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REVIEW ARTICLE

Practical Implementation of Artificial Intelligence in Mental Healthcare: An Integrative Review of Approaches and Case Studies

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ABSTRACT

Artificial Intelligence in mental healthcare is a revolution in the delivery, evaluation and administration of mental health services. This review also maps current literature covering the practical application of AI in mental health practice, focusing on the descriptive use and specific integration and case analyses of those technologies in context. AI solutions are as follows: Solutions that assist with the diagnosis of psychiatric patients, as well as solutions enabled by artificial Intelligence that foretell situations of severe mental health emergencies of individual citizens. Some good examples, Like the REACH VET program, show how AI, using EHRs, can identify suicidal veterans' risk and prevent potential suicides. Nevertheless, numerous challenges exist when using AI in mental health, such as workers' resistance, ethical questions about patient data, and clinician engagement. Concerning implementation methodology, this review has incorporated ideas from implementation science, showing the need to employ a guided approach when implementing AI technologies in clinical practice. Based on the study results, there is potential for increasing patient outcomes through artificial Intelligence and group-specific treatment options, better tools for diagnosing diseases and practical cooperation, but constant work of technologists, clinicians, and policymakers will be needed to eliminate existing issues and ensure equal access to innovations in the sphere of mental health.

Keywords: Artificial Intelligence ▪ Healthcare ▪ Diagnostics ▪ Personalized Medicine ▪ Interdisciplinary Collaboration

1. INTRODUCTION

AI technologies are constantly evolving, and they have successfully entered many spheres of human life. Their increasing use has encouraged further consideration of how these technologies may be applied in mental healthcare. Mental health disorders represent a significant and growing burden on healthcare systems worldwide. In this context, AI offers unique approaches to diagnosis, treatment, monitoring, and early intervention [1].

To begin with, the use of AI in mental healthcare serves several key objectives, particularly addressing the shortage of mental health professionals and improving the timeliness and accuracy of diagnosis. AI can support clinicians through machine learning algorithms, predictive analytics, and natural language processing, allowing healthcare providers to process large volumes of clinical and behavioral data more efficiently [2].

This review paper focuses on the practical applications of AI in mental health. It examines various real-life deployments of AI technologies, including their role in supporting differential diagnosis of psychiatric conditions, predicting the likely

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development of severe mental illnesses, and assisting clinical decision-making through validated tools. This practical emphasis highlights the relevance of AI beyond theoretical discussion and demonstrates its potential value in real-world mental healthcare settings.

The effectiveness of AI in mental health support is not merely theoretical. Successful examples include the REACH VET program, which uses electronic health records to identify veterans at elevated risk of suicide. This program demonstrates how AI-driven systems can contribute to suicide prevention and crisis intervention, thereby showing the life-saving potential of AI in mental healthcare [3].

The review also emphasizes the positive effects of AI applications in mental health services. These benefits include improved diagnostic outcomes, personalized management plans, and better coordination among healthcare providers. Such advancements suggest that AI tools may transform current practices in the mental healthcare sector by improving precision, accessibility, and continuity of care [4].

However, the integration of AI into mental healthcare faces several challenges. These include barriers to adoption among healthcare workers, ethical concerns related to the extraction and use of patient data, and difficulties in engaging clinicians. Such barriers indicate that successful implementation requires a multi-sectoral approach involving clinical, technical, ethical, and policy-related expertise.

This paper uses the lens of implementation science to present a guided framework for how healthcare organizations can begin leveraging AI technologies. As with many digital health technologies, ethical issues related to patient information privacy and security must remain a central concern. Addressing these concerns is necessary to build trust, ensure transparency among stakeholders, and promote responsible AI implementation [5].

The adaptive integration of AI in mental healthcare is most effective when technologists, clinicians, and policymakers work together. Therefore, this review calls for unified stakeholder action to address existing barriers and promote the fair and ethical use of artificial intelligence in mental health services.

With systematic commitment to innovation and collaboration, AI can significantly improve mental health outcomes. Future innovations may contribute to the development of tailored interventions for specific patient groups, improved diagnostic technologies, and scalable solutions for global mental health challenges [6]. This review provides a current synthesis of the literature from a practical perspective. It is valuable for evaluating AI applications in mental healthcare and aims to help researchers, practitioners, and policymakers better understand AI's potential while identifying optimal strategies for addressing urgent mental health needs.

