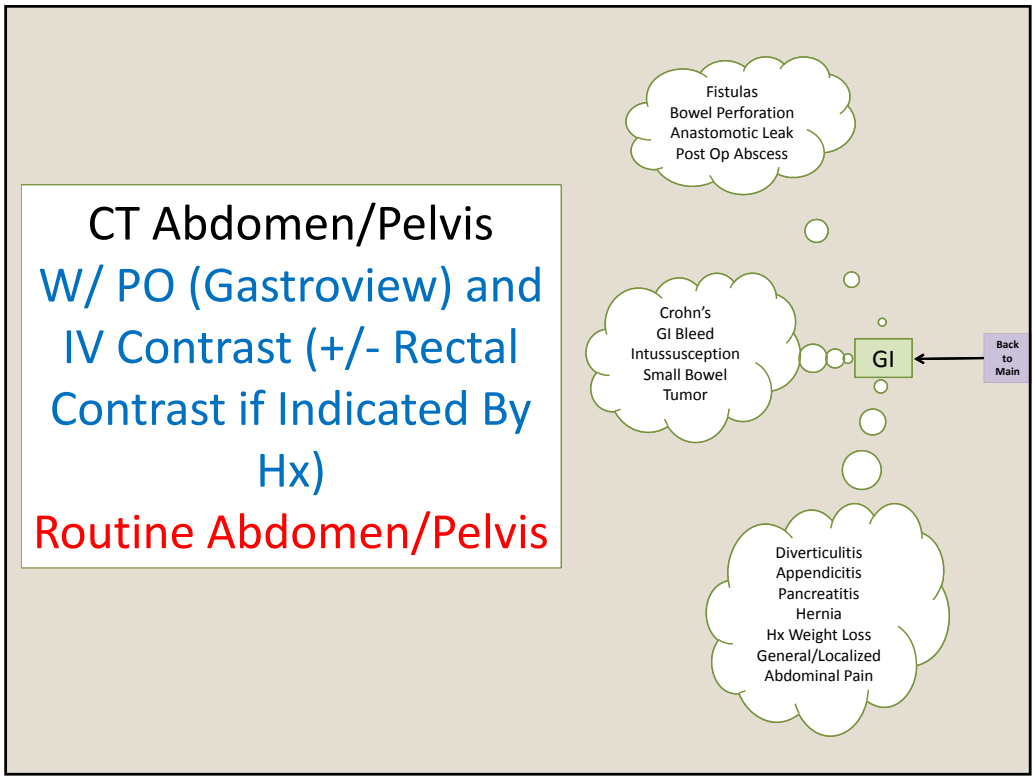

CT Chest
Without Contrast
Low Dose Pulm Nodule
Assess Lymphadenopathy, Abscess, Hx Lung Ca.
R/O Pneumonia, Cough, Chest Pain, Abnormal CXR
Solitary Pulmonary Nodule Lung Ca. Screening (>55 yo, +30 pack-years smoking, No Hx of Lung Ca)
Chest
Back to Main


New Malignancy f/u abnormal US or CT lesion
Hx of hepatitis B/C with cirrhosis for HCC surveillance
Most Malignancies
Back to Main
Oncology
Most Head and Neck Ca.
Known HCC, Neuroendocrine + Liver Mets, Localized Pancreas Ca. Surveillance
CT Abdomen
W/WO IV Contrast
Liver, Pancreas, Adrenal, Renal Mass Multiphase


Back to Main
GU
Post Op Bladder, Suspect Leak/Fistula Bladder Trauma
Post-op, Suspect Ureteral Injury/Leak/Fistula; Macroscopic Hematuria; Microscopic Hematuria + >50 yo, Hx Urothelial Ca or RCC
Pyelo; Renal Abscess; Hydronephrosis
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
Fistulas
Bowel Perforation
Anastomotic Leak
Post Op Abscess
Crohn's
GI Bleed
Intussusception
Small Bowel
Tumor
GI
Back to Main
Diverticulitis
Appendicitis
Pancreatitis
Hernia
Hx Weight Loss
General/Localized
Abdominal Pain

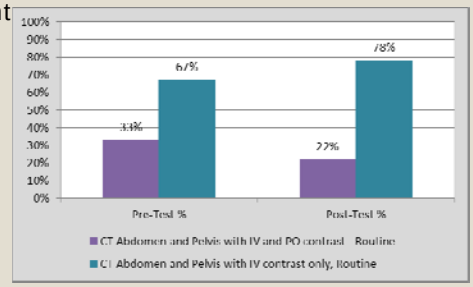
Results

- 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.

Q5: 75 year old male presents to EC with severe abdominal pain, guarding, and rebound tenderness. White blood count is 18 and GFR is 47.
Which of the following is the most appropriate exam?
Correct Answer = Blue

Protocol	Pre-Test %	Pre-Test Number Answered	Post-Test %	Post-Test Number answered
CT Abdomen and Pelvis with IV and PO contrast - Routine	**33%**	**3**	**22%**	**2**
CT Abdomen and Pelvis with IV contrast only, Routine	67%	6	78%	7

Incorrect to Correct	Correct to Incorrect	Stayed Incorrect	Stayed Correct
2	1	1	5



Prev

Next

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.

Prev