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Evaluation of the Adequacy of Plain Abdominal X-ray Examination Request Seen in a Nigerian Tertiary Hospital

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ABSRACT:-

AIM:- The aim of this research is to assess the adequacy of information on the x-ray request forms for plain abdominal x-ray investigation and to assess the proportion of abdominal x-ray request that did not conform to the Royal College of Radiologists (RCR) guidelines. It also aimed at finding out the clinical indications that are often used by clinicians but which are not in the RCR guidelines.

METHODOLOGY:- A sample of 120 request forms drawn from a population of 170 forms were used in this study. A random non-probabilistic sampling technique was used in this research. Data analysis was done using both descriptive and inferential statistics.

RESULTS:- Out of the 120 request forms used in this research, 67 had clinical indications that were adequate according to RCR guidelines. From this study, it was discovered that there were clinical indications for abdominal radiography investigations often used by clinicians that are not in the RCR guidelines and as such the need arises for us to formulate our own guidelines with respect to clinical indications that are peculiar to our country.

CONCLUSION:- There is an appreciable adequacy of information with regards to clinical indications to the Royal College of Radiologists' guidelines for abdominal radiography

I. INTRODUCTION

Plain Abdominal Radiography has long been used as initial imaging modality in the investigation of patients presenting with acute abdominal pain. It is commonly requested for acute medical emergencies on patients with non-specific abdominal symptoms and signs [1].

Plain films are likely to remain the best method of imaging gas shadows for many years to come and computed tomography scanning, isotope studies and magnetic resonance imaging are unlikely to play any major role in the initial investigation of acute abdomen" [2].

Several studies have demonstrated that a diagnosis based solely on a patient's medical history, physical examination and other laboratory tests is not reliable enough, despite the fact that these aspects are essential parts of the workup of a patient presenting with acute abdominal pain [3].Further diagnostic workup such as radiographic imaging is therefore mandatory in patients suspected of an urgent medical condition [4]. Imaging workup traditionally starts with abdominal radiography [5].

Although, the use of plain abdominal radiographs (PAR) as part of the routine investigative profile to diagnose acute abdominal pain is still widely advocated at various levels of medical practice and has become ingrained in our system of management [6], there are many occasions where it is unlikely to provide any useful information. With the advent of newer, more sensitive and specific modalities of investigations, the spectrum of indications for which PAR are used in this day and age have reduced [5]. Several studies have demonstrated a high percentage of plain abdominal radiographs without abnormal or specific findings.

Irrational use of Plain Abdominal Radiography (PAR) places a financial burden on the institution, as well as increases the patient exposure to radiation and its effects. A typical effective dose of a plain abdomen x-ray examination is 0.7 mSv (equal to one-time exposure to 4 months of natural background radiation) and is equivalent to dose from 35 chest radiographs[7]. There is an estimated cancer risk of one death, or two cases per 140 000 films, because of radiation from a PAR [8]. Also, only a few doctors are aware of the relatively high radiation dose from an abdominal x-ray examination[9].

Previous studies in literature have shown that up to 20% of radiographic examinations are clinically unhelpful, because they were either not appropriate or the request was wrong ab initio [10]. For this reason,

filling of the request form adequately and in details is important in helping the radiologist and radiographer give less clinically unhelpful radiographic examinations and concise radiological diagnosis, [10]. Properly filled x-ray requests form also indirectly helps to shorten the investigation time and improve the quality of service offered to the patient and also aid the radiologist to determine the justification for radiation exposure [11].
In a large percentage of patients, radiology request forms play vital role in both available diagnosis and treatment, as such there is need to ensure adequacy of information in the x-ray requests forms [12].
To minimize inappropriate requests, unnecessary radiation dose to the patient and to enhance the efficiency of radiographical investigations, the Royal College of Radiologists (RCR) issued out clear guidelines for requesting plain abdominal radiography. This study will assess how compliant requests for abdominal radiographs in this locality are to these guidelines.