2. RELATED WORK

This paper discusses how artificial intelligence is being implemented into healthcare systems and examines its impact on medical research, diagnosis, patient treatment, and the development of solutions to existing healthcare problems. The review focuses on several AI-based solutions, including analytical models, pharmacogenomics, diagnostics, and other technologies intended to improve healthcare systems and patient experience. The studies reviewed suggest that AI can enhance outcomes in sensitive fields such as mental health, cancer research, and chronic disease management. Furthermore, this review discusses the limitations of AI, including ethical concerns, data heterogeneity, and the need for interdisciplinary collaboration. By reflecting on these advancements and challenges, the review highlights a future in which healthcare innovation may be strengthened through properly incorporated AI applications.

As outlined in [7], integrating design science theory and methods with AI components can significantly enhance health communication by addressing critical weaknesses in traditional approaches. This integration, especially through user-centered and participatory design, ensures that eHealth and AI communication systems are personalized, timely, and interactive, leading to improved health outcomes. The Chronology MD project demonstrates the effectiveness of participatory design in developing AI components tailored to Crohn's disease management, benefiting both system architecture and patient engagement. This example shows that combining iterative design science methods with traditional health communication frameworks can create more effective and impactful solutions.

As outlined in [8], psychological therapy can be conceptualized as a process-based clinical intervention that moves beyond syndrome-focused protocols toward idiographic approaches. Such approaches adapt treatment based on patient complexity and individual differences. This perspective integrates empirical findings on psychological change processes to tailor evidence-based psychotherapy to individual needs. In addition, developments such as precision mental health and decision-support systems demonstrate the potential of personalized, data-informed strategies to improve treatment outcomes and operationalize psychological change processes more effectively.

As outlined in [9], complexity in health services research is frequently discussed but still insufficiently studied. This creates a need to shift from traditional closed-system approaches to methodologies suitable for open systems characterized by dynamic interrelationships and emergent causality. Conventional research designs that focus mainly on predictability and linearity should be expanded through approaches that embrace uncertainty, adaptability, and rich theorizing. The authors propose a complexity-informed health services research framework that emphasizes methodologically pluralistic and flexible designs. This perspective is supported by empirical studies showing the importance of adaptive strategies, pragmatic learning, and theoretical grounding.

In the research described in [10], major depressive disorder was examined by integrating AI and bioinformatics to analyze transcriptomic profiles of 170 MDD participants and 121 non-MDD subjects. Using gene set enrichment analysis, the study found that differentially expressed genes in MDD were mainly linked to immune response, inflammation, neurodegeneration, and cerebellar atrophy pathways. Through machine learning algorithms, the authors developed predictive models with more than 75% accuracy and identified ten biomarkers associated with MDD. Among these biomarkers, NRG1 appeared to be the most accurate in distinguishing MDD patients from controls. Validation using saliva sam-

ples and functional mapping further supported the role of NRG1 in depression and its expression in subcortical limbic brain regions. This integrative approach suggests the possibility of early and non-invasive MDD diagnosis using AI and bioinformatics.

In the analysis conducted in [11], Hofstede's cultural dimensions were used to examine how trust, transparency, and openness influence Nordic national AI policy documents. The study highlights how cultural values are incorporated into policies to ensure digital trust by reinforcing norms such as information security, algorithmic transparency, and the creation of data trusts. Differences among Nordic countries are also analyzed, showing how cultural principles shape AI development while addressing privacy, ethics, and autonomy. Democracy emerges as a central theme, with the study emphasizing citizen involvement and AI education to prevent alienation and enhance accessibility in AI-driven services.

In [12], Shanghai University School of Medicine is presented as a model for integrating national health policies and international medical trends into curriculum development. By emphasizing intelligent medicine and interdisciplinary medical engineering subjects, the school prioritizes horizontal and vertical integration of medical courses together with cross-disciplinary approaches. The transformation of medical science and technological innovation, supported by artificial intelligence and a three-dimensional curriculum integration system, is presented as a critical initiative. This framework provides useful insights for medical schools seeking to modernize teaching and curriculum systems.

