Kelvin Open Science Publishers
Connect with Research Community

Research Article *Volume 1 | Issue 1*

KOS Journal of Public Health and Integrated Medicine
https://kelvinpublishers.com/journals/public-health-and-integrated-medicine.php

Audit to Rectify the Unnecessary Prescription of Abdominal X-Ray at the Emergency Department, and its Comparison with the Royal College of Radiology's iRefer Criteria

Syed Muhammad Ali Haider[1,2*], Ahmad Raza[2], Muhammad Abdullah[2], Talha Sohail[2], Ahmad Hussain[3], Salma Ambreen Shahab[2], Muhammad Omer Farooq Ahmed Qureshi[2] and Muhammad Hassan Zakriya[4]

[1]National University of Medical Sciences, Rawalpindi, Pakistan
[2]HITEC Institute of Medical Sciences, Taxila, Rawalpindi, Pakistan
[3]Punjab Medical College, Faisalabad, Pakistan
[4]International Islamic Medical College, Rawalpindi, Pakistan

[*]**Corresponding author:** Syed Muhammad Ali Haider, HITEC Institute of Medical Sciences, Taxila, Rawalpindi, Pakistan, Tel: +92-314-3213571, ORCID: 0000-0001-9541-609X, E-mail: alihaider1999.ah@gmail.com

Received: April 09, 2025; **Accepted:** April 12, 2025; **Published:** April 14, 2025

Citation: Syed MAH, et al. (2025) Audit to Rectify the Unnecessary Prescription of Abdominal X-Ray at the Emergency Department, and its Comparison with the Royal College of Radiology's iRefer Criteria. *J Pub Health Int Med.* 1(1): 1-5.

1. Abstract

Introduction: Abdominal X-ray (AXR) is the basic and most often conducted radiographic study in the emergency department despite its limited positivity in various diseases, including acute abdominal discomfort. This audit aims to determine if the Royal College of Radiology (RCR) criteria are followed when seeking AXR and to rectify these unnecessary prescriptions for better diagnosis and care at the primary care hospital in Taxila, Pakistan. **Methods:** In the First cycle of the Audit a retrospective chart review as done, using AXR request data obtained from the record system of the Accident and Emergency (A&E) Department, for the whole month. The RCR's iRefer criteria were utilized as a reference to compare the data obtained from the A&E department, and the data was analyzed. In the Second cycle of Audit, a workshop on the prescription of AXR and iRefer criteria was conducted with the physicians in A&E, and the review of AXR request data of the month following the workshop was done. Results are presented in a before and after manner using percentages. SPSS version 20 was used for data analysis. **Results: 1st cycle:** A total of 342 AXR request forms were noted, 60.1% of appeals followed the iRefer criteria while 39.9% were not. 74% of cases are suspected of intestinal obstruction, while the positive results were 14.6%. 9.2% of cases were misdiagnosed and 6% were managed wrongly. **2nd Cycle:** 340 AXR request forms were assessed, and 98% of the forms were following the iRefer criteria. **Conclusions:** Unnecessary usage of AXR can affect patient care badly and the need to rectify this practice is the need of hour-making policies that follow the international guidelines.

2. Keywords
Acute abdomen, Abdominal X-ray, Intestinal Obstruction, iRefer guidelines, Accident and Emergency

3. List of Abbreviations
AXR: Abdominal X-ray; RCR: Royal College of Radiology; A&E: Accident & Emergency; CXR: Chest X-Ray

4. Introduction
Radiological studies are frequently required to confirm a diagnosis. Wilhelm Röntgenin 1895 discovered electromagnetic radiation that has a short wavelength and was named X-rays. Initially, only bone fractures and the presence of foreign bodies were studied under X-rays, but they have now been utilized to diagnose various illnesses such as severe stomach discomfort. At least 5-10% of emergency room visits are for the primary symptom of severe abdominal discomfort [1]**.** Abdomen X-rays (AXR) are among the most common radiological studies ordered by doctors in the emergency department. For many of its circumstances, there are questions on the usefulness of the AXR; AXR has a radiation exposure of 0.7 millisieverts (mSv) as compared to 0.1 mSv of chest X-ray (CXR) and 10.0 mSv of computed tomography scan (CT scan) of the abdomen [2,3]**.** Furthermore, multiple studies have indicated that CT scans are more useful for both early diagnosis and mortality reduction [4]**.** It has been reported in the past that surgeons frequently seek AXR as part of their standard evaluation to detect nonspecific symptoms of abdomen discomfort. The Royal College of Radiology (RCR) has limited the use of AXR to cases of intestinal blockage, palpable abdominal mass, constipation, acute and chronic pancreatitis, acute aggravation of inflammatory bowel disease, foreign body, or abdominal injury caused by stabbing [5]**.**

