

PREVALENCE OF INCIDENTAL FINDING ON ROUTINE PREOPERATIVE CHEST X RAY AND ITS CONSEQUENCES

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Abstract

Background: Chest X-rays are routinely requested for almost all preoperative patients in our local hospitals, regardless of their medical history, clinical examination, or clear indications. This practice is often justified by the belief that it can help stratify risk, guide anesthetic choices, or influence postoperative management. However, this high demand for chest X-rays places an excessive burden on healthcare system resources, increases exposure to ionizing radiation, and elevates the risk of false-positive findings.

Objective: it is to assess the prevalence of incidental findings on preoperative chest X-rays in our city and their impact on surgical decision-making.

Methods: This cross-sectional observational study included 260 patients admitted for elective non-cardiopulmonary surgery who underwent preoperative chest X-rays. We systematically analyzed each chest X-ray for abnormalities and classified them as either normal or abnormal. We also determined the consequences of these findings on the intended surgery (proceed to surgery, specialist referral before surgery without postponing the operation, or postponing the surgery).

Results: Out of the total chest X-rays included in the study, 229 (88.1%) were reported as normal, and only 31 (11.9%) showed abnormalities. When assessing the impact on the decision to proceed with surgery, 257 (98.8%) of the patients underwent surgery without delay. For those with abnormal chest X-rays, they received specialist consultations without postponing their intended surgery. Only 3 patients (1.2%) experienced delayed surgery, and none of them had significant lung field abnormalities on their chest X-rays. The delays were attributed to other reasons.

Conclusion: The use of chest X-rays should be justified on a case-by-case basis and limited to indicated patients based on thorough medical history and clinical examination, in alignment with published international guidelines. This approach will increase the efficacy of the healthcare system, reduce unnecessary costs, and ultimately enhance the safety and benefit for the patient.

Keyword: Chest x-ray, incidental findings, preoperative preparation.

Introduction

Chest imaging first emerged as a clinical test shortly after the discovery of X-rays by Wilhelm Conrad Röntgen in 1895. This test improved the practice of medicine as it allowed clinicians to see inside the body without surgery.¹ From that time, chest X-ray has become the most performed radiographic investigation in many countries. It has been used for screenings, clinical evaluations, diagnoses, preoperative assessments, and therapy assessments. As it is rapid, easy, and widely available, chest X-ray is particularly useful in emergency diagnosis and treatment.^{2,3}

Chest X-ray has long been part of the preoperative investigations of patients aiming to detect any abnormalities that might lead to access morbidity or mortality in the perioperative period.^{4,5} However, it is not totally without hazard, and although the resultant radiation dose to the patient is low, the radiation risk is accumulative. In addition, performing chest X-ray on all preoperative patients adds a burden to workflow in the radiology department and overall health resources, which may not be cost-effective.^{6,7} Therefore, ordering chest X-ray routinely in all patients, regardless of

their age and in the absence of clear clinical indication, solely for the purpose of preoperative assessment, is not justified according to multiple studies and institutional guidelines.^{8,9,10}

(Aim of the study): The aim of the study is to assess the prevalence of incidental findings on preoperative chest X-rays in our city and its impact on operation decisions. Chest X-ray is still ordered routinely in all patients as part of preoperative assessment in our local hospitals.

Patients and Methods:

This cross-sectional observational study was conducted between September 2022 and February 2023 in three major hospitals: Basra Teaching Hospital, Al Sader Teaching Hospital, and Al-Mawani General Hospital. It was approved by the local institutional review board, and all patients provided verbal consent.

Inclusion criteria: Patients who underwent routine chest X-rays before elective, non-cardiopulmonary surgery.

Exclusion criteria: X-ray images of poor quality that significantly interfered with image interpretation.

Initially, 271 patients were included, but 11 were later excluded due to poor image quality. Patient data, including age, gender, and the presence of respiratory complaints, were recorded for each participant. The study encompassed both adult and pediatric populations.

Chest X-ray: A chest X-ray in the posteroanterior position was taken using a digital radiography system and reviewed by a radiology specialist who was aware of the clinical data and the imaging indication. Each X-ray was analyzed for the following aspects: lung fields (overall translucency, lung volume, any discrete or generalized shadows), the hilum (position, shape, size, density), the heart (shape, cardiothoracic ratio, abnormally dense areas), and the rest of the mediastinum (the edge, width, right paratracheal strip), the trachea, the diaphragms (height, outline, shape), the costophrenic angle, the bones, and the soft tissues. The findings were then categorized as normal or abnormal, with abnormal findings further divided into pulmonary or non-pulmonary. Pulmonary findings included air space disease, interstitial abnormality, mass lesions, and pleural disorders. Non-pulmonary findings

encompassed cardiomegaly (cardiothoracic ratio more than 50%), aortic elongation, mediastinal masses, diaphragmatic abnormalities, and thoracic skeleton abnormalities.

