THE EFFECT OF EHR INTEGRATED RADIOLOGIST DRIVEN "ORDER CHANGE" PROCESS ON OUTPATIENT CT AND MRI EXAMINATIONS

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BACKGROUND

YALE RADIOLOGY AND BIOMEDICAL IMAGING

- To improve appropriateness and decrease medical imaging costs, Center for Medicare and Medicaid Services is launching Protecting Access to Medicare Act (PAMA) in January 2020.

- PAMA mandates clinicians to select evidence-based imaging exams to decrease use of imaging when not clinically indicated.

- In our department radiologists oversee CT and MRI exam orders and assign the parameters for technologists to follow for the exam based on indication & history. This process is referred to as "protocoling".

BACKGROUND

YALE RADIOLOGY AND BIOMEDICAL IMAGING

- To facilitate engagement in patient care and leverage the expertise radiologists possess, our protocol page is embedded in the Electronic Health Record (EHR) and includes a "Change order needed" button, which flags exam orders that are deemed incorrect at the time of protocoling.

PURPOSE

- To assess the percentage of exam orders where an order change was requested.
- To assess the types of changes requested by radiologists.
- To assess the acceptance rate of the suggested changes by the ordering providers.

MATERIALS & METHODS

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- IRB approved quality improvement study.
- Informed consent was waived.
- All outpatient CT and MRI imaging requests protocoled from 4/2017- 1/2018, where a change order request was submitted were analyzed.
- Total number of change order requests was calculated and the difference between the initial and new order for all accepted changes was categorized.
- Fisher exact test was utilized to assess for statistical significance ($P<0.05$).

WORKFLOW

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- The change order requests submitted by radiologists populate a separate work-list managed by radiology clinical scheduling assistants (CSA). The CSAs initiate contact with the ordering provider and detail the change order request.

- If the provider agrees with the change, the CSA modifies the order for the provider and the provider can co-sign the order electronically.
  - A new order is requested for providers who do not have access to our EHR

- If the provider prefers not to change the order, it returns to the protocol list without change, with a note from the CSA.

- If a phone consult is requested by the ordering provider to discuss the case, the CSA facilitates transferring the provider into the relevant reading room.

EXAMPLE OF PROTOCOL SCREEN

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In this case, radiologist believed CT exam WITH intravenous (IV) contrast is best test based on history of worsening abdominal pain and requested order change.

Protocol Work List: NEW CT BODY YNH/SRC/Park Ave, Total Count: 25

Refresh | Views | Chart | Study History | Anc Orders | No Protocol | Reassign Protocol | Hide Report | Media Manager | Notes | Legend | Recent Protocols | IB Message | Clear Protocols

Protocol Details | Prior Protocols/Studies | Protocol Details

CT Abdomen Pelvis wo IV Contrast — Accession #:

Base Procedure Name: CT ABDOMEN PELVIS WO IV CONTRAST

Reason For Exam — Priority: Routine

Worsening abdominal pain

Dx: Abdominal pain, unspecified abdominal location [R10.9 (ICD-10-CM)]

Questions

Reason for Exam: Worsening abdominal pain

Ordered On 4/18/2019 12:26 PM

Ordering Provider	Authorizing Provider	Ordering User	Ordering Department
[redacted]	[redacted]	[redacted]	YNH CENTRAL SCHEDULING

[redacted]

Ordering Comments

Not on file

Relevant Lab Information

No labs found.

Signed and Held Orders

None

Allergies

Not Specified: Pork/porcine Containing Products

CT BODY

Division: Adult | Pedi | ED | Cardiac

Perform as Ordered

Body Regions: Chest | Chest/Abdomen/Pelvis | Abdomen/Pelvis | Chest/Abdomen | Abdomen | Pelvis

CT Abd Pel Protocols: Routine Abd Pelvis WITH IV contrast | WITHOUT IV contrast | Acute GI Bleed Protocol | Entergraphy | Flank Pain | General CTA | General CTV | Low Dose Renal Stone Protocol | Urography/Hematuria | Virtual Colonoscopy | ED A/P