5. Methods
This audit employed a before and after study design to evaluate the adherence of emergency staff to iRefer criteria developed by the RCR, in prescribing the Abdominal X-ray. Data was collected through computerized patient record system. This is a retrospective chart review of the AXRs, that were requested at the A&E department of a primary care hospital in Taxila, Pakistan. This research included individuals who were prescribed and underwent an AXR in August 2023. Individuals over the age of 17 were included in the study, although AXR for urological causes and individuals under 17 years of age were excluded. We wanted to look at the reasons for AXR. In the 1st cycle of the audit, the data was acquired from the radiology department's computerized system. Patients' demographics and clinical characteristics were gathered and assessed before being provided descriptively as percentages. Compliance with recognized Royal College of Radiology (RCR) requirements was verified. Patients were identified using the radiology department results, and information on radiological examination request Performa. Radiological reports were examined to see if AXR was warranted per Royal College of Radiology recommendations **(**Table 1**)** whether any positive results were also shown by Computerised Tomography imaging and how many cases were diagnosed and managed wrongly on the AXR findings. The favourable AXR results were associated with the patient'ssymptoms and indications. A seminar on the iRefer criteria was held in the A&E department to educate and make the staff familiar with the guidelines of RCR in prescribing the X-ray, after one month of the seminar again the same procedure was repeated to collect and analyse the data.

Table 1: Royal College of Radiology; iRefer guidelines for plain abdominal radiography.

Clinical suspicion of obstruction
Acute exacerbation of inflammatory bowel disease
Palpable mass (specific circumstances)
Constipation (specific circumstances)
Acute and chronic pancreatitis (specific circumstances)
Sharp/poisonous foreign body
Smooth and small foreign body, e.g., coin, battery (specific circumstances)
Blunt or stab abdominal injury (specific circumstances)
Post-Gastrografin follow-through study

6. Results
6.1. 1st Cycle
342 AXR films were found. 60.1 percent of requests for AXR followed the RCR's iRefer criteria, whereas 39.9 percent of all requests did not.74 percent (n = 152) of the patients were investigated for intestinal blockage. In this 74%, the top clinical detail of requesting an abdominal X-ray with suspicion of abdominal obstruction was abdominal pain, accounting for 21% (n = 32). Similarly, pain in the abdomen with bowel obstruction and abdominal pain associated with vomiting accounted for 13% (n = 20) and 8% (n = 12), respectively. Pain in the abdomenassociated with loose stool, distension, and distension with vomiting were responsible for 3.16% (n = 5), 10.30% (n = 16), and 4% (n = 6), respectively (Table 2).

Only 1 request wasfor toxic megacolon in acute aggravation of inflammatory bowel disease. Similarly, 4.4% of requests were for checking for foreign things and inspecting the location of the percutaneous endoscopic jejunostomy (PEJ) tube, peritoneal dialysis catheter, nasojejunal (NJ) tube, and so on. 2% of AXRs were obtained to detect toxic megacolon in C.difficile infection. 1AXRwas ordered to check for a palpable mass in the abdomen. Seven AXRs were taken to check the post-Gastrograffin results, and 11were to see the constipation. Patients with vague suspicions of obstruction of the bowel on AXR were subjected to CT scans based on clinical evaluation. From the findings on AXR, 13 individuals had a CT abdomen performed. 6 of these scans verified the concern expressed on the abdominal film whereas 7 of the scans were deemed normal, However, 14 patients were wrongly diagnosed based on the initial AXR findings and were later rectified, while 9 patients were wrongly diagnosed from initial AXR leading to the wrong emergency management (Table 3).

6.2. 2nd Cycle
340 AXR request forms were assessed, and 98% (n = 333) of the forms were following the iRefer criteria. 2% (n = 7) were excluded as they were not following the inclusion criteria.

Table 2: Frequency and percentages of the clinical information provided to request AXRs for suspected bowel obstruction.

Clinical Information	Total (n)	Percentage (%)
Pain in Abdomen	32	21
Pain in Abdomen & Bowel obstruction	20	13
Pain in Abdomen & History of Vomiting	12	8
Pain in Abdomen & History of loose stool	5	3.16
Pain in Abdomen & History of distension	16	10.30
Pain in Abdomen & History of diarrhea	1	0.87
Pain in Abdomen & History of obstruction and vomiting	3	1.2
Pain in Abdomen & History of vomiting, constipation, and distension	2	0.87
Pain in Abdomen & History of vomiting and diarrhea	2	0.87
Pain in Abdomen & History of distension and vomiting	6	4
Pain in Abdomen & History of bloody stools	2	0.87
Distention of abdomen	8	5.3
Distention of abdomen & history bowel obstruction	3	1.3
History of Vomiting	2	1.1
History of Vomiting & loose stools	1	0.3
History of Vomiting and bowel obstruction	1	0.3
Bowel obstruction	2	1.3
Decreased Bowel sounds	5	2.3

Table 3: Clinical suspicion and indications for AXR, positive results, any additional CT performed or verifying a diagnosis, and any wrong diagnosis made are shown as frequencies.