In [13], the authors propose that an important objective of brain and cognitive sciences should be to develop neurally mechanistic models capable of explaining broad domains of human intelligence, including vision, language, and motor control. Although existing models can replicate experimental results in specific tasks or brain regions, the study advocates for integrating data across laboratories into comprehensive benchmarking platforms. Brain-Score is used as a case study to demonstrate the potential and challenges of this integrative methodology.

As outlined in [14], three decades of research in artificial intelligence in medicine have emphasized the need for AI in medicine to integrate with broader fields such as medical informatics and health economics. Despite methodological advances, the dissemination of AI systems remains limited. This highlights the importance of integrated environments that combine decision-support systems with patient data and resource management applications. The rise of communication networks also requires modeling organizational dynamics within healthcare settings. Workflow management systems are presented as a promising direction because they focus on behavioral aspects of clinical processes and support workflow-based hospital information systems.

In [15], the future of nursing is explored through the lens of ChatGPT, an advanced AI language processing model developed by OpenAI. Edited transcripts with ChatGPT highlight emerging trends in nursing, including the adoption of technology, digital tools, AI integration, and robotics in patient care. The analysis emphasizes the implications of these advancements for nurses, patients, and healthcare systems while reinforcing the importance of maintaining high-quality patient care during technological transformation.

In the research presented in [16], healthcare case studies demonstrate the role of chatbots in improving patient monitoring and medical services. The transition toward personalized health management emphasizes public awareness in self-monitoring, self-appraisal, and self-management. Patient-generated health data, supported by wearable devices and Internet-of-Things technologies, enables monitoring of conditions such as sleep apnea and heart rhythm disorders. Cognitive approaches are needed to mine, interlink, and interpret these data. Chatbot technologies can engage users, collect verbal health information, provide feedback, and support intervention and management strategies.

The article by [17] explores the interdisciplinary integration of medicine and artificial intelligence, focusing on intelligent diagnosis and treatment. It emphasizes that the standardization of Chinese medicine diagnosis remains a major challenge in modernization and globalization. The application of AI technologies to Chinese medicine is described as an urgent need in the AI era. Using pneumonia with dyspnea and cough as an example, the article reviews intelligent medical technologies, their applications, current technical challenges, and recent advancements in AI-driven Chinese medicine diagnosis and treatment.

In [18], the rise of big data and artificial intelligence in healthcare is critically examined, with particular attention to philosophical challenges. The authors identify three main challenges: the epistemological-ontological issue related to theory-ladenness in big data and measurement, the epistemological-logical problem associated with algorithmic reliability and interpretability, and the phenomenological challenge of reducing human experience to quantitative data. These challenges demonstrate the need for careful evaluation of AI and big data technologies in medicine.

As outlined in [19], the development of robotics and AI in healthcare requires human-centered approaches that address healthcare practice requirements as well as social and ethical considerations. The study emphasizes the often-overlooked role of engineers' imaginaries in shaping healthcare technology design. Drawing on Science and Technology Studies, the authors analyze interdisciplinary collaboration among ethicists, social scientists, and engineers in a robotics and AI healthcare project. The findings highlight themes such as assistance, reframing healthcare practices, division of labor between humans and machines, and the implications of acceptance in user-centered design.

In [20], the limitations of the traditional pathogenic approach to chronic disease are examined. The authors propose a salutogenic model that emphasizes healing processes as a whole system. Chronic diseases are complex and multifactorial, often resisting simple causal inference and intervention. The Integrated Model for the Evaluation of Healing is introduced to assess healing through multilevel observational data, including sociocultural, psychological, behavioral, clinical, and biological variables. This model provides a blueprint for studying healing capacity across conventional, complementary, and traditional primary care systems.

The study referenced in [21] explores the perception of robots as companions or artificial partners through robotic psychol-

ogy and robotherapy. Person-robot communication is viewed as a complex interactive system based on interactivity, equifinality, and multimodality. Robots are categorized as assisting robots and interactive stimulation robots, with applications in social, educational, therapeutic, and entertainment contexts. The Person-Robot Complex Interactive Scale is introduced to assess these interactions. Initial findings using a robotic cat suggest therapeutic and social potential across diverse groups, including children, adults, and elderly individuals with dementia.

