



# How Does Medical Artificial Intelligence Revolutionize Physician Productivity?

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This study examines the impact of medical artificial intelligence (AI) on physician workload and the quality of patient care. A meta-analysis of empirical studies found that AI significantly reduces physician workload and diagnostic time by automating repetitive interpretation and documentation processes, freeing clinicians to focus solely on patients. Automated generative AI-based electronic medical record systems reduce documentation time by approximately 40%, while voice recognition and AI scribing technologies reduce patient charting time by 28.8%. This reduces administrative burden, a major cause of physician burnout, by more than 30%. In radiology, AI-based interpretation reduced the interpretation time for abnormal contrast-enhanced brain CT lesions by 11.23%, the interpretation time for lung lesions by 52.82%, and the analysis time for peripheral blood smears by 61%. Importantly, these time savings occur naturally and, in some cases, improve diagnostic accuracy for major diseases (e.g., lung nodules, brain lesions, and breast cancer). Furthermore, AI minimizes the workload of interpretation through its automatic filtering function. This includes a 77.4%–86.7% reduction in review time for pulmonary nodules, a 51.3%–72.9% reduction in endometrial slide screening time, and an 86% saving in manual review time for epilepsy electroencephalography evaluation. These findings confirm that AI is establishing itself as a reliable tool that simultaneously improves physician efficiency, diagnostic efficiency, and clinical accuracy. Therefore, future healthcare policies regarding AI should not simply focus on expanding the workforce, but should adopt a strategic approach, optimizing resource efficiency and building a more resilient healthcare system.

**Key Words:** Artificial intelligence; physicians; workload; diagnosis, sensitivity and specificity; quality improvement; health services accessibility

## INTRODUCTION

Medical artificial intelligence (AI) is expected to evolve from hardware to software and services,<sup>1</sup> and its market size is projected to grow by 36.83% annually from 2025 to 2034.<sup>2</sup> This growth trend is anticipated to continue as AI contributes to the improvement of hospital systems.<sup>3</sup> Medical AI is widely used

in fields such as medical imaging and diagnosis, patient data-based risk analysis, virtual medical assistance, inpatient treatment and hospital management, cybersecurity, drug discovery, and research.<sup>4</sup> Particularly, the size of the computer vision market, including fundus cameras, echocardiography, and angiography devices in cardiovascular medicine that employ AI for image recognition and interpretation, is expected to grow by 37.6% annually through 2030. In addition, the fields in which context recognition technology provides customized services by recognizing the user's situation (location, time, surrounding environment, biometric information, etc.) are expected to grow by 39.2% annually through 2030.<sup>5</sup> Medical AI is positioning itself as a technology that promotes human-centered values and service innovation in the entire medical field, extending beyond its role as a mere support tool.<sup>6</sup> Furthermore, medical AI is a powerful alternative that can improve the quality of medical care without the need to recruit additional physicians, and some experts believe it has the potential to play an even greater role

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in the future.<sup>7</sup> Therefore, this study aimed to examine the current use of AI in the medical field and analyze its effect on physician productivity and the quality of medical care to suggest policy recommendations for the medical community.

This study was approved by the Institutional Review Board of Korean Medical Association (IRB No. KMAA 2025-07-01).

## CURRENT STATUS OF MEDICAL AI UTILIZATION

The adoption of medical AI is spreading worldwide, and each country uses it in various ways. In South Korea, AI is actively used mainly for administrative tasks. Many hospitals use AI chatbots and virtual assistants to automate appointments and adjustments<sup>8</sup> and reduce waiting times by optimizing patient flow.<sup>9</sup> Additionally, AI voice recognition technology reduces repetitive documentation by recording conversations between medical staff and patients in real-time and assisting with the creation of medical records.<sup>10,11</sup> Moreover, medical AI is used in medical image analysis and as a diagnostic aid. Most AI-based medical devices licensed by the Ministry of Food and Drug Safety (MFDS) between 2018 and 2022 are image analysis software packages.<sup>12</sup>