Patient file records in the Department of Surgery were used to determine whether the chest X-ray results impacted the intended surgery. The consequences were categorized as follows: proceed to surgery, specialist referral prior to surgery without postponement of the operation, or postponing the surgery.

Statistical Analysis: Data were analyzed using IBM SPSS statistical package for Windows, version 26 (SPSS Inc., Chicago, Illinois, USA). Results were expressed as frequencies and percentages.

Result:

Our study included the chest X-rays of 260 patients, of whom 103 were males, and 157 were females. The youngest patient was 2 years old, and the oldest was 96 years old. Their distribution according to age categories is illustrated in Table I.

Table I: Patient Distribution According To Age Categories.

Age	Frequency	Percent
10 years and below	15	5.8
11-20	34	13.1
21-30	43	16.5
31-40	39	15.0
41-50	65	25.0
51-60	24	9.2
61-70	26	10.0
more than 70	14	5.4
Total	260	100.0

Out of the total chest X-rays included in the study, 229 (88.1%) were reported to be normal, and only 31 (11.9%) showed abnormalities (Figure I).

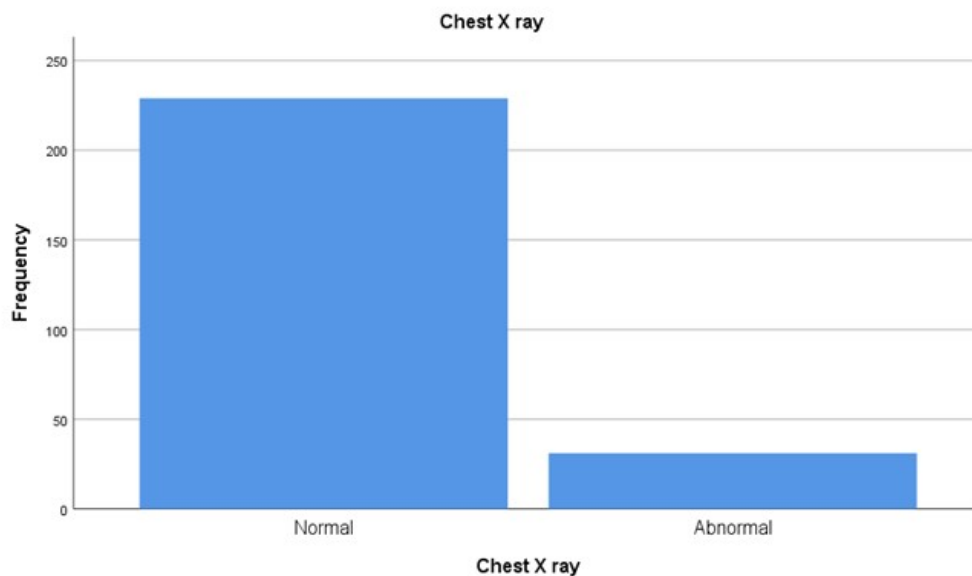


Figure 1: Proportion of Abnormal Chest X-rays

The abnormalities were in the form of cardiomegaly (14 patients), opacity in the lung field (4 patients), mild pleural effusion (4 patients), hyperinflated lungs (2 patients),

bronchiectasis (1 patient), aortic elongation (1 patient), diaphragmatic hump (1 patient), tracheal deviation (1 patient), mediastinal widening (1 patient), lung cyst with air-fluid

level (1 patient), and an incidental nodule in the right lung (1 patient).

When assessing the impact on the decision to operate, 257 (98.8%) of the patients proceeded to surgery without delay. However, those with abnormal chest X-rays received specialist consultation without

postponement of the intended surgery. Only 3 patients (1.2%) had their operation delayed (Figure 2), but none of them had significant lung field abnormalities on the chest X-ray, and the delay was due to other reasons.



Figure 2: Consequences Regarding Surgery Date

From our sample, 5 patients (1.9%) had respiratory complaints in the form of cough, dyspnea, or chest pain, as shown in Figure 3. However, only one patient showed abnormal

chest X-ray findings in the form of mediastinal widening, and this patient proceeded to surgery on its intended date.

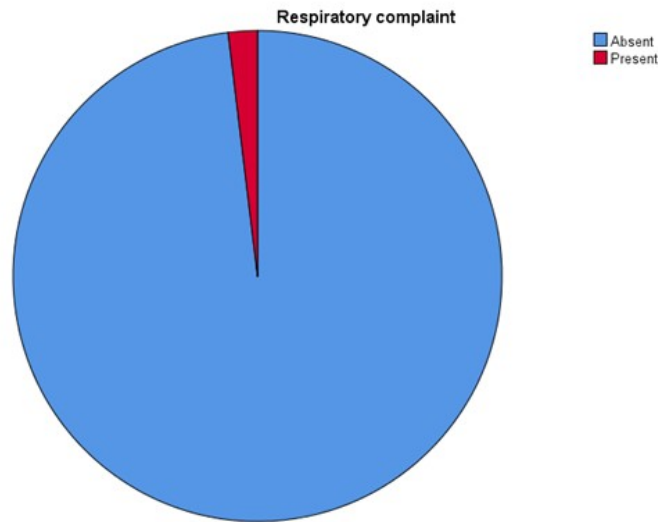


Figure 3: Proportion of Patients with Respiratory Complaints

Discussion:

There is a high demand for chest X-rays in our hospitals, as they are performed on almost all preoperative patients. In addition to its usual role in the diagnosis and monitoring of disease processes, this adds an excessive burden to the health system's resources and increases exposure to the biohazard of ionizing radiation. Furthermore, it increases the chance of having false positive findings, with its intrinsic risk, and may trigger a series of subsequent requests for other unjustified tests, posing more risk to the patient.^{11,12}

We studied the preoperative chest X-rays of 260 patients admitted for elective non-cardiopulmonary surgery. Of these, 229

(88.1%) were reported to be normal, and only 31 (11.9%) showed abnormalities. None of these patients had their surgery postponed due to chest X-ray findings. When compared to previous studies, Irum Ali et al. analyzed 500 preoperative chest X-rays, of which 109 (21.87%) were reported as abnormal, and surgery was delayed in 30 patients. However, in only one patient, the delay was due to significant chest X-ray findings.¹³ Jeavons SJ et al. also studied 500 preoperative chest X-rays, of which 33 patients had abnormalities thought to be significant, and there was an impact on the operation decision in 6 patients (four had their surgery canceled, one had palliative surgery, and one had surgery postponed due to the need for further workup).¹⁴ While

Kovacevic M et al. included 749 preoperative chest X-rays collected from patients visiting the preoperative anesthetic clinic and found that 591 (78.81%) were normal, and 142 (18.96%) had chronic changes, while only 10 (1.34%) had acute changes. Among those with abnormal chest X-rays, surgery was postponed in 16 (2.1%) patients due to the need for further investigations, and all of them were rescheduled for the primary surgery after additional review.⁵

The results of those studies are comparable to our study results, although there is a difference in sample size, which may affect the percentage of abnormal findings. Additionally, the studies differ in reporting abnormal findings (only those significant or all abnormal findings), which may also impact the proportion of abnormalities detected.

A large systematic review of evidence on routine preoperative testing published in 1997 by Munro et al. had analyzed numerous studies (case-series) from 1976 to the date of publishing and found that routine preoperative chest X-rays are considered abnormal in 2.5–37.0% of cases and lead to alteration in clinical management in 0 to 2.1% of cases. However, the effect on

patient outcomes is unknown, and they stated that "The available evidence does not support a policy of performing routine preoperative chest X-ray for all patients."¹⁵

Upon reviewing the present guidelines on ordering preoperative chest X-rays, the American College of Physicians states that chest X-rays should not be used routinely for predicting the risk of postoperative pulmonary complications, and only patients with new or unstable cardiopulmonary signs or symptoms and those at increased risk of postoperative pulmonary complications should have preoperative chest X-rays if the results will alter their perioperative management¹⁶. The American College of Radiologists, in their ACR Appropriateness Criteria®, considered ordering preoperative chest X-rays in asymptomatic patients with an unremarkable history and physical examination is usually not appropriate¹⁷.

The Royal College of Radiologists, in its radiological investigation guideline (iRefer: making the best use of clinical radiology), states that screening preoperative chest X-rays are indicated in patients undergoing cardiothoracic surgery. However, for elective non-cardiothoracic surgery, preoperative chest X-rays are not indicated but may be appropriate in those patients

with significant cardiopulmonary disease or in several other indications depending on local guidelines¹⁰.

From a literature review and the results of our study, we conclude that although preoperative chest X-rays may help stratify risk, guide anesthetic choice, or affect postoperative management, their use should be justified for each case and limited only to indicated cases judged by thorough medical history and clinical examination and according to published international guidelines. We recommend ordering them according to medical necessity rather than following a protocol, which, in turn, will increase the efficiency of the health system, reduce unnecessary costs, and be safer and

more beneficial for the patient, We also recommend conducting further controlled randomized trial on a large sample of patients to assess the actual significance of preoperative chest X-rays and its primary impact on anesthetic choice, intraoperative, and postoperative complications, mortality rate and period of hospital stay.

Limitations to our study include the relatively small sample size, lack of PACS (picture archiving and communication system) in our local hospitals that incorporate the whole patient's information, making it difficult to assess the details of further workup after specialist referral and difficult to assess the effect on anesthetic choice or postoperative morbidity.

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Data collection and analysis 2,3,4,5

Responsibility for statistical analysis 1,2,3,4,5

Writing the article 1,2,3,4,5

Critical review, 1, 2,3,4,5

Final approval of the article 1,2,3,4,5

Each author believes that the manuscript represents honest work and certifies that the article is original, is not under consideration by any other journal, and has not been previously published.

Availability of Data and Material: The corresponding author is prompt to supply datasets generated during and/or analyzed during the current study on wise request.

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