As detailed in [22], the increasing use of machine learning in critical societal domains has raised ethical concerns, especially regarding bias and discrimination. The study introduces a participatory, data-centric approach to AI ethics by design. This approach is rooted in value-sensitive design and emphasizes ethical and epistemic considerations during the early stages of machine learning development. Collaboration between system developers and domain experts is presented as essential for developing ethically informed AI systems.

As outlined in [23], AI and machine learning are positioned to transform cancer research, diagnosis, and care by using large volumes of biomedical data. Machine learning has advanced digital pathology, diagnostics, multi-omics analysis, drug discovery, and wearable device data analysis. Nevertheless, major challenges remain, including bias in training datasets, data heterogeneity, and the need for external validation cohorts. Addressing these challenges is essential for realizing the potential of AI in precision oncology.

The publication by [24] explores the specifications of a Virtual Medical Doctor System platform for medical information sharing in research and local healthcare applications. The platform uses a multi-layered architecture interconnected through information flows. Its foundational layer supports extensions such as social networks for collaborative scientific research and risk analysis tools. This integrated approach demonstrates the potential of such platforms to improve doctor-patient relationships and support medical research.

As outlined in [25], the integration of AI and machine learning into pharmaceutical research and development has advanced precision medicine by using multidimensional biological and clinical data. Patient-centered forward and reverse translation supports the discovery and optimization of pharmacotherapy. Advanced analytics enable the use of genomics, proteomics, microbiomics, and other omics data. The article emphasizes opportunities for machine learning in translational medicine, pharmacometrics, and model-informed drug discovery.

The article by [26] explores the potential of social media and AI as tools for discovering and expressing personal purpose. AI analysis was applied to the author's social media data from LinkedIn, Facebook, Instagram, and WhatsApp. This experiment led to the development of Purpose GPT, an AI bot designed to help users explore dimensions of purpose, including personal growth, professional development, thought leadership, and legacy building.

Table 1 presents a comparative summary of the reviewed studies, highlighting the diversity of artificial intelligence applications across healthcare and related domains. The table organizes the literature according to the study reference, research focus, key contributions, practical applications, and major limitations or challenges. Overall, the reviewed studies show that AI has been applied in several important areas, including mental health diagnosis, clinical decision support, health communication, medical education, cancer research, pharmaceutical development, healthcare robotics, chatbot-based monitoring, and ethical AI design. These studies demonstrate that AI can improve diagnostic accuracy, support personalized treatment, enhance patient engagement, and strengthen healthcare management through data-driven and adaptive approaches. At the same time, the table emphasizes that AI implementation is still constrained by several challenges, such as data heterogeneity, algorithmic bias, limited external validation, privacy concerns, lack of explainability, cultural differences, and difficulties in integrating AI systems into routine clinical workflows. Therefore, the findings summarized in the table suggest that the successful adoption of AI in healthcare requires not only technical advancement but also ethical governance, interdisciplinary collaboration, clinician involvement, and patient-centered system design.

AI has become a new horizon for innovation, especially in the medical industry, where it supports diagnosis, treatment planning, and healthcare management. The practical uses examined in this review include AI in mental health emergencies, precision medicine for oncology, and diagnostic applications in both conventional and holistic systems of medicine. AI can help optimize healthcare systems by improving accuracy, speed, and personalization. These achievements demonstrate its potential to address traditional problems, including shortages in healthcare resources and increasingly complex patient needs.

However, several challenges must be addressed before AI can be optimized in healthcare. Ethical barriers, especially those related to data privacy, fairness, and explainability, remain major obstacles to broad adoption. In addition, the diversity of medical data and resistance among healthcare executives and professionals may complicate implementation. Resolving these problems requires cooperation among technologists, clinicians, policymakers, and ethicists to develop ethical, practical, and clinically suitable AI solutions.

The review also shows that AI integration in healthcare should be based on people-centered technology. Participatory design allows stakeholder groups to create systems that are technically effective while also reflecting patient values and beliefs. Examples include participatory design in health communication and culturally informed AI policy development. Such approaches can improve public trust, engagement, and acceptance of AI systems in healthcare.

