Abdominal radiographs (AXR) are commonly requested in the acute setting. Non-indicated AXR unnecessarily add to the workload of imaging departments and can delay more urgent investigations. Furthermore, AXR expose patients to 0.429 mSv, equivalent to 31 chest x-rays.

Anecdotally, the authors have noted often AXR:
- Are followed by cross-sectional imaging
- Are requested by junior doctors without senior input
- Have no influence on further management
- Are falsely negative

We audited AXR use at the Royal Cornwall Hospital for patients referred to the general surgical team with acute gastrointestinal symptoms. Our aim was to establish what % of AXR were indicated, and if required implement a strategy for improvement.

The criteria for this audit was ‘for abdominal x-rays to be requested in line with iRefer guidelines’ (figure 1). The target was 67% compliance, the best value derived from our literature search.

We also recorded what % of AXR were reported as abnormal and collected data on CT imaging. This allowed us to compare the diagnostic yield of indicated vs non-indicated AXR and assess the false negative rate of AXR followed by CT.

**Method:**

- List of all admissions seen by general surgical team over a 31-day period created. Patients aged ≥16 with GI symptoms included.
- The total number of AXR and abdominal CT performed during each admission recorded.
- For the first AXR carried out during each admission we recorded multiple variables including the request form ‘clinical details’ and a copy of the radiologist report. Similar information was recorded for the first abdominal CT carried out during each admission.
- The clinical details given on the request form were used to classify AXR as indicated or non-indicated. If 2 or more symptoms associated with bowel obstruction or a history suggestive of toxic colonic dilation in IBD was given, the request was classified as indicated.
- Radiologist reports used to classify AXR as normal or abnormal.

Following the first audit cycle we delivered teaching to the doctors most frequently ordering AXR, a strategy which has effectively reduced the number of AXR requests in other hospitals. After the second cycle we trialled a radiographer-led AXR vetting process; only AXR indicated according to locally agreed indications were carried out;
- Toxic megacolon
- Gastrografin studies
- Bowel obstruction
- Consultant or registrar discretion

We demonstrated a greater diagnostic yield in indicated vs non-indicated AXR (figure 2). Bowel obstruction was the most common abnormality (73% abnormal AXR).

Over the 3 audit cycles 30 AXR were indicated, reported as normal and followed by CT. In these instances, 25 of the CTs identified an abnormality not detected on AXR, giving a false negative rate of 83% for these indicated AXR.

### Results & Conclusion:

The results of the three audit cycles are shown in table 1.

<table>
<thead>
<tr>
<th>Audit cycle start date</th>
<th>01/02/15</th>
<th>20/08/15</th>
<th>08/12/15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of patients included</td>
<td>321</td>
<td>368</td>
<td>347</td>
</tr>
<tr>
<td>AXR within 24hrs of admission</td>
<td>34%</td>
<td>24%</td>
<td>12%</td>
</tr>
<tr>
<td>CT within 48hrs of admission</td>
<td>40%</td>
<td>42%</td>
<td>43%</td>
</tr>
<tr>
<td>% AXR indicated</td>
<td>31%</td>
<td>41%</td>
<td>47%</td>
</tr>
<tr>
<td>% AXR abnormal (all AXR)</td>
<td>22%</td>
<td>25%</td>
<td>24%</td>
</tr>
<tr>
<td>24hr AXR &amp; 48hr CT</td>
<td>18%</td>
<td>13%</td>
<td>6%</td>
</tr>
<tr>
<td>Straight to 48hr CT</td>
<td>21%</td>
<td>29%</td>
<td>37%</td>
</tr>
</tbody>
</table>

Table 1: Audit results.

Through teaching we reduced the % of patients undergoing AXR and increased the % of indicated AXR, both without a dramatic increase in the % of patients having a CT. After the vetting process was introduced we improved these numbers further, just 12% of patients had an AXR on admission compared with 34% prior to intervention, and 47% of AXR requests were clinically indicated compared with 31% prior to intervention.

We hope to maintain the improvements achieved by delivering further teaching to new doctors, and through liaising with the emergency and medical departments to ensure all-round good practice at RCH.

## Conclusion:

We hope to maintain the improvements achieved by delivering further teaching to new doctors, and through liaising with the emergency and medical departments to ensure all-round good practice at RCH.

However, based on our literature review and the high false negative rate for indicated AXR observed in our audit, we feel the use of AXR should be reconsidered. Research into imaging patients with GI symptoms has shown highest overall sensitivity and lowest overall radiation exposure when using CT only after negative or inconclusive ultrasonography (US).

Whilst AXR continue to be used, they should be limited to indications in current guidelines. Junior doctors should be encouraged use the iRefer guidelines to ensure familiarity with indicated conditions. Furthermore there should be sound clinical evidence of the indicated conditions, and if there is any doubt a senior’s advice should be sought before requesting an AXR to ensure good radiological practice.

1. iRefer Guidelines: Making the best use of clinical radiology. The Royal College of Radiologists; 2015.