

Assessment of the Utilisation of Plain Abdominal Radiography in Patients with Acute Abdominal Complaints

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Citation

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Abstract

Background: Plain film abdominal radiography (PFAR) is over utilised as an investigation for acute abdominal complaints. The Royal College of Radiologists (RCR) have published guidelines in order to minimise inappropriate requests. The aims of this study were to measure the degree of adherence to the guidelines and to assess the practice of requesting and reporting radiographs.

Patients and Methods: The case notes, radiograph request cards and the abdominal radiographs of 168 consecutive patients presenting to the Surgical Assessment Unit (SAU) with an acute abdominal complaint over a four week period were prospectively analysed. The initial clinical diagnosis was compared to that stated on the request card to determine the validity of the request according to the RCR guidelines. All radiographs were reported by a consultant radiologist and compared with the findings documented by the clinician

Results: PFAR was requested in 56% (94/168) patients of which 57.4% (54/94) were not in accordance with the RCR guidelines. 57.4% (31/54) of the inappropriate requests were ordered by a House Officer. Radiograph findings were documented in 71.7% (66/92) of cases, and a high level of concordance (81.8%) was demonstrated between the radiologist's and clinician's interpretation of the radiographs. From a total of 92 radiographs only 16 (17.3%) were diagnostic.

Conclusion: There is an ongoing lack of adherence to the RCR guidelines by junior medical staff resulting in excessive numbers of inappropriate PFAR requests.

INTRODUCTION

The performance of plain abdominal radiography is often considered to be an essential requirement for assessing acute abdominal complaints. The requests are usually made by the admitting junior doctor who may not be fully aware of the indications or appreciate the limitations of this investigation towards making a diagnosis. Furthermore, the overuse of plain abdominal radiography will result in unnecessary radiation exposure and its consequent risks. The magnitude of exposure equates to that of thirty-five chest x-rays and a four month period of natural background radiation (¹).

In order to minimise inappropriate requests, The Royal College of Radiologists (RCR) have produced clear guidelines for ordering plain abdominal radiographs (²). However recent studies show high percentages (56-87%) of patients continue to undergo this investigation (^{3,4}). The limitations of abdominal radiography are consistently

demonstrated in several series where the percentages of diagnostic radiographs range from 10-20% (^{3,4,5,6}). The low diagnostic yield is due to its poor soft tissue contrast coupled with the fact that many causes of acute abdominal pain have no specific radiographic features.

The study reported here was a prospective audit designed to assess adherence to the RCR guidelines when requesting abdominal radiographs in a district general hospital surgical unit.

METHODS

Royal Bolton Hospital has a busy Surgical Assessment Unit (SAU) which deals with approximately 2500 acute abdominal complaints annually. Each day over a four week period the case notes of all patients who presented to the SAU with an acute abdominal complaint were examined. The admission diagnosis and whether an abdominal radiograph was requested were noted.

The patients for whom an abdominal radiograph was requested had further details pertaining to their request documented, including the grade and speciality of the clinician making the order. A comparison was made between the clinical data entered onto the request card and that in the case notes to check for consistency. Furthermore, the validity of each request based on the admission diagnosis was determined in accordance with the RCR guidelines (Table 1).

Case note documentation of the radiograph findings was assessed. All films were reviewed by a consultant radiologist and the findings compared with those of the clinician. Finally, the impact of the radiograph on influencing clinical management was determined.

Figure 1

Table 1: Indications for plain abdominal radiographs: Royal College of Radiologists, London

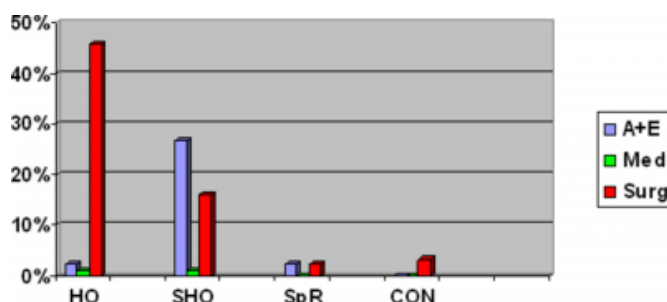
Indicated	Not Indicated
? Obstruction	Acute Gastrointestinal Bleed
? Perforation	Haematemesis
Acute Inflammatory Bowel Disease	Palpable Mass (Renal or Colon)
Pancreatitis	Gallstones
Haematuria	Urinary Tract Infection
Renal / Ureteric Calculi	Constipation / Faecal Impaction

RESULTS

The total number of patients included in this study was 168 of which 94 (56%) had a request made for an abdominal radiograph. Approximately half of all requests originated from a House Officer and a quarter from the Senior House Officer in the accident and emergency department (Figure 1). There was a statistically significant difference in the mean ages of patients in whom an abdominal radiograph was requested compared to those without a request (55.3 yrs vs. 42.5 yrs, $p < 0.05$).