Finally, the future possibilities for applying AI in healthcare are extensive. These include early diagnosis, individualized medicine, and broader availability of medical services. Achieving these goals will require continuous innovation, validation of AI systems, and attention to social and ethical issues. By encouraging interdisciplinary cooperation, the healthcare industry can promote a positive transformation in which technology and human intelligence work together. The future role of AI in healthcare will depend on the extent to which AI systems support, rather than replace, human expertise in solving challenges faced by patients and clinicians.

Recent global statistics provide strong quantitative support

Table 1. Comparative Summary of AI Applications in Healthcare Literature

Study Reference	AI Model/Research Focus	Key Contributions	Applications	Limitations/Challenges
[7]	Design science and AI in health communication	Demonstrated how user-centered and participatory design can improve AI-supported health communication systems, particularly through the Chronology MD case example.	Personalized eHealth communication, patient engagement, and Crohn's disease management support.	Requires careful participatory design, user engagement, and alignment between system architecture and patient needs.
[8]	Precision mental health and decision-support systems	Highlighted a shift from syndrome-focused care toward individualized, data-informed clinical decision-making and adaptive treatment pathways.	Personalized psychological therapy, clinical decision support, and process-based mental health interventions.	Challenges include operationalizing individualized treatment processes and integrating decision-support tools into routine clinical practice.
[9]	Complexity-informed health services research	Proposed flexible and methodologically pluralistic approaches for studying complex healthcare systems with dynamic and emergent behavior.	Adaptive healthcare research, implementation science, and evaluation of open-system healthcare interventions.	Traditional linear research designs may be insufficient for uncertainty, complexity, and emergent causality in healthcare systems.
[10]	AI and bioinformatics for major depressive disorder	Identified transcriptomic biomarkers associated with MDD, including NRG1, and developed machine learning models with predictive value.	Early and non-invasive diagnosis of depression, biomarker discovery, and psychiatric risk prediction.	Requires external validation, larger datasets, and careful interpretation of biological and clinical heterogeneity.
[11]	Cultural values in Nordic AI policy	Explained how trust, transparency, openness, and democratic participation shape national AI policy strategies.	AI governance, digital trust, public policy, and ethical AI implementation.	Cultural differences, privacy concerns, and citizen inclusion must be addressed to ensure legitimate AI adoption.
[12]	AI-integrated medical curriculum development	Presented an interdisciplinary medical-engineering curriculum model emphasizing intelligent medicine and integrated medical education.	Medical education modernization, intelligent medicine training, and interdisciplinary curriculum design.	Implementation requires institutional restructuring, interdisciplinary coordination, and continuous curriculum evaluation.
[13]	Benchmarking models of human intelligence	Advocated integrative benchmarking platforms such as Brain-Score to advance neurally mechanistic models of cognition.	Computational neuroscience, cognitive modeling, and AI benchmarking.	Combining neural, behavioral, and anatomical datasets across laboratories remains technically and methodologically challenging.
[14]	Artificial intelligence in medicine and learning healthcare organizations	Emphasized the integration of AI with medical informatics, health economics, workflow systems, and organizational theory.	Clinical decision support, workflow management, hospital information systems, and learning healthcare organizations.	Limited dissemination of AI systems and organizational complexity restrict practical implementation.
[15]	ChatGPT and the future of nursing	Explored how generative AI, digital tools, and robotics may influence nursing roles and healthcare delivery.	Nursing education, patient care support, digital health communication, and healthcare workforce adaptation.	Maintaining high-quality patient care, professional accountability, and ethical use of AI remains essential.
[16]	Healthcare chatbots, IoT, and background knowledge	Showed how chatbots combined with IoT and cognitive computing can support patient monitoring and personalized health management.	Patient-generated health data, self-monitoring, sleep apnea monitoring, heart rhythm monitoring, and chatbot-based health interaction.	Challenges include data integration, interpretation of IoT signals, patient engagement, and reliability of chatbot feedback.
[17]	AI-assisted Chinese medicine diagnosis	Reviewed intelligent diagnosis and treatment methods in Chinese medicine, using pneumonia with dyspnea and cough as an example.	Chinese medicine modernization, intelligent diagnosis, and clinical decision support.	Standardizing Chinese medicine diagnosis remains a major technical and clinical challenge.
[18]	Big data and AI in medicine	Identified epistemological, logical, and phenomenological challenges related to AI and big data in clinical care.	Clinical data analysis, AI-supported medicine, and philosophical evaluation of digital health technologies.	Concerns include interpretability, reliability, measurement assumptions, and reduction of human experience to quantitative data.
[19]	Human-centered AI and healthcare robotics	Analyzed how engineers' imaginaries shape the design, use, and acceptance of robotic and AI systems in geriatric healthcare.	Healthcare robotics, geriatric care, human-computer interaction, and interdisciplinary technology design.	Social, ethical, and practical assumptions in engineering design may affect user engagement and technology acceptance.
[20]	Integrated healing evaluation model	Proposed a whole-systems approach for evaluating healing in complex chronic disease contexts, particularly cancer care.	Chronic disease management, cancer care, integrative medicine, and multi-level health evaluation.	Requires complex data collection across sociocultural, psychological, behavioral, clinical, and biological levels.
[21]	Robotic psychology and robotherapy	Introduced robotic psychology and the Person-Robot Complex Interactive Scale to assess human-robot interaction.	Therapeutic robots, elderly care, dementia support, social robotics, and educational or entertainment applications.	Cross-cultural differences, psychological acceptance, and evaluation of long-term therapeutic effects remain challenges.
[22]	Participatory AI ethics by design	Presented a value-sensitive, data-centric approach that involves domain experts during early machine learning development.	Ethical AI design, bias mitigation, responsible machine learning, and participatory system development.	Requires early collaboration, shared domain understanding, and systematic attention to ethical and epistemic risks.
[23]	AI and machine learning in cancer research	Discussed how AI can support digital pathology, diagnostics, multi-omics analysis, drug discovery, and precision oncology.	Cancer diagnosis, oncology research, drug discovery, wearable data analysis, and personalized cancer treatment.	Bias in training datasets, data heterogeneity, and lack of external validation remain major barriers.
[24]	Virtual Medical Doctor System	Presented a cognitive-computing-based medical information platform with a multi-layered architecture for healthcare and research.	Emergency healthcare support, medical information sharing, risk analysis, and doctor-patient communication.	Practical deployment requires robust architecture, reliable information flows, and integration with healthcare workflows.
[25]	Machine learning in translational medicine	Explained how ML can support patient-centered forward and reverse translation in drug discovery and precision medicine.	Pharmacotherapy optimization, pharmacometrics, omics-based analysis, and model-informed drug development.	Requires cross-functional collaboration, high-quality multidimensional data, and careful clinical validation.
[26]	AI and social media for purpose discovery	Explored how AI analysis of social media data can support personal purpose discovery and led to the development of Purpose GPT.	Personal development, professional reflection, thought leadership, and AI-supported self-exploration.	Raises concerns about privacy, interpretation of personal data, and responsible use of social media-derived insights.