II. METHODS

A series of 120 x-ray request forms of patients who underwent plain abdominal x-ray investigation in the radiology department of Nnamdi Azikiwe University Teaching Hospital, Nnewi (NAUTH), Anambra state from January, 2014 to May, 2015. This research is a retrospective, non-experimental research design and a secondary source of data was adopted. The data were obtained from the medical records of Radiology department NAUTH by examining patients' x-ray request forms for all the patients that underwent plain abdominal x-ray investigation within the periodthat falls within the scope of the study. Information such as:

- Date of the investigation,
- Indication/provisional diagnosis for the investigation etc. was looked for.

A random non-probabilistic sampling technique was employed in this study and a samplesize of 120 was used. This sample was drawn from the target population of 170 using yaroyamene formula [13].
$n= N/Ne^2 + 1$
Where, N = target population, n= sample size, e = tolerable error (0.05) and 1 = constant
Both descriptive and inferential statistics were used. Data were analyzed using Statistical Package for Social Sciences SPSS version 16, level of significance was taken at ≤ 0.05.
Data were presented using frequency tables and Bar chart. T-test and ANOVA tests were used as appropriate.

III. RESULTS

Table 1: Distribution of referrals for abdominal radiography.

Clinical indications					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Intestinal obstruction	26	21.7	21.7	21.7
	Perforation	5	4.2	4.2	25.8
	Peritonitis	4	3.3	3.3	29.2
	Inflammatory dx	1	.8	.8	30.0
	Haematuria	2	1.7	1.7	31.7
	Renal/ ureteric calculi	13	10.8	10.8	42.5
	Abdominal trauma	6	5.0	5.0	47.5
	Abdominal pain	10	8.3	8.3	55.8
	Appendicitis	4	3.3	3.3	59.2
	Gall stones	3	2.5	2.5	61.7
	UTI	2	1.7	1.7	63.3
	Pancreatitis	3	2.5	2.5	65.8
	Abdominal mass	7	5.8	5.8	71.7
	Haematemesis	1	.8	.8	72.5
	Diverticulitis	3	2.5	2.5	75.0
	Sepsis	6	5.0	5.0	80.0
	BOO 2^0 BPH	4	3.3	3.3	83.3
	Cancer	4	3.3	3.3	86.7
	Ex TB	2	1.7	1.7	88.3
	PUD	2	1.7	1.7	90.0
	Congenital anomaly	5	4.2	4.2	94.2
	Hernia	3	2.5	2.5	96.7
	Hirschsprungs disease	4	3.3	3.3	100.0
	Total	120	100.0	100.0	

Table 2: Shows the distribution of appropriate referral for abdominal radiography. Among the indications, Intestinal obstruction is the most referred (21.7%) while acute inflammatory disease is the least referral (0.8%). The total percentage for clinical indications that are appropriately referred is 55.8 %

Distribution of Appropriate referral for abdominal radiography

Clinical indications	Frequency	Percentage (%)
Intestinal obstruction	26	21.7
Perforation	5	4.2
Peritonitis	4	3.3
Acute inflammatory disease	1	0.8
Hematuria	2	1.7
Renal calculi/ ureteric colic	13	10.8
Abdominal trauma	6	5
Acute abdominal pain	10	8.3
TOTAL	**67**	**55.8**

Table3: Shows distribution of inappropriate referral for abdominal radiography. Abdominal mass is the highest source of inappropriate referral (5.8%). Hematemesis is the least referred (0.8%). The total percentage for clinical indications that are inappropriately referred is 16.6 %

Distribution of Inappropriate referral for abdominal radiography

Clinical indications	Frequency	Percentage (%)
Gall stones	3	2.5
Appendicitis	4	3.3
Urinary tract diseases (UTI)	2	1.7
Pancreatitis	3	2.5
Abdominal mass	7	5.8
Hematemesis	1	0.8
TOTAL	**20**	**16.6**

Table4: Shows the distribution of referrals for abdominal radiography that are in the Royal College of Radiologists Guidelines. Sepsis is the highest of the referral (5%), while extrapulmonary tuberculosis and peptic ulcer disease are the least referred (1.7%).

