

Improving Chest Imaging Interpretation Skills of General Practitioners in Primary Care: A Global Imperative for Reducing Misdiagnosis and Mortality

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Abstract

Chest imaging—including digital radiography (DR) and computed tomography (CT)—is essential for the early detection and management of life-threatening conditions such as pulmonary malignancies, cardiovascular diseases, and esophageal disorders. Although these imaging modalities are increasingly available in primary care settings globally, misdiagnosis and treatment delays persist, largely due to limited radiological expertise among general practitioners (GPs). This article highlights the critical need to enhance GPs' chest imaging interpretation skills to reduce diagnostic errors, improve patient outcomes, and promote global health equity. We discuss the diagnostic challenges faced by GPs, including the gap between radiology reports and clinical context, and illustrate these issues with case studies of missed diagnoses such as lung cancer and coronary artery disease. The systemic consequences of these misdiagnoses include increased morbidity, mortality, and healthcare costs. To address these challenges, we propose evidence-based strategies for capacity building: structured training programs, integration of artificial intelligence (AI) tools, telemedicine and collaborative networks, and continuous professional development. These interventions have significant global implications, particularly for low- and middle-income countries (LMICs) facing critical shortages of specialists. Future research should focus on evaluating the impact of training on diagnostic accuracy, developing culturally appropriate educational resources, and assessing the cost-effectiveness of AI in primary care. Empowering GPs with advanced chest imaging interpretation skills is a scalable, cost-effective strategy to reduce misdiagnosis and save lives worldwide. Policy action and investment in training infrastructure are urgently needed to achieve these goals.

Keywords

Chest Imaging, General Practitioners, Misdiagnosis, Artificial Intelligence, Primary Care, Global Health

1. Introduction

Noncommunicable diseases (NCDs)—including cardiovascular disease, cancer, and chronic respiratory conditions—are the leading causes of morbidity and mortality worldwide, accounting for over 70% of global deaths [1]. Early and accurate diagnosis is essential to improving outcomes, reducing healthcare costs, and ensuring efficient resource utilization. Among diagnostic tools, chest imaging—particularly digital radiography (DR) and computed tomography (CT)—plays a pivotal role in detecting life-threatening conditions such as lung cancer, pulmonary embolism, pneumonia, and coronary artery disease [2]-[4].

In primary care settings, GPs are often the first point of contact for patients and are responsible for initial assessment, diagnosis, and triage. With the growing availability of chest imaging technologies even in resource-limited areas, GPs are increasingly utilizing these tools to aid in diagnosis [5]. However, despite the widespread use of DR and CT, diagnostic inaccuracies remain common, largely due to limited training in radiology among GPs [6]. This gap in expertise can lead to missed or delayed diagnoses of critical conditions, resulting in worse patient outcomes and increased healthcare burdens [7].

This article addresses the urgent need to improve GPs' chest imaging interpretation skills as a global health priority. By enhancing diagnostic accuracy, reducing misdiagnosis, and fostering interdisciplinary collaboration, we can improve patient care and promote health equity worldwide.

2. Methods

A narrative review of the literature was conducted to identify relevant articles published between 2000 and 2024. Electronic databases, including PubMed, Web of Science, and Google Scholar, were searched using keywords such as “chest imaging”, “general practitioners”, “misdiagnosis”, “artificial intelligence”, “primary care”, and “radiology training.” Articles were selected based on relevance to the topic, study design, and publication in peer-reviewed journals. Both observational and interventional studies were included, with priority given to systematic reviews, meta-analyses, and high-impact clinical trials.

3. Current Challenges and Clinical Consequences

3.1. Diagnostic Gap between Radiology Reports and Clinical Context

Radiology reports are typically written by specialists and focus on descriptive findings, requiring clinicians to integrate these results with patient history, symptoms,

and clinical context to make accurate diagnoses. However, many GPs lack formal training in radiology, which limits their ability to interpret complex imaging findings. As a result, critical abnormalities—such as small lung nodules, coronary artery calcifications, or early signs of esophageal pathology—are often missed or misinterpreted [8].

For example, subtle lung nodules, which may indicate early-stage lung cancer, are frequently overlooked by GPs due to their inability to distinguish benign from malignant lesions. Similarly, coronary artery calcifications, a key predictor of cardiovascular events, may be missed, leading to preventable myocardial infarctions or sudden cardiac death [9].