for the importance of applying artificial intelligence in mental healthcare and healthcare systems. According to the World Health Organization, approximately 970 million peo-ple worldwide were living with a mental disorder in 2019, with anxiety and depressive disorders being among the most common conditions. This figure reflects the substantial global burden of mental illness and demonstrates why healthcare systems require scalable, data-driven, and accessible support tools. The urgency became even clearer during the COVID-19 pandemic, when the global prevalence of anxiety and depression increased by 25% in the first year of the pandemic, placing additional pressure on already under-resourced mental health services. More recent WHO data further show that mental health systems remain significantly constrained: median government spending on mental health represents only 2% of total health budgets, while the global median number of mental health workers is only 13 per 100,000 people. These indicators reveal a considerable mismatch between the demand for mental healthcare and the available human and financial resources. In this context, artificial intelligence may provide practical support by assisting in early screening, risk prediction, clinical decision support, patient monitoring, and personalized intervention planning. At the same time, adoption statistics from healthcare organizations indicate that AI is moving from experimentation to implementation. McKinsey reported that 50% of surveyed US healthcare organizations had implemented generative AI, and more than 80% had deployed initial use cases to end users. Similarly, the American Medical Association reported that more than 80% of physicians use AI professionally, while physicians also emphasized the importance of privacy, safety validation, and shared decision-making in AI adoption. Therefore, these statistics suggest that AI is increasingly relevant to healthcare transformation, not only because mental health needs are rising, but also because healthcare systems are actively searching for technologies that can improve efficiency, access, and quality of care while maintaining ethical and clinical safeguards.