Distribution of referrals for abdominal radiography that are not in Royal College of Radiologist Guidelines.

Clinical indications	Frequency	Percentage (%)
Diverticulitis	3	2.5
Sepsis	6	5
BOO 2^0 BPH	4	3.3
Extra pulmonary TB	2	1.7
Peptic ulcer disease (PUD)	2	1.7
Congenital anomaly	5	4.2
Hernia	3	2.5
Hirschsprung's disease	4	3.3
Total	**33**	**27.5**

Table 5: Shows the distribution of plain radiography requests in the radiology department of NAUTH. Abdominal radiography is the least request with a percentage of 2.9

Distribution of the radiological examinations requests in the radiology department of NAUTH

Requests	Frequency	Percentage (%)
Extremities and shoulder region	832	14.4
Chest	3541	61.2
Spines	754	13.0
Skull/Facial bones & Sinuses	294	5.1
Hip & Pelvis	206	3.5
Abdomen	170	2.9
TOTAL	**5782**	**100**

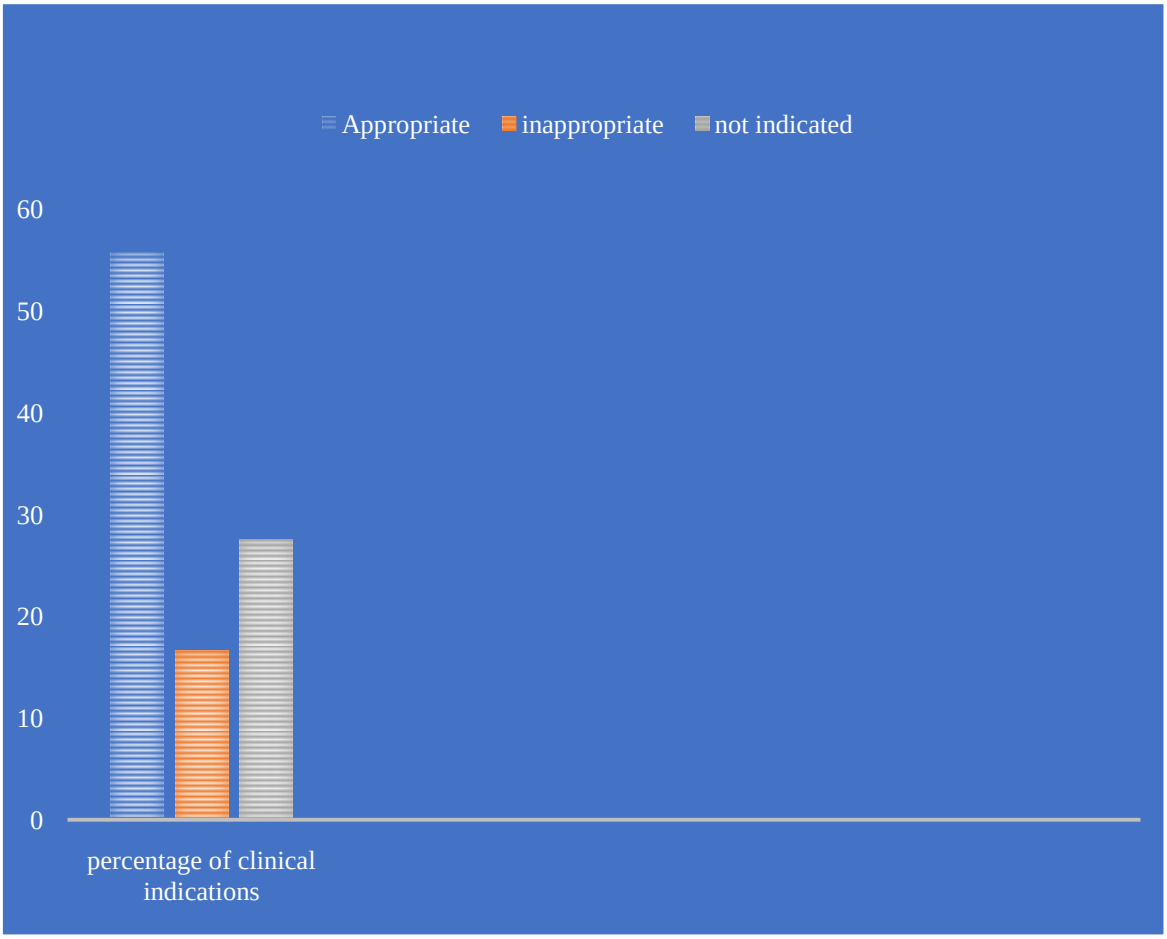

Fig 1: Bar chart showing percentage of appropriate clinical indications, inappropriate clinical indications and clinical indications that are not in the RCR guidelines.

IV. DISCUSSION

The results of this study revealed that most of the information on the request forms with regards to clinical indications were adequate according to the royal college of radiologists' guidelines (RCR) for plain abdominal radiography referral, UK. This is based on the fact that out of the 120 referrals used in this research, 67(55.8%) referrals were appropriate, 20(16.6%) referrals were inappropriate while 33(27.5%) referrals were not indicated in the RCR guidelines for plain abdominal radiography referrals. This finding conforms to a similar study by Karkhanis and Medcalf, which was aimed at looking at the appropriateness of requests for plain abdominal radiography and its utilization in emergency department. In their work, 67% (50 of 75) of the requests were appropriate according to the Royal College of Radiologists guidelines while thirty three percent (25 of 75), of the requests were inappropriate.

However, the findings of this study contrast the result of a similar work carried out by Feyler*et al*,to determine the appropriateness of plain abdominal radiography commonly requested for acute medical emergencies in patients with non-specific abdominal symptoms. In their work, out of 131 cases referred for abdominal radiography, only 12% conformed to the guidelines. In this study majority of plain abdominal radiographs requested on acute medical emergencies were inappropriate. The difference in the findings could be attributed to the fact that while the above research was carried out in accident and emergency department, this present research was carried out using all the referrals coming from different departments. Clinicians handling emergency cases might not be in the right frame of mind to consider whether a referral is appropriate or inappropriate.