Medical AI devices approved by the U.S. Food and Drug Administration (FDA) are mainly software that detect, classify, and assist in reading lesions based on CT, MRI, X-ray, and ultrasound images.<sup>13</sup> AI-based medical devices licensed by the Korean MFDS between 2018 and 2022 primarily consist of medical image detection, analysis, and diagnostic assistance software.<sup>12</sup> Specifically, mammography imaging AI has become widely adopted, with approximately 60% of high-level general hospitals using it as of July 2024. Chest X-ray (CXR) and wireline CT image analysis AI are enhancing physicians' reading efficiency in national lung cancer screenings.<sup>14</sup> In the field of neuroimaging, AI also facilitates rapid diagnosis by physicians.<sup>15,16</sup>

However, electronic medical record (EMR)-based disease prediction and generative AI technologies are still in the research and pilot stages. Although the Korean MFDS established guidelines for the approval and examination of Generative AI medical devices in January 2025, no products have been officially approved. However, as the number of approvals for related clinical trials increases, expectations for commercialization are also increasing. The United States and Europe are utilizing AI more extensively than Korea in the areas of diagnosis and prediction. Although most medical AI devices approved by the U.S. FDA are image-reading assistance software, such as CT and MRI, AI is also widely applied in the early diagnosis of various diseases, including infectious diseases, diabetic retinopathy,<sup>17</sup> and cancer detection and progression prediction. This reduces time wastage and increases accuracy between patient examination and final diagnosis, while lowering hospitalization costs and workload for medical staff.

## IMPROVEMENT OF PHYSICIAN PRODUCTIVITY

AI has contributed to increased productivity and accuracy and improved work management efficiency in various areas of medical care, thereby improving diagnostic processes.<sup>18</sup> Consequently, medical AI is shaping the future of medical diagnosis and problem-solving by fostering collaboration with healthcare professionals in an evolving clinical environment. Doctors at Korea Advanced General Hospital spend approximately 15.26% of their total working hours on medical record documentation.<sup>19</sup> However, after automating the drafting of medical records by establishing a Generative AI platform in the hospital, the EMR writing time per inpatient was reduced by approximately 10 minutes. This translates to approximately 1.5 hours saved daily for doctors treating nine inpatients. This is equivalent to 20–30 workdays per year—and an estimated total of 83000 hours saved across the hospital.<sup>20</sup> Thus, AI provides more opportunities for medical staff to participate efficiently in patient treatment.<sup>21</sup>

In the United States, physicians use 34%–55% of their daily working hours creating EMRs—an opportunity cost estimated at \$90–\$140 billion annually.<sup>22</sup> In a study of 10 pediatric emergency medical doctors, Barak-Corren, et al.<sup>23</sup> reported that the time required to create medical records using AI was reduced by approximately 40%. In addition, Owens, et al.<sup>24</sup> pointed out that physician burnout is a major cause of the shortage of medical personnel in primary care. Their study showed that using voice recognition AI, which automatically records and structures patient-physician conversations, reduced documentation time per patient by 28.8% and documentation time outside of working hours by 11.8%, enabling medical staff to focus more effectively on patient care.

A medical institution in California, USA, adopted Ambient AI Scribe, a tool that goes beyond organizing voice records to summarizing key information needed to establish diagnosis and treatment plans, functioning as support for clinical decision-making.<sup>25</sup> In a subsequent survey, all 22 participating physicians reported feeling that the cognitive burden was eased, 89% of the workload was reduced, 68% of the patients experienced improved interaction, and 62% of the time burden was reduced.<sup>25</sup> The Permanente Medical Group found that approximately 3400 physicians wrote more than 300000 medical records using AI Scribe over 10 weeks, saving an average of 1 hour of documentation time per physician per day. Systematic reviews by several organizations, including the University of Pennsylvania,<sup>26</sup> show that the introduction of AI Scribe is associated with reduced documentation time, increased work efficiency, and alleviated physician burnout, significantly improving productivity without additional personnel.<sup>27</sup>