Figure 1 illustrates the global burden of mental health conditions and provides quantitative evidence for the urgent need to strengthen mental healthcare systems. The figure shows that more than one billion people worldwide are living with a mental health condition, indicating that mental illness is a large-scale public health concern rather than an isolated clinical issue. It also highlights the severity of suicide as a global health problem, with 727,000 deaths reported in 2021. In addition to the human burden, the figure emphasizes the economic consequences of poor mental health, showing that depression and anxiety cost the global economy approximately US1 trillion annually in lost productivity. Furthermore, the loss of 12 billion working days each year due to depression and anxiety demonstrates that mental health disorders have direct effects on labor productivity, social stability, and economic development. Therefore, this figure supports the argument that innovative, scalable, and data-driven approaches, including artificial intelligence, are increasingly needed to improve early detection, risk prediction, patient monitoring, and timely intervention in mental healthcare.

Figure 2 presents the major resource gaps that continue to restrict the effectiveness of mental healthcare systems worldwide. The figure shows that the median share of total health budgets allocated to mental health is only 2%, reflecting a substantial mismatch between the global burden of mental disor-



Figure 1. Global mental health burden: key statistics.

ders and the financial resources dedicated to addressing them. It also reports that the global median number of mental health workers is only 13 per 100,000 population, which remains far below the recommended benchmark frequently cited in practice discussions. This shortage of specialized professionals limits access to timely diagnosis, treatment, follow-up, and crisis intervention, particularly in low- and middle-income countries. The figure further indicates that fewer than 10% of countries have fully transitioned to community-based mental healthcare models, while nearly half of inpatient mental health admissions occur involuntarily and more than 20% of inpatient stays last longer than one year. Collectively, these indicators reveal that mental healthcare systems face persistent structural, financial, and workforce-related constraints. In this context, artificial intelligence can serve as a supportive tool by assisting with screening, triage, workload reduction, remote monitoring, and decision support, although it must be implemented ethically and under clinical supervision.

Figure 3 summarizes key indicators of artificial intelligence adoption in healthcare and demonstrates that AI is becoming increasingly integrated into organizational and clinical practice. The figure shows that 50% of U.S. healthcare organizations have implemented generative AI, while more than 80% have already deployed initial generative AI use cases to end users. It also indicates that 82% of organizations expect a positive return on investment from generative AI within three years, suggesting that healthcare leaders increasingly view AI as a practical technology for improving efficiency, decision-making, and service delivery. At the physician level, the figure reports that 81% of physicians use AI professionally, reflecting growing acceptance of AI-supported tools in medical work. However, the figure also emphasizes that adoption is strongly linked to governance and trust, as 88% of physicians consider validation of safety and efficacy im-

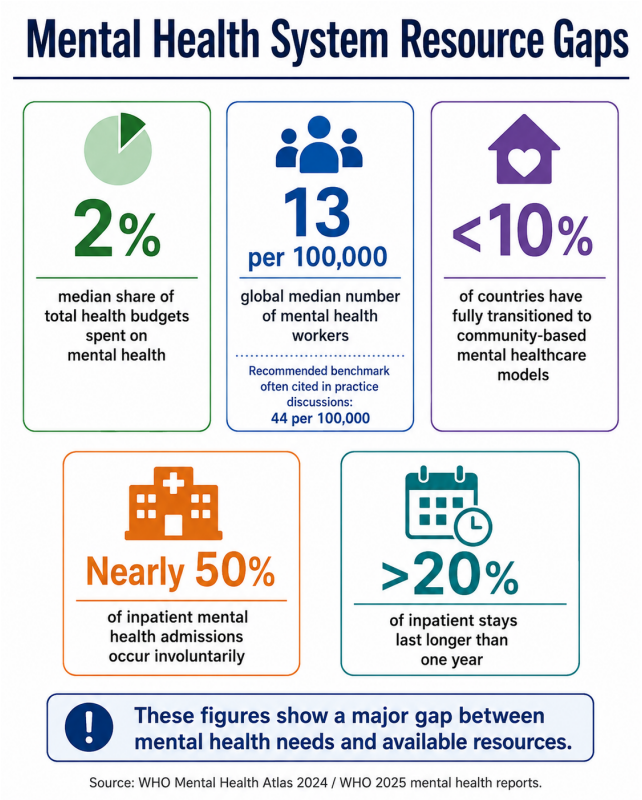


Figure 2. Mental health system resource gaps.