3.2. Case Studies Highlighting Misdiagnosis

Several real-world cases illustrate the consequences of diagnostic errors in chest imaging interpretation:

Case 1: A 62-year-old male with a 40-pack-year smoking history presented with mild cough and fatigue. A chest CT scan was performed and initially interpreted by the GP as “mild chronic inflammation.” The patient was diagnosed with advanced lung adenocarcinoma nine months later, underscoring the need for improved nodule detection. Case 2: A 58-year-old hypertensive male with episodic chest discomfort underwent chest radiography that revealed coronary artery calcifications. This finding was not recognized as significant by the GP. The patient suffered a fatal myocardial infarction three weeks later. Early identification could have led to preventive measures [10]. These cases underscore the life-threatening consequences of misinterpreting chest imaging and emphasize the need for GPs to have enhanced radiological proficiency.

3.3. Systemic Impact of Misdiagnosis

Diagnostic errors in chest imaging lead to:

- Increased morbidity and mortality due to delayed treatment.
- Higher healthcare costs from unnecessary tests, hospitalizations, and advanced-stage interventions.
- Strain on specialist services, as misdiagnosed patients often require more intensive care at later stages of disease [11] [12].

4. Strategies for Capacity Building

To address these challenges, we propose the following evidence-based strategies:

4.1. Structured Training Programs

Structured, standardized training programs can significantly improve GPs' ability to interpret chest imaging. These programs should include:

- Didactic sessions on anatomy, pathology, and radiological patterns.
- Case-based learning to enhance practical decision-making.
- Image atlases for reference and self-assessment [13].

Evidence from the UK shows that GP training in chest X-ray interpretation improves diagnostic confidence and reduces unnecessary specialist referrals. Lung cancer kills more people than any other cancer in the UK (5-year survival < 13%). Early diagnosis can save lives. The USA-based National Lung Cancer Screening Trial reported a 20% relative reduction in lung cancer mortality and 6.7% all-cause mortality in low-dose computed tomography (LDCT)-screened subjects [14].

4.2. Artificial Intelligence (AI) Integration

AI tools can assist GPs by:

- Flagging suspicious lesions (e.g., lung nodules, calcifications).
- Quantifying disease severity (e.g., tumor size, calcification burden).
- Suggesting differential diagnoses based on imaging patterns [15].

Deep learning models have demonstrated high accuracy in detecting lung cancer, pulmonary embolism, and other thoracic conditions. For instance, a 2023 study reported an AI system achieving a sensitivity of 94% and specificity of 91% for lung nodule detection on CT [16]. Integrating AI into primary care can enhance diagnostic precision, particularly in resource-limited settings.

4.3. Telemedicine and Collaborative Networks

Telemedicine enables:

- Remote radiology consultations allow GPs to seek expert opinions on complex cases.
- Interdisciplinary collaborations between GPs and specialists to improve diagnostic accuracy.

Tele-radiology initiatives in rural areas have improved access to specialist expertise and reduced diagnostic errors [17].

4.4. Continuous Professional Development (CPD)

CPD programs, including:

- Workshops and online modules on emerging imaging technologies.
- Quality assurance initiatives to maintain radiological competence.

Regular training ensures that GPs remain updated on best practices in chest imaging interpretation.

5. Global Implications and Future Directions

Enhancing GPs' chest imaging skills has global relevance, particularly in LMICs—defined as nations with a gross national income per capita below \$13205—where specialist shortages are severe [18]. Cost constraints in these regions may limit the adoption of advanced AI or tele-radiology solutions, necessitating scalable, low-cost training alternatives. By empowering GPs with advanced diagnostic capabilities, we can:

- Reduce healthcare disparities in underserved regions.
- Improve early detection of NCDs (e.g., lung cancer, heart disease).

- Optimize resource allocation in low-resource settings.

6. Future Research Priorities

- 1) Measuring the impact of training programs on diagnostic accuracy and patient outcomes.
- 2) Developing culturally tailored educational materials for diverse healthcare systems.
- 3) Assessing the cost-effectiveness of AI integration in primary care radiology [19].

Longitudinal studies are needed to evaluate the long-term benefits of improved imaging interpretation on healthcare systems.

7. Limitations

This narrative review is based on existing literature and does not present original data. The recommendations may not be universally applicable due to variations in healthcare systems, resources, and training standards across regions. The case studies, while based on real clinical scenarios, are simplified for illustrative purposes and may not capture all complexities of diagnostic decision-making.

8. Conclusion

Enhancing GPs' chest imaging interpretation skills is a cost-effective, scalable solution to reduce misdiagnosis and mortality worldwide. As frontline healthcare providers, GPs with advanced radiological proficiency can ensure timely interventions, improving patient outcomes and reducing healthcare burdens. Urgent policy action and investment in training infrastructure are needed to implement these strategies globally.

Authors' Contributions

Fumu Wang: Study conception, manuscript drafting, critical revision. Haiming Wang: Literature review, manuscript feedback. Both authors approved the final manuscript.

Data Availability

Not applicable (original data not collected).

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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