Currently, productivity improvements and efficiency through the use of medical AI have been best proven in the field of radiology. A number of studies published between 2021 and 2024

have reported that the use of AI in radiology improved diagnostic accuracy and shortened the average reading and diagnosis time (Table 1). Beyond radiology, AI is being used in various medical specialties, including gastroenterology, internal medicine, pathology, and cancer diagnosis. In terms of application, two primary approaches are commonly used: supporting clinicians' final diagnoses by providing relevant data, and reducing repetitive tasks and workload by presenting only essential images to physicians. Table 1 summarizes findings from multiple studies showing that AI effectively reduces the workload of medical staff, particularly repetitive and quantitative tasks, such as image reading and lesion classification.<sup>28,29</sup> In the field of pathology, work efficiency can also be increased by reducing the number of repetitive classification tasks through slide image analysis.<sup>30</sup> This implies that the overall efficiency of the treatment process is boosted by increasing the accuracy of AI-based pattern recognition, which can identify abnormal microscopic signs.

Furthermore, many studies have reported that the number of daily judgments per physician has increased in hospitals that use AI for mammography,<sup>31</sup> while average working hours have been reduced by 15%–25% owing to faster diagnosis.<sup>32</sup> Moreover, domestic studies have reported that AI-based computer-aided detection for mammography has significantly improved radiologists' reading accuracy and reduced the interpretation time.<sup>33</sup> CXR AI, which has been used in many hospitals in recent years, has also improved reading efficiency by reducing the repetitive and exhausting working hours of physicians, thereby contributing to the improvement of treatment outcomes.<sup>14</sup> In the field of neurology, a study found that the workload of physicians was reduced by AI when analyzing complex electroencephalography (EEG) and image data.<sup>34</sup> Therefore, the data preprocessing and summarization functions of medical AI effectively reduce the amount of data required for analysis, thereby decreasing the workload of medical staff and minimizing system resource consumption (Table 2).

These findings suggest that AI automates time- and resource-intensive tasks, allowing physicians to focus on the primary tasks of patient care and higher-order decision-making. Specifically, AI-assisted diagnoses can improve diagnostic accuracy, alleviate personnel shortages, and serve as the basis for establishing an efficient medical system.<sup>18</sup>

If AI-based prediction models are commercialized in clinical practice, they will enhance the precision of treatment planning, enable customized treatment, and facilitate early intervention, all of which will significantly improve physician productivity. Consequently, the widespread adoption of medical AI is expected to reshape the demand structure for medical personnel. Hence, future workforce planning should be designed to account for these changes.

## IMPROVEMENT OF HEALTHCARE QUALITY

Medical AI performs repetitive and standardized tasks, allowing physicians to focus on treating severe and complex cases.<sup>35</sup> It also analyzes pathological tissue images to improve diagnostic accuracy and consistency. Furthermore, it accurately predicts various clinical risk factors, including risk assessment, length of stay, complications, and readmissions, for patients with degenerative diseases.<sup>36</sup> This predictive efficiency has led to AI being utilized in mental health, including for classifying mental illness and predicting treatment response. This contributes to optimizing personalized care by suggesting the most effective treatment options for each patient.<sup>37</sup>

In addition, AI has shown excellent performance in the diagnosis of acute leukemia and has increased the precision of treatment by providing detailed diagnostic information. It is also used as a monitoring system for predicting mental health conditions, such as pediatric attention deficit and hyperactivity disorder, and for supporting treatment and rehabilitation,<sup>38</sup> reducing hospitalization period and mortality,<sup>39</sup> facilitating patient treatment adjustment, and improving the quality of diagnosis. Specifically, real-time health monitoring helps improve the quality of life by maintaining patient independence, preventing complications, and reducing personal healthcare costs.<sup>40</sup> Furthermore, the commercialization of AI-based predictive models in the clinical setting will significantly improve physician productivity by enhancing the precision of treatment planning, enabling personalized therapy, and facilitating early intervention. Consequently, the diffusion of medical AI is expected to bring about a shift in the structure of healthcare workforce demand. Future healthcare workforce planning must therefore be designed to account for these changes.

