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Evaluation of clinical effect of chest radiographs: A retrospective study

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Background: Millions of chests X-rays (CXR) are being performed across the globe in the present scenario. Uncertain when to request or how to interpret, they may retreat expensively and unnecessarily into computerized tomography.[6- 8]Hence; we planned the present study to assess the clinical impact of chest radiographs.
Materials & methods: The present study included assessment of clinical impact of chest radiographs. Retrospective evaluation of a total of 100 chest radiographs was done out of which 58 were males and 42 were females. Classification of the outcome of the chest radiographs was done into following types: Normal, Incidental, and Pathologic. All the data records were compiled and analysed by SPSS software.
Results: A total of 100 radiographs were included in the present study. Out of these 100 radiographic cases, 30 percent of the cases showed normal findings whereas 60 percent of the cases were associated with pathologic findings. Only 10 cases showed presence of incidental findings. In majority of the cases (75 percent), highly expected results came.
Conclusion: Chest radiographs play a crucial role in the diagnosis of unexpected pathologies.

Keyword: chest, pathologic, radiograph

INTRODUCTION: Despite advances in radiology, the chest X-ray (CXR) has survived as the most frequently requested examination.[1] About 6.7 million CXR are performed each year in the UK. The radiation dose of a frontal CXR is equivalent to only three days' exposure to natural background radiation (effective dose 0.02 mSv [2, 3]. The lateral CXR is less frequently requested and more difficult to interpret. Nevertheless it contains much information on the thoracic cage, pleura, lungs, pericardium, heart, mediastinum and upper abdomen [4, 5] Many junior doctors, at ease with the frontal CXR, seem intimidated by the lateral film. Uncertain when to request or how to interpret, they may retreat expensively and unnecessarily into computerized tomography [6, 8] Hence; we planned the present study to assess the clinical impact of chest radiographs.

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Materials & Methods

The present study was conducted in the department of Radio-Diagnosis of the medical institute and included assessment of clinical impact of chest radiographs. Ethical approval was taken from institutional ethical committee and written consent was obtained after explaining in detail the entire research protocol. Retrospective evaluation of a total of 100 chest radiographs was done out of which 58 were males and 42 were females. The mean age of the subjects, as recorded from the data records, was 59.5 years. Data records of all the subjects who were referred to the department of Radio-Diagnosis for the purpose of chest X-rays were evaluated. Classification of the outcome of the chest radiographs was done into following types:

- Normal,
- Incidental,
- Pathologic

After matching the diagnosis of the radiologists with that of the referred physicians, the cases were further classified into following types:

- Highly expected results,
- Moderately expected results,
- Unexpected results

All the data records were compiled and analysed by SPSS software. Chi- square test and student t test were used for assessment of level of significance. P- Value of less than 0.05 was taken a significant.

Results

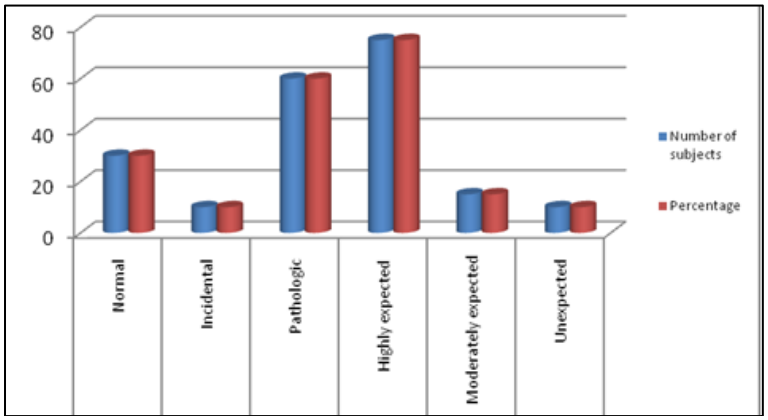
A total of 100 radiographs were included in the present study. Out of these 100 radiographic cases, 30 percent of the cases showed normal findings whereas 60 percent of the cases were associated with pathologic findings (Table 1, Graph 1). Only 10 cases showed presence of incidental findings. In majority of the cases (75 percent), highly expected results came whereas only 10 percent cases, radiographic diagnosis was unexpected form the clinical diagnosis (Table 2).

