Decreasing Duplicative Imaging: Clinical Decision Support Intervention to Reduce Unnecessary Abdominal Ultrasound Following Abdominal CT

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Introduction

• Duplicative imaging contributes to unnecessary health care expenditure
• In particular, for patients who have an abdominal ultrasound after an prior abdominal computed tomography (CT) scan, the diagnostic information in question is often available on the CT
• Most common scenario: inpatient acute kidney injury (AKI)
  – Usually due to causes other than renal obstruction
  – Renal ultrasound reflexively ordered
• Acceptable acknowledgement reasons provided to bypass the BPA
Introduction

• Baseline review of reports on 100 inpatients in 2015-2016 imaged for AKI with renal US revealed absence of hydronephrosis in 89% (89/100)
• Purpose of quality improvement initiative: to reduce unnecessary inpatient and emergency department abdominal US exams in patients who have undergone abdominal CT within 72 hours prior to the US order being placed

Methods

• Best practice advisory (BPA) created in the electronic medical record (EMR)
  – Advise against routine use of abdominal US in adult inpatients and emergency department patients who had undergone an abdominal CT within the preceding 72 hours
• Patients with transplants and oncology patients were excluded
  – Often unable to receive intravenous contrast enhanced CT, and noncontrast CT provides limited information
Methods

- Frequency of BPA firing and subsequent ordering behavior were evaluated after integration of the BPA into the EMR in December 2017
- Orders initially cancelled and later imaged with an override during the same admission also not included
- For all patients whose ultrasounds were canceled between January 1 - June 30, 2018, chart review was conducted to confirm that patient care quality and safety were not compromised by omitting the ultrasound
- Subset of 100 patients who had ultrasound performed were reviewed to determine if the test added value

Methods

- Two separate BPAs were designed, depending whether the CT result was pending or finalized
- Acceptable acknowledgement reasons to proceed with the order were made available with the BPA
Results

- In the first six months of 2018, a total of 614 inpatient and ED abdominal US orders were placed in patients with a preceding abdominal CT
- **Following the BPA, 16% (96/614) of the US orders were canceled**
- Frequency of cancellation and acknowledgement reasons to override were documented
- 20 renal ultrasounds requested by nephrology or urology

Review of patients who received US following CT (n=100)

<table>
<thead>
<tr>
<th>Renal</th>
<th>Unchanged findings</th>
<th>Contributory findings</th>
<th>Radiologist recommended - contributory findings</th>
<th>Renal cyst clarification</th>
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<tr>
<th>Liver &amp; Biliary Tree</th>
<th>Unchanged findings</th>
<th>Contributory findings</th>
<th>Radiologist recommended - contributory findings</th>
<th>Various causes on CT</th>
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<th>Gallbladder</th>
<th>Unchanged findings</th>
<th>Contributory findings</th>
<th>Radiologist recommended - contributory findings</th>
<th>Miscellaneous</th>
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<td>12</td>
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<td>LVAD abscess 3 days following phlegmonous changes on CT</td>
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<td>Porcelain gallbladder</td>
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<td>Further clarified abnormal CT findings, polyps</td>
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<td>Degraded liver images on CT</td>
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<td>LVAD abscess 3 days following phlegmonous changes on CT</td>
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<td>Radionuclide follow-up CT, renal cyst, detectable, heterogeneous kidneys</td>
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Results

• Chart review of 96 patients whose US orders were cancelled demonstrated patient care and hospital course not compromised
  – Review of free text comments demonstrated at least 42 US for AKI or renal stones that could have potentially been avoided
  – Need for better education and prompting modification of the BPA to emphasize that AKI was a primary area of overuse

• Chart review of 100 patients who received US following CT demonstrated a paucity of contributory findings in evaluation of the kidneys, liver and biliary tree, and various miscellaneous concerns better evaluated on CT
  – Of note: gallbladder evaluated often revealed clinically significant findings either not depicted by CT or further clarified by US

Conclusions

• Abdominal CT provides more diagnostic information than abdominal ultrasound in many cases, with the exception of evaluating the gallbladder

• Inpatient and ED abdominal ultrasound may be obviated by a recently performed abdominal CT scan, particularly when ordering renal ultrasound in the setting of hospital acquired AKI

• Implementing a smart BPA to avoid an unnecessary abdominal US in a patient with a recently performed abdominal CT safely reduces wasteful practice to decrease patients’ cost of care, but is only effective in a small percentage of patients.

• Performance improvement interventions need to be bolstered to by education and provider feedback reports, which we will be adding in the next phase.