Figure 2

Figure 1: Percentage Requests of Abdominal Radiographs by Grade and Speciality of Clinician



The number of patients with a clinical diagnosis documented on admission was 163/168 (97%). Of the 94 patients in

whom an abdominal radiograph was requested, 89 (94.7%) had a documented clinical diagnosis prior to the request being made, 91 (96.8%) had adequate clinical details written on the request card and 90 (95.7%) had a specific question to be answered by the radiograph (Table 2). There were a total of 85 cases where both an admission diagnosis was entered into the case notes and a radiograph request card was adequately completed. In 51/85 (54.1%) cases there was no consistency between the information documented in the case notes and the request card.

Figure 3

Table 2: Breakdown of the Specific Question's to be Answered by Radiograph

Question to be Answered by Radiograph	Number
Obstruction	70
Renal / Ureteric Stone	9
Obstruction / Perforation	2
Perforation	2
Appendicitis	1
Biliary Colic / Cholecystitis	1
Colitis / Toxic Colon	1
Colonic Tumour	1
Constipation	1
Pancreatitis	1
Subphrenic Abscess	1

Of the 94 requests, 54 (57.4%) were not in accordance with the RCR guidelines. Figure 2 depicts the sources of the inappropriate requests and Table 3 shows the various diagnoses for which an inappropriate radiograph request was made.

Figure 4

Figure 2: No. of Inappropriate Requests by Grade and Speciality of Clinician

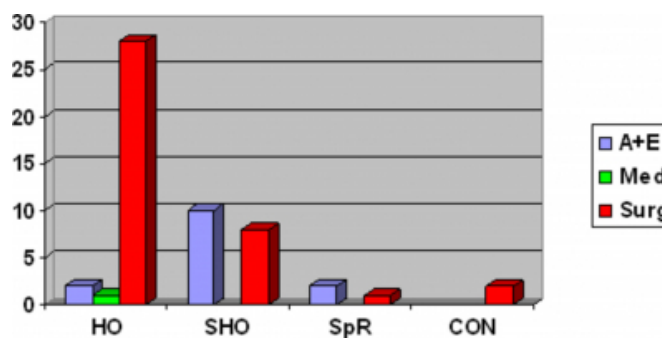


Figure 5

Table 3: Clinical Diagnoses for Which Inappropriate Radiograph Requests Were Made

Diagnoses not Requiring Abdominal Radiograph	Number
Appendicitis	5
Hepato-Biliary problems	7
Faecal impaction / constipation	10
Gastroenteritis	5
Diverticulosis / Diverticulitis	4
Gastritis	3
UTI	3
Musculoskeletal	2
Others (e.g. Gynaecological Disorders, Rectal Bleeding)	10
No Diagnosis Stated	5
Total	54

A total of 92 radiographs were obtained following the cancellation of 2 requests by the radiographer due to the indications falling outside the RCR guidelines. In 66/92 (71.7%) cases there was case note documentation of the radiograph findings by a clinician. There was agreement between the clinician's interpretation and that of a consultant radiologist in 54/66 (81.8%) cases. In 6 of the 12 cases where there was disagreement between the two groups, the clinician interpreted the radiograph as being diagnostic where as the radiologist felt a non specific or normal interpretation was more appropriate. Out of a total of 92 radiographs only 16 (17.3%) radiographs were classified as diagnostic after review by a consultant radiologist. The remainder (82.3%) were classified as non specific or normal.

Of the 40 radiograph requests made in accordance with the RCR guidelines, the results of 33 radiographs contributed positively towards patient management by either confirming or refuting the initial clinical diagnosis. The cases where no benefit was seen were either due to an inaccurate initial clinical diagnosis or unexpected non-diagnostic films e.g. in cases of intestinal obstruction due to an incarcerated hernia. Out of the 54 inappropriate requests, 52 went on to have an abdominal radiograph. The radiologist's interpretation of the films is shown in Table 4. Only 4 radiographs demonstrated significant abnormalities which were either inconsistent or unexpected in relation to the original clinical diagnosis.