There is also statistically no difference between appropriate and inappropriate abdominal radiography referral according to the royal college of radiologists' guidelines (RCR).

The result of this study also shows that there is statistically no difference between appropriate abdominal radiography referral, inappropriate abdominal radiography referral and abdominal radiography referral that are not in the RCRguidelines. The distribution for abdominal radiography requests in the radiology department of NAUTH is 2.9%, the essence of determining this is due to the high radiation dose associated with the abdominal x-ray investigation, according to United Nations Scientific Committee on the Effects of Atomic Radiation (USCEAR), the gonad dose from abdominal x-ray in females is equal to 4.1mGy while in males is equal to 2.5mGy [14]. The United Kingdom committee on radiological hazards to patient's final report of the committee states that bone marrow from abdominal x-ray is 1.2mGy for male and 1.3mGy for female. This calls for the need to justify the procedure [15].

The percentage of clinical indications that are not in the RCR guidelines is 27.5 in this study, this means that there is need to formulate our own guidelines with respect to clinical indications that are peculiar to our country.

V. SUMMARY OF FINDINGS

The proportion of requests form with adequate information with regards to clinical indications was greater than requests forms with inadequate information with regards to clinical indication according to the RCR guidelines.There were clinical indications for plain abdominal radiography referral thatare not in the RCR guidelines for plain abdominal radiography referral.

The distribution of abdominal radiography requests in the radiology department in NAUTH is 2.9%.

VI. CONCLUSION

This research revealed that there is an appreciable adequacy of information as regards clinical indications to the Royal College of Radiologists' guidelines for abdominal radiography. There is need to ensure adequacy of information in request for abdominal radiography referral due to the high radiation dose associated with plain abdominal radiography investigation.

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