## TECHNICAL LIMITATIONS, INITIAL COST, AND COGNITIVE BURDEN ON PHYSICIANS REGARDING THE INTRODUCTION OF MEDICAL AI

Despite advances in AI technology, concerns regarding the technical, clinical, ethical, and social risks of medical AI persist.<sup>41,42</sup> Medical AI is expected to improve physician productivity; however, it remains limited by bias, instability, accuracy constraints, limited controllability, and reliability concerns. Notably, the technical limitations of AI have been reported in several studies. AI used to diagnose intracranial aneurysms or detect pneumonia lesions in COVID-19 patients showed significantly lower specificity (the rate of incorrectly identifying disease in the absence of pathology) than clinicians. Similarly, AI models for lung nodule detection and classification still face technical challenges, as instances have been reported where actual disease cases were misclassified as normal. This suggests that patient trust in AI-based diagnosis and treatment is not propor-

**Table 1.** Achievements in Reducing Diagnostic Time Via Medical AI Across Clinical Specialties

| Classification    | Lead author                   | Year | Disease                                | Outcome                                                                                                       | Sample | Reduction in diagnosis time | Reduction in diagnosis time                                                                                                                                             |
|-------------------|-------------------------------|------|----------------------------------------|---------------------------------------------------------------------------------------------------------------|--------|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Radiology         | Hunter, et al. <sup>52</sup>  | 2025 | Pneumothorax                           | AI-integrated system for automatic detection and reporting of pneumothorax through chest X-ray interpretation | 27397  | 46%                         | AI-assisted chest X-ray interpretation shortened radiologist reporting time (Avg. 186 minutes → 100 minutes, $p<0.001$ )                                                |
|                   | Buchlak, et al. <sup>53</sup> | 2024 | Intracranial disease                   | Detection of abnormal lesions on non-contrast augmented brain CT                                              | 2848   | 11.23%                      | AI assistance reduced CT interpretation time (Avg. 236 seconds → 209.5 seconds, $p<0.001$ )                                                                             |
|                   | Yacoub, et al. <sup>54</sup>  | 2022 | Lung disease                           | Automatic detection and segmentation of lung and heart lesions on chest CT                                    | 390    | 22.10%                      | Automated AI platform integrated into the clinical workflow for chest CT interpretation shortened the average reading time (Avg. 421 seconds → 328 seconds, $p<0.001$ ) |
|                   | Ahn, et al. <sup>55</sup>     | 2022 | Lung disease                           | Improved AI-based reading performance in chest radiographs                                                    | 497    | 10.00%                      | AI assistance reduced chest X-ray reporting time (Avg. 40.8 seconds → 36.9 seconds, $p<0.001$ )                                                                         |
| Gastroenterology  | Oh, et al. <sup>56</sup>      | 2024 | Small bowel lesion                     | Removal of poorly visualized images before capsule endoscopy interpretation                                   | 90     | 35.60%                      | AI shortened interpretation time by filtering out images with poor mucosal visibility (Avg. 120.9 minutes → 77.9 minutes, $p<0.001$ )                                   |
| Pathology         | Eloy, et al. <sup>57</sup>    | 2023 | Prostate cancer                        | Prostate cancer detection, classification, and quantification                                                 | 105    | 21.94%                      | AI assistance reduced slide reading time for prostate cancer lesions (Avg. 139.0 seconds → 108.5 seconds)                                                               |
| Internal medicine | Karz, et al. <sup>58</sup>    | 2021 | Abnormalities in blood cell components | Identify platelets, white blood cells, and red blood cells from peripheral blood smears                       | 645    | 61.00%                      | AI assistance reduced peripheral blood smear analysis time (Avg. 20 minutes → 7 minutes 46 seconds)                                                                     |
| Neurosurgery      | Lu, et al. <sup>59</sup>      | 2021 | Brain tumor                            | Detection and segmentation of lesions in brain tumor SRS in 10 patients                                       | 10     | 30.08%                      | AI assistance reduced physicians' manual time required for brain tumor contour generation (Avg. 11.2 minutes → 7.3 minutes)                                             |

AI, artificial intelligence; CT, computed tomography; SRS, single-fraction stereotactic radiosurgery. This table refers to the table from Jeong, et al.,<sup>18</sup> but the authors reconstructed it by directly reviewing the original texts of each primary study and incorporating additional literature. This table shows how AI reduces diagnostic time across medical fields—both in percentages and in minute- and second-level measures—demonstrating its quantitative impact on improving clinicians' productivity and efficiency.