Figure 6

Table 4: Radiologist's Interpretation of the Inappropriately Requested Radiographs

Category	Number
Normal	37 (71.2%)
Faecal Loading / Constipation / Non Specific Bowel Gas Pattern	11 (21.2%)
Obstruction / Ileus	1 (1.9%)
Calculus (Renal / Biliary)	3 (5.7%)

DISCUSSION

Our results demonstrate a high proportion (54.8%) of patients with an acute abdominal complaint undergo plain

abdominal radiography. This finding is mirrored by several studies over the last 3 decades, 42.7% in a 1976 survey (⁷), 46% in a study from 1988 (⁸) and 55.8% in a more recent study from 1998 (³). This is primarily due to the large number of requests which are not in accordance with the RCR guidelines. In contrast, other studies have reported relatively low percentages (10%-20%) of patients undergoing abdominal radiography (^{9,10}). In our series a level of 23.8% may have been attainable had the inappropriate requests not been performed. Our study also shows a high level of inconsistency between the clinical information entered in the case notes and that entered on the request card. The inconsistency results in many radiograph requests being completed without true clinical justification. This trend was also identified by Feyler et al (⁹).

In our study the Surgical House Officer group was responsible for the greatest number of inappropriate requests. Stower et al. demonstrated that in approximately one third of patients in their study the House Officer had requested a radiograph whilst expecting it not to reveal any abnormality (¹¹). This highlights the fact that further education (centred on the RCR guidelines) needs to be targeted at this group to bring about improvement. Referrals for abdominal radiographs in one hospital were seen to decrease from 31 to 7% after the introduction of posters displaying guidelines (¹²).

This study demonstrated a high level of concordance between the clinician's and radiologist's interpretation of the radiographs (81.8%). This compares favourably with 30% quoted by Feyler et al (⁹). In the cases where non concordance was observed, the clinician was more likely to attribute particular significance to a feature observed on the radiograph which the radiologist had interpreted as being non specific or normal. Though not observed in our series, attributing significance to an otherwise non specific or normal radiographic feature may result in pursuing an inappropriate diagnostic pathway.

Excessive inappropriate use of abdominal radiography will result in lower diagnostic yield rates. Bohner et al (¹³) have reported 80% of radiographs in their series were non specific or normal. A similar figure (82%) is quoted in a 2005 study by Prasannan et al (¹⁴). Our figure of 82.7% reflects the situation is no different to the quoted studies. Of the 16 diagnostic radiographs in our study, 9 showed features of intestinal obstruction and 5 revealed a ureteric / renal calculus. When compared with the total number of

radiographs requested for the respective diagnoses, a detection rate of 12.9% (9/70) and 55.6% (5/9) was obtained for intestinal obstruction and ureteric calculus respectively. The low detection rate for the former can be partially explained by the fact that in several requests it was commonplace to cite a diagnosis of intestinal obstruction despite entering an alternative diagnosis in the case notes, thus justifying the request by false means. It is also likely that our clinical assessment of these cases fell short of a minimum standard that would allow us to determine with greater accuracy those genuine cases of intestinal obstruction. Both Bohner et al⁽¹³⁾ and Prasannan et al⁽¹⁴⁾ identified 6 clinical features associated with intestinal obstruction (distended abdomen, increased bowel sounds, history of constipation, previous abdominal surgery, age over 50, and vomiting), of which the presence of two or more dramatically increased the sensitivity of abdominal radiography in confirming the diagnosis and also reduced the number of unnecessary requests.

In conclusion despite our small sample size, our study findings suggest an ongoing lack of awareness amongst junior doctors of the RCR guidelines when making a radiograph request. The adoption of a departmental protocol may be the best way to rectify this problem. A greater level of honesty is necessary in order to eliminate those requests which are simply carried out as 'routine' and those which are performed to avoid criticism from seniors. We have clearly shown that inappropriate requests result in a high number of non specific and normal radiographs which do not contribute positively towards patient management. Furthermore by reducing inappropriate requests there would be a long term financial benefit for the radiology department coupled with the positive benefits from decreased radiation exposure.

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