What Is the Cost-Effectiveness of AI in Diagnostic Imaging?

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Abstract

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Introduction

Artificial intelligence (AI) is rapidly transforming the landscape of healthcare, particularly in the field of diagnostic imaging. With its potential to enhance diagnostic accuracy, streamline workflows, and improve patient outcomes, AI has generated significant excitement. However, the integration of AI into clinical practice requires substantial investment, raising a critical question for healthcare leaders and policymakers: Is AI in diagnostic imaging a cost-effective solution? This article explores the economic value of AI in diagnostic imaging, drawing on recent academic research to provide a comprehensive overview for health professionals.

The Economic Value of AI in Radiology

The economic impact of AI in radiology is not a simple calculation; it is highly dependent on the specific application, the context of its use, and the implementation model [2]. A systematic review published in 2025 found that AI can provide significant economic value in resource-intensive and high-volume tasks, especially when its diagnostic accuracy is comparable to or exceeds that of human radiologists [2]. For instance, in lung cancer screening, the use of AI has been shown to result in incremental cost savings of up to $242 per patient [2]. These savings are primarily achieved by improving the efficiency of the screening process and reducing the need for unnecessary follow-up procedures.

However, the cost-effectiveness of AI is not guaranteed. The same review

highlights that the choice of implementation model plays a crucial role. Pay-per-use models, for example, can lead to increased costs, as has been observed with some computer-aided diagnosis (CAD) systems used in mammography, which have increased screening costs by up to $19 per patient [2]. This underscores the importance of carefully evaluating the financial implications of different AI implementation strategies.

Improving Outcomes and Reducing Costs

A broader systematic review of AI in healthcare, also from 2025, reinforces the idea that AI interventions can lead to improved patient outcomes and reduced costs [1]. This review, which covered a range of clinical AI applications, found that AI can enhance quality-adjusted life years (QALYs) by improving diagnostic accuracy and optimizing the use of healthcare resources [1]. By minimizing unnecessary procedures, AI can help to reduce the overall cost of care while simultaneously improving the quality of that care.

Despite these promising findings, the review also cautions that many economic evaluations of AI rely on static models, which may not fully capture the dynamic nature of AI technologies [1]. AI systems have the ability to learn and improve over time, and static models that do not account for this may overestimate the long-term benefits. Furthermore, many studies do not fully account for indirect costs, such as those related to infrastructure, training, and implementation, which can be substantial [1].

The Path Forward: A Need for Robust Evaluation

For AI to be successfully integrated into diagnostic imaging, a clear understanding of its economic impact is essential. While the potential for cost savings and improved patient outcomes is significant, healthcare organizations must carefully consider the context-specific factors that will influence the cost-effectiveness of any given AI solution. This includes the complexity of the diagnostic task, the volume of examinations, and the availability of skilled personnel.

Future research should focus on conducting high-quality economic evaluations of AI in real-world clinical settings. These evaluations should use dynamic models that can account for the evolving nature of AI and should include a comprehensive assessment of all relevant costs, both direct and indirect. By building a strong evidence base for the cost-effectiveness of AI, we can ensure that these powerful technologies are implemented in a way that maximizes their value for patients and the healthcare system as a whole.

Conclusion

The cost-effectiveness of AI in diagnostic imaging is a complex issue with no easy answers. While there is growing evidence that AI can deliver significant economic value by improving efficiency, reducing costs, and enhancing patient outcomes, the financial benefits are highly dependent on the specific context of its use. As AI technologies continue to mature, it is crucial that we continue to rigorously evaluate their economic impact to ensure that they are deployed in a way that is both clinically effective and financially sustainable.

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