Table 2. Effectiveness of Medical AI in Workload Reduction by Clinical Specialty

| Classification | Lead author                          | Year | Disease            | Outcome                                                                  | Sample | Reduced workload | Workload reduction                                                                                                                                                                                 |
|----------------|--------------------------------------|------|--------------------|--------------------------------------------------------------------------|--------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Radiology      | Elhakim, et al. <sup>32</sup>        | 2024 | Breast cancer      | Evaluation of AI-integrated double reading mammography screening         | 249402 | 48.7%-49.7%      | The ratio of the reduction in the number of images a physician needs to interpret due to AI automatically classifying low-risk images in mammography                                               |
|                | Shoshan, et al. <sup>28</sup>        | 2022 | Breast cancer      | Diagnosis of breast cancer in DBT                                        | 5182   | 39.60%           | The ratio of the reduction in the interpretation workload achieved by AI classifying high-risk cases in screening examinations                                                                     |
|                | Lancaster, et al. <sup>60</sup>      | 2022 | Breast cancer      | Detection of pulmonary nodules                                           | 283    | 77.40%-86.70%    | The ratio of the reduction in the total volume of scans a physician must interpret, achieved by AI classifying voice/speech and/or imaging data                                                    |
|                | Raya-Povedano, et al. <sup>61</sup>  | 2021 | Breast cancer      | DBT-based breast cancer screening                                        | 15987  | 72.50%           | Reduction in the interpretation workload achieved by AI automatically classifying low-risk images from DB/DBT scans and thereby decreasing the number of screening exams subject to interpretation |
| Pathology      | Rodriguez-Ruiz, et al. <sup>23</sup> | 2019 | Breast cancer      | Breast cancer screening on DBT                                           | 2654   | 17.00%           | The ratio of the reduction in the number of cases requiring physician judgment, achieved by AI automatically classifying normal cases                                                              |
|                | Seker, et al. <sup>30</sup>          | 2024 | Breast cancer      | Early detection and interval cancer detection in breast cancer screening | 5136   | 69.50%           | The ratio of the reduction in the interpretation workload achieved by AI automatically marking high-risk areas within pathology slides                                                             |
|                | Vermorgen, et al. <sup>62</sup>      | 2024 | Endometrial cancer | Classification of normal, abnormal, and malignant endometrial tissue     | 91     | 51.03%-72.90%    | The ratio of the reduction in the number of cases (slides) a physician must interpret, achieved by AI pre-screening and selecting only slides suspected of malignancy                              |
|                | da Silva, et al. <sup>63</sup>       | 2021 | Prostate cancer    | Prostate cancer detection                                                | 600    | 65.50%           | Reduction in the ratio of slides a physician must interpret, achieved by AI automatically classifying voice/speech and/or imaging slides                                                           |
| Neurology      | Peltola, et al. <sup>34</sup>        | 2023 | Epilepsy           | Detection of epochs and classification of seizure types                  | 40     | 86.00%           | The ratio of the reduction in a physician's manual review time achieved by AI segmenting time intervals of electroencephalogram recordings                                                         |

AI, artificial intelligence; DBT, digital mammography. This table refers to the table from Jeong, et al.,<sup>18</sup> but the authors reconstructed it by directly reviewing the original texts of each primary study and incorporating additional literature. This table maps the effectiveness of medical AI in reducing physicians' workload across clinical domains, offering quantifiable evidence of its contribution to easing clinician burden.