Abdomen Contrast: Without IV | With IV | With and Without IV | Rectal

Pelvis Contrast: Without IV | With IV | With and Without IV | Rectal

Oral Contrast: Without Oral | With Oral

Change order needed? Yes ← Change order button

(Tech/CSA use only) Change Order Request Outcome: Referring Physician Approved Radiologist Protocol | Referring Physician Denied Order Change ← Buttons for CSA to note outcome

Comments

For nursing- - Ok to access/deaccess patient's: Yes

Finalize Protocol | Finalize & Place Orders

Route protocol to: | Finalize | Restore

EXAMPLE OF PROTOCOL SCREEN

In this case, the exam indication was not correct per radiologist chart review. Lumbar MRI was suggested based on history of sudden onset low back pain and restricted range of motion.

Protocol Work List: NEW MR BODY YNH/SRC/YHC/Park Ave/Devine, Total Count: 12

Refresh | Views | Chart | Study History | Anc Orders | No Protocol | Reassign Protocol | Hide Report | Media Manager | Notes | Legend | Recent Protocols | IB Message | Clear Protocols

Protocol Details | Prior Protocols/Studies | Protocol Details

MRI Pelvis w wo IV Contrast — Accession #:

Base Procedure Name: MRI PELVIS W WO IV CONTRAST

Reason For Exam — Priority: Routine

Subcutaneous cyst

Dx: Subcutaneous cyst [L72.9 (ICD-10-CM)]

Questions

Attention: MRI of a patient with a cardiac pacemaker or defibrillator may be dangerous and will only be scheduled under certain specific conditions. Does the patient have a pacemaker or defibrillator?	No
Reason for Exam:	Subcutaneous cyst
Can the patient lie flat and still for 45 min while in MRI scanner?	Yes
Does the patient need Anesthesia or Sedation?	No

Ordered On 4/26/2019 10:55 AM

Ordering Provider	Authorizing Provider	Ordering User	Ordering Department
			BH OUTPATIENT IMAGING CENTRAL SCHEDULING

Ordering Comments

Not on file

MRI BODY

MRI Body Region: Abdomen | Pelvis | Chest/Cardiac | A/P | C/A/P | Peripheral Vascular

Indication Review - Use this for MRI scan requests in patients with pacemaker and/or ICD: Medically Necessary | Do Not Proceed

Responsible Attending

Comments: Appropriate exam would be lumbar MRI without and with intravenous contrast.

Change order needed? Yes

Change order button

(Tech/CSA use only) Change Order Request Outcome: Referring Physician Approved Radiologist Protocol | Referring Physician Denied Order Change

For nursing- - Ok to access/deaccess patient's Port per radiology protocol if needed: Yes

Finalize Protocol | Route protocol to:

Finalize & Place Orders | Finalize | Restore

RESULTS

YALE RADIOLOGY AND BIOMEDICAL IMAGING

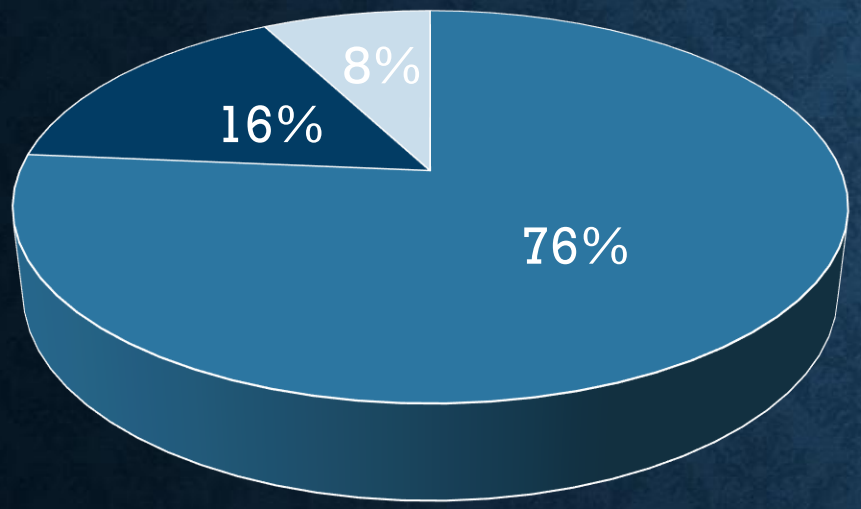
- Change order requests submitted by radiologists were significantly higher for MRI (5.2%, 1,283/24,553) compared to CT (2.9%, 1,585/54,757), P<0.001.