Suspicion /Indications	Patients (n)	+ive Results	CT scan done	CT verified diagnosis	Wrong diagnosis on AXR Later Rectified	Wrong diagnosis leading to wrong management
Obstruction of bowel	152 (74%)	22 (14.6%)	13 (8.4%)	6 (4.0%)	14 (9.2%)	9 (6%)
Acute exacerbation of IBD	1 (0.2%)	0				
Foreign body	9 (4.4%)	0				
C. difficile toxic megacolon	4 (2%)	0				
Post-Gastrografin study	7 (3.5%)	0				
History of constipation	11 (5.5%)					
iRefer protocol not followed	135 (39.9%)					
Palpable mass in abdomen	1 (0.52%)					

7. Discussion

In the emergency department, an AXR is a part of a routine examination for abdominal complaints. The imaging workup begins with an X-ray of the abdomen [6]. The majority of individuals with significant AXR findings are further investigated. iRefer standards with appropriate reasons for abdominal X-rays were established to reduce incorrect referrals. Abdominal X-rays identify foreign bodies in the abdomen with a sensitivity of 90% and intestinal obstruction with a sensitivity of 49% [7]. In 30 days of our study, 342 AXR requests were made. Clinically, 152 requests indicated a probable intestinal obstruction. The clinical history of AXR request forms included the following variables: pain in the abdomen, constipation, distension of the abdomen, and vomiting. Only 22 (14.6%) of the AXR reports were positive. 6 (4.0%) instances were verified with a CT scan. AXR is also recommended for acute exacerbation of inflammatory bowel disorder. In this study, fourteen individuals were tested by AXR for the same reason. The majority of queries sought to investigate bowel dilatation. Only eight participants were suspected of having constipation. iRefer recommends an AXR for a variety of reasons, including foreign bodies. AXRs are utilized to detect harmful bodies, such as sharp objects, as well as non-metallic objects like glass beads and batteries [8]. Plain X-rays show a specificity of 100% and 90% for ingested foreign bodies and radiopaque objects, respectively [9]. In our study, 9 X-rays were requested to analyze foreign substances, as well as to determine the location of the PEJ tube, NG tube, and peritoneal dialysis catheter. A post-Gastrografin follow-up study was conducted to distinguish between partial and complete small intestine obstruction [10]. Post-Gastrograffin AXR is also often employed, as evidenced by seven requests in 30 days. Similarly, palpable masses, acute and chronic pancreatitis, and blunt or stabbing abdominal injuries are also indications for iRefer abdominal X-rays. Our study revealed that an average number of doctors followed the iRefer guidelines. Feyler, et al. conducted a prospective observational study of abdominal X-rays and discovered that 131 out of 1,309 patients had abdominal X-rays taken, with only 12 percent of requests meeting RCR guidelines [11]. In our analysis, however, the compliance percentage with iRefer standards was 60.1%. This needs more investigation, preferably prospectively and for a longer duration, to discover the complete facts. Although most referrals for abdominal X-rays follow the iRefer criteria, the X-ray results show that clinical indications and symptoms have limited predictive value for AXR abnormalities. In our investigation, the vast majority of abdomen X-rays had normal results. Previous investigations found similar results, with just 15.8 percent and 25% showing positive X-ray findings, respectively [12,13]. Several writers have questioned the request process for

abdominal X-rays [14,15]. There is still a need for more studies and recommendations that need to be updated to reduce unnecessary AXR requests.

8. Conclusions

This study analyzed AXR requests made by the RCR in accordance with the iRefer criteria and discovered that most AXRs were not requested in accordance with the iRefer recommendations. Furthermore, little fraction of AXR revealed good results. More research is required to optimize the use of AXR or to investigate other imaging modalities like abdominal ultrasonography, which may aid in reducing needless radiation exposure.

9. Acknowledgments

The authors thank the staff of THQ Hospital Taxila for their help in data collection.

The authors made use of Grammarly to assist with the drafting of this article. This AI toolwas obtained from Microsoft Add-ins and used without modification. The tools help improve the quality of the English language as English is not the authors' first language.

The Authors used Mendeley referencing software to add references and bibliography to this article.