Table 1: Findings associated with chest radiographs

Parameter	Number of subjects	Percentage
Normal	30	30
Incidental	10	10
Pathologic	60	60
Total	100	100

Table 2: Diagnosis based on clinical and radiographic assessment

Parameter	Number of subjects	Percentage
Highly expected	75	75
Moderately expected	15	15
Unexpected	10	10



Graph 1: Findings and clinic-radiographic diagnosis associated with chest radiographs

Discussion

In the present study, we observed that unexpected results are encountered in considerable number of cases in subjects undergoing chest radiography (Table 2). Den Boon S *et al* evaluated new chest radiograph reading and recording system (CRRS) for community surveys of tuberculosis (TB) and lung disease. An experienced pulmonologist read 2608 chest X-rays (CXRs) performed as part of a TB prevalence survey using the newly developed CRRS. The kappa (kappa) for inter-reader agreement was calculated after a second reader reported on a stratified random sample of 810 (31%) of the 2608 CXRs. The kappa for intra-reader agreement was calculated from the repeated reporting of a stratified random sample of 104 CXRs. The kappa agreement between the two readers was 0.69 (95%CI 0.64-0.74) for abnormalities consistent with TB and 0.47 (95%CI 0.42-0.53) for any abnormalities. The kappa for intra-reader agreement was 0.90 (95%CI 0.81-0.99) for abnormalities consistent with TB and 0.85 (95%CI 0.74-0.95) for any abnormalities. This standardised method for CXR reading and recording provides satisfactory inter- and intra-reader agreement, making it suitable for surveys of TB and other forms of lung disease in the community. Its use will permit comparisons of results obtained in different surveys.[8-10]Nesterova GV *et al* investigated the frequency of errors in CXR interpretation by pediatricintensivists and their impact on patient management. Chest radiographs of PICU patients were evaluated by 5 pediatricintensivists then by a pediatric radiologist (the "gold standard"). If the interpretation of the radiologist and intensivist differed, an independent intensivist determined whether a management change took place. A pediatric pulmonologist determined how many intensivist interpretations were different from the radiologist's interpretations. Seven hundred twenty-eight radiographic findings were identified by the radiologist in 460 CXRs. There were 33 interpretation errors by the intensivists (4.5% of the findings in 7.1% of the CXRs). Only 3/33 error corrections (0.45% of the findings in 0.7% of the CXRs) resulted in change in patient management. Errors in interpretation of CXRs by pediatricintensivists were common but less than that in other series, probably because of education of the pediatricintensivists through daily rounds with the radiologist. Although interpretation errors that affected patient management were rare, their clinical importance supports the growing practice of 24/7 remote radiograph reading by radiologists [11].

Oken MM *et al* assessed 100 patients who were admitted to the PACU following various surgical procedures, and in whom a postoperative chest radiograph was routinely performed. Chest radiograph was taken in each study patient soon after admission to the PACU. The indications for postoperative chest radiograph were: thoracotomy (30 patients), thoracoscopy (7), central vein catheterization (CVC) (75), pulmonary artery catheterization (3), and mechanical ventilation (36). A staff anaesthesiologists examined each patient, evaluated each chest radiograph, and decided if a treatment action was to be taken. A chest radiologist later evaluated each chest radiograph, and her interpretation was compared with the anesthesiologist's interpretation to assess if this may affect patient management. The anaesthesiologists found eight abnormal chest radiographs (8%): three with pulmonary congestion, four in whom the CVC was in the right atrium, and one with malpositioned CVC. In four patients (4%), the chest radiographic findings directly affected patient management. The radiologist confirmed the anesthesiologist's interpretation and found four additional abnormalities: one pulmonary congestion, one malpositioned CVC, and two chest radiographs, each with a small pneumothorax. Abnormal chest radiographic findings resulted in a change in the management of only 4% of the patients. Therefore, the yield of a routine postoperative chest radiograph in the PACU is low. Performing a chest radiograph for a specific indication rather than on a routine basis, may decrease work load and save expenses. Postoperative chest radiography can be safely evaluated by a staff anesthesiologist.[12]Oken MM *et al* analyzed the data from a subset of eligible participants for the National Lung Screening Trial (NLST), which compared chest radiograph with spiral computed

tomographic (CT) screening. Participants in the intervention group were offered annual Posteroinferior view chest radiograph for 4 years. Diagnostic follow-up of positive screening results was determined by participants and their health care practitioners. Participants in the usual care group were offered no interventions and received their usual medical care. All diagnosed cancers, deaths, and causes of death were ascertained through the earlier of 13 years of follow-up or until December 31, 2009. Secondary outcomes included lung cancer incidence, complications associated with diagnostic procedures, and all-cause mortality. Screening adherence was 86.6% at baseline and 79% to 84% at years 1 through 3; the rate of screening use in the usual care group was 11%. Cumulative lung cancer incidence rates through 13 years of follow-up were 20.1 per 10,000 person-years in the intervention group and 19.2 per 10,000 person-years in the usual care group (rate ratio [RR]; 1.05, 95% CI, 0.98-1.12). A total of 1213 lung cancer deaths were observed in the intervention group compared with 1230 in usual care group through 13 years (mortality RR, 0.99; 95% CI, 0.87-1.22). Stage and histology were similar between the 2 groups. The RR of mortality for the subset of participants eligible for the NLST, over the same 6-year follow-up period, was 0.94 (95% CI, 0.81-1.10). Annual screening with chest radiograph did not reduce lung cancer mortality compared with usual care [13].

Conclusion

Chest radiographs play a crucial role in the diagnosis of unexpected pathologies. However, future research is advocated.

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