- Ordering provider denial rate was equivalent for CT (18%, 230/1,283) and MRI (18%, 286/1,585).

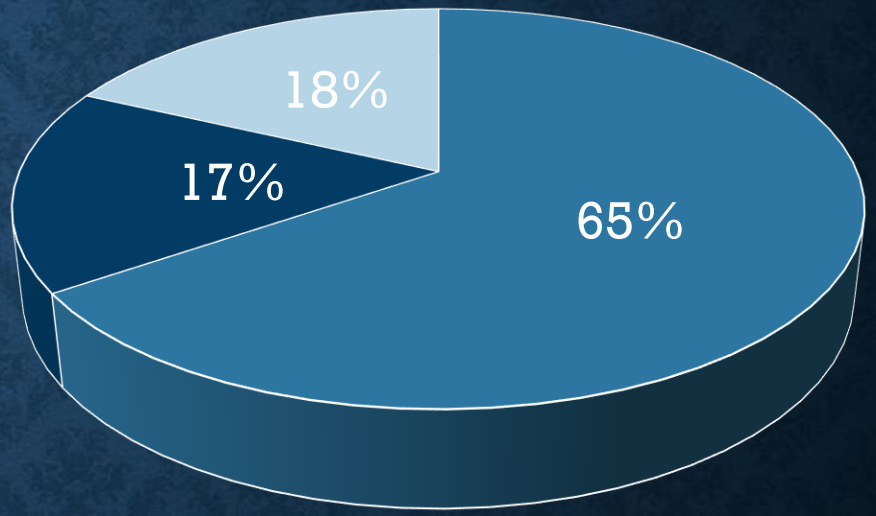
- Change requests secondary to alteration in contrast utilization was the most common and was significantly different between CT (76%, 992/1,299) and MRI (65%, 688/1,053), P<0.001. Of these, most did not require a change in anatomical region imaged (92%, 912/992 for CT vs. 96%, 662/688 for MRI).

CHANGED ORDERS

Changed CT Orders



Changed MRI Orders



- Intravenous contrast was added or omitted
- Anatomy coverage was decreased or increased
- Exam type was changed*

* Examples include CT/MR to CT/MR Angiography.

RESULTS

- Requests for different anatomical coverage only (without adjustment in contrast/exam type) were not significantly different between CT (16%, 206/1,299) and MRI (17%, 174/1,052).

- The most common change for CT maintained anatomical coverage but changed "with and without IV contrast" orders to "with IV contrast" only (35%, 460/1,299, $P<0.001$).

- The most frequent MRI change maintained anatomical coverage but changed "with and without IV contrast" studies to "without IV contrast" (25%, 259/1,052, $p<0.001$).

DISCUSSION

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- Outpatient CT and MRI exams are deemed incorrect in 2.9% - 5% of cases after radiologist review.

- Radiologist review of orders is highly impactful and well received with 82% of requested order changes accepted by the ordering provider.

- Such a system appears more impactful than computerized decision support software, as a recent study showed 63% of "inappropriate studies" were still performed following an alert from computerized decision support software[1].

1. Gupta S, Klein K, Singh AH, Thrall JH. Analysis of Low Appropriateness Score Exam Trends in Decision Support-based Radiology Order Entry System. J Am Coll Radiol. 2017 May;14(5):615-621.

CONCLUSIONS

YALE RADIOLOGY AND BIOMEDICAL IMAGING

- Direct radiologist supervision of the CT and MRI exam orders improves patients' care by optimizing contrast use for clinical indication and ensuring correct anatomical region is scanned.
  - While not specifically assessed in this study, the process may also help reduce radiation exposure and imaging costs.

- Integration of an EHR embedded protocoling interface and the change order process facilitates radiologist workflow and optimization of CT and MRI orders at the time of protocoling.

THANKS FOR YOUR ATTENTION

I would be happy to receive your questions:

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