portant, 86% prioritize data privacy assurances, 85% want involvement in AI adoption decisions, and 92% want more education and training on AI. These findings show that AI adoption in healthcare is accelerating, but its successful implementation depends on clinical validation, privacy protection, professional involvement, and continuous education.

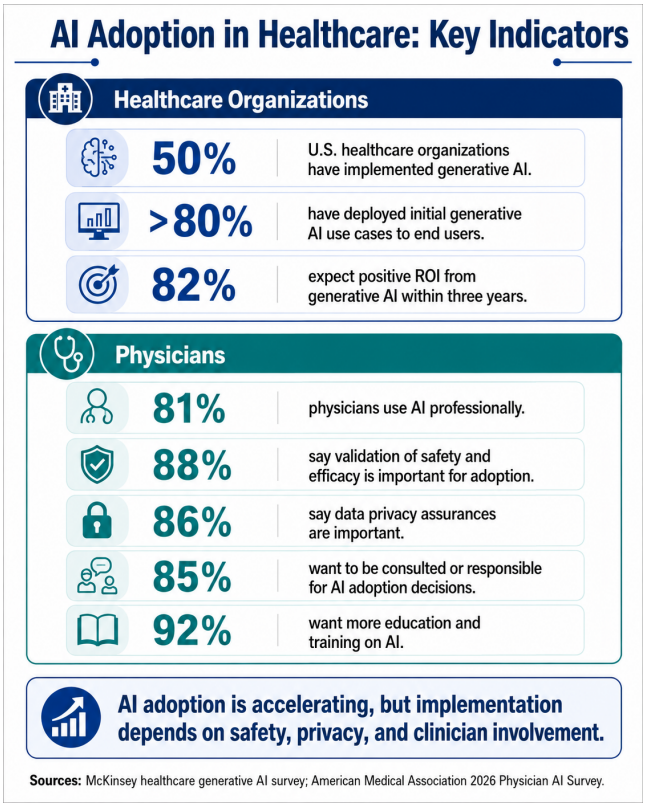


Figure 3. AI adoption in healthcare: key indicators.

3. CONCLUSION

AI has become a new horizon for innovation, especially in the medical industry, where it supports diagnosis, treatment planning, and healthcare management. The practical uses examined in this review include AI in mental health emergencies, precision medicine for oncology, and diagnostic applications in both conventional and holistic systems of medicine. AI can help optimize healthcare systems by improving accuracy, speed, and personalization. These achievements demonstrate its potential to address traditional problems, including shortages in healthcare resources and increasingly complex patient needs.

However, several challenges must be addressed before AI can be optimized in healthcare. Ethical barriers, especially those related to data privacy, fairness, and explainability, remain major obstacles to broad adoption. In addition, the diversity of medical data and resistance among healthcare executives and professionals may complicate implementation. Resolving these problems requires cooperation among technologists, clinicians, policymakers, and ethicists to develop ethical, practical, and clinically suitable AI solutions.

The review also shows that AI integration in healthcare should be based on people-centered technology. Participatory design allows stakeholder groups to create systems that are technically effective while also reflecting patient values and beliefs. Examples include participatory design in health communication and culturally informed AI policy development. Such approaches can improve public trust, engagement, and acceptance of AI systems in healthcare.

Finally, the future possibilities for applying AI in healthcare are extensive. These include early diagnosis, individualized medicine, and broader availability of medical services. Achieving these goals will require continuous innovation, validation of AI systems, and attention to social and ethical issues. By encouraging interdisciplinary cooperation, the healthcare industry can promote a positive transformation in which technology and human intelligence work together. The future role of AI in healthcare will depend on the extent to which AI systems support, rather than replace, human expertise in solving challenges faced by patients and clinicians.

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