tional to the level of technological advancement. AI has consistently demonstrated accuracy in relatively simple images, and image interpretation algorithms have shown remarkable results in both accuracy and efficiency.<sup>43</sup> However, physicians remain superior in complex or exceptional cases, and AI should function as an auxiliary tool, not as a substitute for the decisions of the attending clinician.<sup>44</sup> Patient surveys also show a strong preference for AI as a support tool for medical decision-making, rather than as an independent system.<sup>45</sup> Therefore, a “human-in-the-loop” approach that ensures human control and autonomy is essential. AI should be viewed not as an independent final decision-making tool, but as a tool that augments and complements the capabilities of healthcare professionals. Healthcare professionals should critically review AI recommendations and comprehensively consider the patient’s individual characteristics, values, and complex clinical circumstances to make a final decision. This collaborative model compensates for the limitations of AI and fosters psychological reassurance and trust among both patients and healthcare professionals.

While medical AI is expected to have the potential to improve productivity, some critics argue that the initial costs and structural constraints inherent in its implementation could offset its impact, leading to a “productivity paradox.”<sup>46</sup> Even if AI automates a significant portion of tasks, physicians must still review the accuracy of judgment results and identify errors, incurring cognitive burden and time.<sup>47</sup> Furthermore, making final decisions based on AI guidance can increase ethical responsibilities and decision-making burden.<sup>48</sup> This increased workload, coupled with the stress of adapting to new technologies and procedures, can hinder physicians’ performance.<sup>49</sup> In addition, if AI systems are insufficiently sophisticated or fail to integrate seamlessly with existing workflows, such as EHRs and PACS, they may disrupt clinical flow and create inefficiencies. In particular, AI systems tend to be designed to focus on specific diseases, which may not adequately reflect the diversity of real-world clinical settings, particularly in primary care settings. Without careful design and appropriate workflow integration, stress and workload for primary care physicians can increase.<sup>50</sup> Additionally, physicians require parallel training not only on how to use the technology but also on the ethical principles and responsibilities associated with AI utilization. A structural limitation exists where a gap in AI utilization and acceptance is inevitable between large-scale institutions (such as tertiary hospitals) capable of managing such comprehensive operational frameworks and those that are not (e.g., primary care clinics). This disparity can lead to differences in adaptation and perception between physicians in primary care and tertiary hospitals. However, these critical viewpoints do not negate the utility or practical necessity of medical AI. Instead, they emphasize the need to establish a comprehensive complementary framework that enables medical AI to integrate stably into the healthcare field and lead to tangible pro-

ductivity gains.

## CONCLUSION AND PERSPECTIVES

As medical AI assists physicians in their diagnosis and takes over routine tasks, it is increasingly recognized as a practical tool for freeing physicians’ time to focus on more complex aspects of patient care. Maximizing the efficiency of patient care through medical AI is a new means of effectively responding to the increasing demand for care without increasing the number of physicians.<sup>18</sup> In other words, improving productivity using medical AI suggests that more patients can be safely cared for within the existing workforce. Therefore, rather than relying on physical workforce expansion, a new policy approach is required to increase productivity through capacity expansion using digital technologies and AI. The Organization for Economic Co-operation and Development also emphasized the need to actively support technology-based efficiency strategies in its 2023 report, noting that “new technologies such as AI are reducing the need for the workforce.”<sup>51</sup> Ultimately, achieving sustainable healthcare delivery requires not only expanding the number of healthcare personnel but also establishing an institutional foundation and infrastructure in which medical staff can reliably utilize medical AI technologies that have been proven effective in the field. In the future, medical policies should aim to transition into a sustainable healthcare system by reflecting both the pace of technological revolution and the realities of the clinical environment.

## AUTHOR CONTRIBUTIONS

**Conceptualization:** Ji-Yeun Lim and Kye-hyun Kim. **Investigation:** Ji-Yeun Lim. **Methodology:** all authors. **Resources:** Ji-Yeun Lim. **Supervision:** Seog-Kyun Mun. **Validation:** all authors. **Visualization:** all authors. **Writing—original draft:** Ji-Yeun Lim. **Writing—review & editing:** all authors. **Approval of final manuscript:** all authors.

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