LITERATURE REVIEW ON HEALTH AI: RISKS, BARRIERS, AND OPPORTUNITIES FOR SAFETY-NET HEALTH CARE SERVICES PROVIDERS

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INTRODUCTION

The growth of artificial intelligence (AI) in recent years has been explosive and increasingly inclusive methodologically. Much recent attention has been focused on large language models (LLMs). In our view, it is important to embrace recent LLM advances simultaneously with other methods and techniques that include various machine learning methods, natural language processing (NLP), and even robotics (Poalelungi et al., 2023). Because the range of methods and techniques is broad and interconnected, it is instructive to summarize the use cases for AI in health care rather than focus on the different computational methods. These include various analytics on health care data toward the goals of precision medicine, health outcomes prediction and risk management, and as decision support tools for interpreting test results and diagnosing disease (Davenport & Kalakota, 2019). While AI has great promise to innovate health care for those use cases, there are also potential perils that need to be addressed (Vo et al., 2023). This systematic review attempts to characterize those promises and perils as discussed in peer-viewed literature.

Over the past few years, health care has undergone a digital transformation with the rise of artificial intelligence (AI) owing to the increasing availability of health data and the rapid growth of analytical methods such as machine learning (ML) and deep learning (DL) that enhance the speed and accuracy of physicians' work (Al Kuwaiti et al., 2023).

This exponential growth of new digital health technologies has paved the way for AI applications to play a role in the medical sector, prompting expansion in areas such as translational medical research, clinical practice, and medical image diagnostics systems (Albahri et al., 2023). However, with the increasing rise of AI within the medical sector, concerns have been raised among practitioners and policymakers about the ethical, practical and legal concerns of its implementation that could undermine patient-provider relationships and cause concern/anxiety for both parties (Da Silva et al., 2022).

One of these concerns comes from the impacts it can have on underserved populations, especially those in rural communities, who need timely access to specialist physicians that can address complex inequities (Walsh et al., 2021). However, providers may be too busy or understaffed to address the health concerns of underserved communities, which can make implementing AI to reduce these inequities a challenge. To address these concerns comprehensively, it is essential to review the existing literature, which provides a broad spectrum of perspectives on the integration of AI in health care, specifically the advancements and challenges associated with AI implementation to better understand what solutions would be best to meet these challenges.

This literature review examines the advancements and challenges associated with AI implementation in rural health care. It focuses on promises such as enhanced decision making,

improved patient outcomes, overcoming language barriers, and reducing biases, alongside perils including the potential perpetuation of inequities, biases in AI algorithms, lack of regulatory frameworks, and issues with data limitations and representation. To systematically explore these aspects, this review adopts the PRISMA farmwork to ensure a comprehensive and transparent methodology, detailing the selection, assessment, and synthesis of relevant studies on AI implementation in health care, especially on underserved communities.

METHODOLOGY

Overview

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework has been significant in our efforts to systematically explore and evaluate AI's potential in the healthcare system. A team of 3 researchers performed this systematic review, including two analysts and a supervisor. Adhering to the PRISMA guidelines allowed us to synthesize the current landscape more comprehensively and transparently, assessing AI technologies' opportunities and challenges when being implemented within the healthcare sector.

This approach allowed us to evaluate and interpret existing primary studies that explore the promises and perils of Health AI. Alongside the PRISMA method, the two independent reviewers were also using an eligibility criterion to assist with the selection process of the articles, which is listed below for more clarification (Tables 1 & 2).

Literature Search Strategy

Following the PRISMA guidelines, we created an elaborate search strategy to identify the growing literature on the influence of promises and perils of AI in health care. A literature search was conducted in the following two databases: PubMed and Web of Science. The main concepts that we focused on during our research were: artificial intelligence, health care, equity and marginalized communities. The literature search was conducted through an automatic search in PubMed and Web of Science using the keywords presented in Table 1 and the inclusion/exclusion criteria presented in Table 2.