10. Declarations

10.1 Ethical declaration: The Authors declare that they are entirely responsible for the scientific content of the paper and that the paper adheres to the journal's authorship policy. This retrospective chart review was conducted by the guidelines set forth by the Declaration of Helsinki and the International Conference on Harmonization. The study did not involve any human subjects and all data used in the retrospective chart review were obtained from computer records of the department. Therefore, ethics approval was not required for this study.

10.2. Availability of data and materials

The data used in this retrospective Chart review were obtained from the hospital's computer record and thus not available publicly.

10.3. Competing interests

None.

10.4. Funding

None.

10.5. Author declarations

The authors declare that they have no conflicts of interest. The authors confirm that the manuscript is original and has not been submitted for publication elsewhere. The authors confirm that all data used in the study were obtained from the hospital's record system. All authors declare that they have fully read the paper and give full permission for submission and publication.

10.6. Data sharing statement: The data used in this retrospective Chart review were obtained from the hospital's computer record and thus not available for sharing.

10.7. Financial declaration: The authors declare that they have not received any financial support or funding for the conduct of this study. The authors did not receive any financial compensation for the preparation or submission of this manuscript.

10.8. Authors contributions

- **Syed Muhammad Ali Haider**: Conceptualization, methodology, investigation, data curation, writing - original draft preparation, visualization, and supervision.
- **Ahmad Raza:** Data analysis, writing - original draft preparation.
- **Muhammad Abdullah**: Writing - review and editing, data curation, visualization, and methodology.
- **Talha Sohail:** Writing - review and editing, data curation, visualization, and methodology.
- **Ahmad Hussain:** Writing - review and editing, proofreading, methodology, and investigation.
- **Salma Ambreen Shahab:** Writing - review and editing, data curation, and investigation.
- **Muhammad Omer Farooq Ahmed Qureshi:** Data curation, review and editing.
- **Muhammad Hassan Zakriya:** Data curation, Data interpretation.

11. References

1. Lameris W, van Randen A, van Es HW, et al. (2009) Imaging strategies for detection of urgent conditions in patients with acute abdominal pain: Diagnostic accuracy study. BMJ. 338: 2431.
2. Bertin CL, Ponthus S, Vivekanantham H, et al. (2019) Overuse of plain abdominal radiography in emergency departments: A retrospective cohort study. BMC Health Serv Res. 19(1): 36.
3. Wall BF, Hart D (1997) Revised radiation doses for typical X-ray examinations. Report on a recent review of doses to patients from medical X-ray examinations in the UK by NRPB. National Radiological Protection Board. Br J Radiol. 70(833): 437-439.
4. Ng CS, Watson CJE, Palmer CR, et al. (2002) Evaluation of early abdominopelvic computed tomography in patients with acute abdominal pain of unknown cause: Prospective randomised study. BMJ. 325(7377): 1387.
5. Kyriakides J, Khamar R, Khani A, et al. (2022) A quality improvement project: Reducing the number of unnecessary plain abdominal radiographs performed in the emergency department of a London district general hospital. J Family Med Prim Care. 11(1): 190-193.
6. Karkhanis S, Medcalf J (2009) Plain abdomen radiographs: The right view? Eur J Emerg Med. 16(5): 267-270.
7. Ahn SH, Mayo-Smith WW, Murphy BL, et al. (2002) Acute nontraumatic abdominal pain in adult patients: Abdominal radiography compared with CT evaluation. Radiology. 225(1): 159-164.
8. Smith JE, Hall EJ (2009) The use of plain abdominal x rays in the emergency department. Emerg Med J. 26(3): 160-163.
9. Gans SL, Stoker J, Boermeester MA (2012) Plain abdominal radiography in acute abdominal pain; past, present, and future. Int J Gen Med. 5: 525-533.
10. Biondo S, Parés D, Mora L, et al. (2003) Randomized clinical study of Gastrografin administration in patients with adhesive small bowel obstruction. Br J Surg. 90(5): 542-546.
11. Feyler S, Williamson V, King D (2002) Plain abdominal radiographs in acute medical emergencies: An abused investigation? Postgrad Med J. 78(916): 94-96.

12. Böhner H, Yang Q, Franke C, et al. (1998) Simple data from history and physical examination help to exclude bowel obstruction and to avoid radiographic studies in patients with acute abdominal pain. Eur J Surg. 164(10): 777-784.
13. Campbell JP, Gunn AA (2005) Plain abdominal radiographs and acute abdominal pain. Br J Surg. 75(6): 554-556.
14. Stower MJ, Amar SS, Mikulin T, et al. (1985) Evaluation of the plain abdominal x-ray in the acute abdomen. J R Soc Med. 78(8): 630-633.
15. Field S, Guy PJ, Upsdell SM, et al. (1985) The erect abdominal radiograph in the acute abdomen: Should its routine use be abandoned? Br Med J. 290(6486): 1934-1936.