The Abdominal plain film: A justified 21st century imaging investigation?

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Purpose

The plain film has an increasingly limited role in the assessment of patients presenting with non-traumatic abdominal pain (1). Its use, purely anecdotally, appears to be more in determining appropriateness for discharge of patients in the acute setting. It is often used defensively in medicine or to buy time.

The aim of this study was to determine the appropriateness and subsequently the value of this high-dose and low positive and negative predictive value investigation, with an aim to producing a streamlined list of indications, through the audit of current practice against Royal College of Radiology Guidance (2). If this were a new modality, we would not begin to use it so widely without rigorous research to assess its value and indications.

Anecdotally, current guidance (2) for clinicians has been identified as vague and too broad to be helpful to the referrer. This study looks to streamline the use of the abdominal plain film, thus improving patient safety by reducing the number of unnecessary exposures and also provide a cost-saving benefit (each abdominal film exposes the patient to a radiation dose equivalent of approximately 20 PA chest radiographs).

Recent audits and literature reviews (3,4) have shown an excess of inappropriate referrals and state, each in their own way, that for an investigation to be of use to a clinician it ought to add weight to their diagnosis or positively alter management. By limiting the use of plain abdominal XR to defined clinical scenarios it will continue to remain relevant in modern imaging.
Methods and Materials

This was a retrospective study of a one-month sample of abdominal plain films, performed and reported in a large tertiary referral centre. Abdominal films of all non-traumatic cases excluding patients under the age of 16 were audited. Children were excluded as pathologies vary from those of adults and therefore pathways of investigations. All reports included in the study were verified by a senior registrar or consultant radiologist.

A comprehensive investigation of the 304 films and the clinical request cards included the following:

- Gender,
- Age,
- Clinical details on request form,
- Clinical question justifying exposure,
- Relevant positive findings in the report and
- Full details of any further investigations.

Further investigations were only included if they were carried out within the same clinical scenario as the original plain film. If for example, symptoms had changed after a few days of admission, or a patient had been re-admitted with the same symptoms, further investigations at that time were not included in this study.

Using the information provided by the referrer, a clinical judgement was made, with respect to the Royal College of Radiology guidelines (2), as to whether or not the investigation was truly appropriate.

The data was then organised according to referrer, justification, reported findings and further investigations. This was subsequently analysed with a view to determining the most useful applications for the abdominal radiograph.
Results

Over the one-month period, 304 plain abdominal x-rays were carried out in total. The justification for each exam was based upon the clinical questions stated by the referrer on the request card. No patient in this study was exposed without adequate justification being provided at the time of request.

However when assessing, for the purposes of the audit, the appropriateness of each investigation the wider clinical history provided by the clinicians was taken into consideration. This information was then related to the RCR guidelines (2). Overall, exactly half (152/304) of all studies were deemed appropriate by the RCR standards taken for the purposes of this Audit.

Subgroup analysis, found that appropriateness of request differed greatly across referrer groups (Figure 3); with 63% of surgical and only 38% of Emergency Department referrals deemed appropriate.

Of all the films included, only 64 studies (21%) had positive findings. Of the 152 films deemed to be inappropriate, only 13 (9%) were reported as having positive findings. Notably, these positive findings (Figure 1) bear little resemblance to the referring clinicians question to the radiologist (Figure 2).

When inappropriate requests are further analysed, it was found that where positive findings were reported, further investigations were carried out in 7 of the 13 cases. Of the 139 (90%) normal cases a further 56 patients were referred for more definitive imaging regardless (Figure 4).

With regards to appropriately requested films, clinicians requested definitive investigations in 27 (53%) of cases after the abdominal XR revealed pathology and 36% of cases with no XR findings. One third of these investigations were also normal.
Fig. 1: Figure 1: Findings for all films

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Fig. 2: Figure 2: Clinical Questions Justifying Exposure

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**Fig. 3:** Figure 3: Appropriate vs. Inappropriate Requests by Referrer

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Fig. 4: Further definitive investigations carried out after inappropriate AXRs
Conclusion

It would seem that despite a great many literature reviews and audits of practice, no studies have been translated into revised recommendations by the Royal College of Radiologists for use of the abdominal plain film. The current guidelines have little evidence base or basis from established practice. In 2011 a multicentre prospective trial of patients in the Netherlands concluded that plain radiographs should be omitted from the routine diagnostic work up of patients with acute abdominal pain to a substantial cost saving effect (5).

It can be concluded from our data that only half of all AXR requests are appropriate and a very small number have positive results. It is possible that this is because few referrers are aware of and are adhering to the current guidance. Similar results have been seen previously in smaller studies (6, 7).

Also highlighted by this study is that a lack of confidence in the plain AXR and its diagnostic capability exists. Regardless of reported findings, further investigations appear to be requested in order to adequately support or make suspected diagnoses and inform management.

This study does not advocate the complete elimination of the abdominal plain film from the clinician's toolbox, however a more measured approach to its requesting and a better understanding of its diagnostic capacity. In order to fully justify the exposure of patients to a significant radiation dose, the study should go some way to affecting their diagnosis or the confidence with which the clinicians will make that diagnosis.

It is clear from the data regarding further investigations, that in a number of cases the AXR findings are not of relevance to the decision making process. Thus by streamlining the referral criteria to a few diagnoses that can be confidently ruled out then patients will be imaged more appropriately and in a more timely fashion. It would follow that further information should be provided with any new guidelines produced that would guide the clinician to the most appropriate alternative investigation. As well as impacting patient care, this can be expected to have significant cost and efficiency benefits.

From this study and evidence from other referenced material (1,3,8), it is concluded that the abdominal plain film should only be requested for the indications listed below and that for each of these sufficient clinical information ought to be available to support the request.

Indications suggested for AXR in the patient with acute abdominal pain:
1. Suspected intestinal obstruction
2. Suspected colitis or complication (eg: Toxic Megacolon)
3. Foreign Body

Specific indications, of note, that do not feature in this list:

1. Perforation: only an erect CXR is clearly indicated here (2)
2. Calculi: Gallstones require an Ultrasound and Renal tract stones a CT-KUB (8)

It is also inferred that this investigation appears to still be used inappropriately as part of a routine work up of patients with indistinct abdominal symptoms and this is not practice recommended by the RCR. If requested appropriately there will be a savings in:

1. Patient dose
2. Time, and
3. Cost.

The positive pick-up rate from plain AXR should also be seen to improve. These results are observed in a study of plain films in 2006 (9).

A program of education for referrers and subsequent re-audit should be carried out. If a re-audit were to show more appropriate requesting and a greater diagnostic yield, it could then be concluded that central guidelines should be re-examined.
References

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