Table 1. Keywords and Synonyms

Artificial Intelligence	"ML OR AI" OR "Electronic health" OR "big data" OR "data mining" OR "decision support" OR "Data"
Health care	"Health" OR "treatment" OR "patient experience" OR "provider experience" OR "clinical outcome" OR "rural health" OR "health information technology" OR "health informatics"
Equity	"Ethics OR equity" OR "accessibility" OR "health equity" OR "health disparity" OR "Social Determinants of Health"
Marginalized Communities	"Safety-net OR marginalized communities" OR "rural communities" OR "rural" OR "underserved population"

Table 2. Eligibility Criteria

Inclusion	Exclusion
Mentions AI/DL/ML or some other component of Artificial Intelligence	Does not mention AI/DL/ML or other components of Artificial Intelligence
Highlights health care or a component of health	Did not focus on health care or a component of health
Relates to patient or provider perspective	Does not relate to patient or provider perspective
Written in English	Any papers that focused on clinical trials, meta-analyses or randomized controlled trials

Selection Process

Once the two reviewers gathered the selected articles, a two-step screening process was implemented:

1. Title Review: The titles of all retrieved articles were reviewed to determine their relevance to Health AI. Titles that did not align with the criteria above were removed.
2. Abstract Review: After the title screening, abstracts were then meticulously reviewed against the inclusion criteria, relating to some component of AI with health care or health being in the background of the articles and exploring patient/provider perspectives on the AI technologies utilized. Duplicate documents were removed at this step.

Results

To achieve a comprehensive review, we developed an extensive search strategy incorporating terms related to AI and ML with a specific focus on health/health care efforts and its impact on underserved communities. Our extensive search strategy led us to a combined 4,290 articles from both search engines. Our next step was further exploring the patients/providers experiences on the accessibility of AI/ML tools in health care, where the graduate research assistants used the search terms accessibility & equity alongside the existing search terms (ML or

AI) and (health or health care) and (underserved population or rural or safety-net or marginalized community) led us to a combined 1,097 articles.

To ensure that we kept our original focus, we excluded reviews, meta-analyses, clinical trials, and non-primary research materials that allowed us to have a combined effort of 275 research articles. Finally, we narrowed this down to literature reviews that focused on above concepts, which finally narrowed down the results of our combined efforts to 21 articles.

Our second search strategy focused on AI within health informatics and its implications for health equity, allowing us to redefine our search terms to ensure that we can find the appropriate information on how key components of health data contribute to the challenges and concerns of AI within health care. For the first search, terms like health information technology, health informatics while including artificial intelligence to narrow down the search results initially returned a combined 68,136 articles. The 2nd search was expanded to include more description terms such as electronic health records, big data, data mining, decision support, diagnosis, or treatment so that articles that included electronic health data and anything data related within the context of AI was included in the search.

By adding more specifics to the search engines, this strategy allowed us to have a yielded 46,575 results. Our next step was adding more specific terms that related to the content that the researchers were hoping to see, such as including health equity and health disparities to make sure that health outcomes were included in the articles. Finally, we decided to include the filter of just selecting articles that focused on literature review articles so that way the researchers can rely on those sources to help gather more information on the growing literature, which was crucial to narrowing the results to a manageable number of 71 articles to review. Across both search strategies, we identified 92 literature reviews detailing the promises and perils of AI in healthcare systems.

The initial abundance of literature was still imperative to be distilled through a methodical screening process, incorporating title and abstract reviews followed by full-text examinations in line with clearly defined inclusion and exclusion criteria. From the 92, we selected only those that were directly relevant to our research aims. In addition, we identified 25 more articles during the writing process—found through reference lists, recommendations, and related searches—that provided valuable context, empirical insights, or theoretical frameworks.

In total, 46 articles were cited in the final literature review. These represented the most relevant and rigorous sources across both structured and supplemental searches. From this body of work, we identified 13 key themes, which are explored in the following sections, along with a critical analysis of the recommended solutions to help address these perils.

PROMISES OF AI IN IMPROVING HEALTH EQUITY

Enhanced Decision Making and Medical Treatment

AI technologies revolutionized decision-making processes in rural health care settings by providing clinicians with advanced diagnostic and treatment support. Leveraging machine learning algorithms, AI systems can analyze vast amounts of patient data, assisting clinicians in making more accurate and timely decisions, and ultimately improving patient outcomes (Roy et al., 2022a) (Wang et al., 2021). This enhanced decision-making capacity holds promise for addressing challenges associated with limited access to specialized health care services in rural areas, thereby promoting equity in health care delivery. SML is being applied to various diseases, including cancer, neurology, and cardiology, to aid in diagnosis and treatment planning. Examples include IBM Watson for oncology, movement restoration in quadriplegia patients, and heart disease diagnosis from cardiac images (Roy et al., 2022b). SML holds promises for the future of health care, with advancements expected in precision medicine, diagnostic radiography, drug discovery, and health monitoring.

AI-powered diagnostic tools can detect early signs of diseases by identifying patterns and anomalies in medical images, potentially reducing treatment costs and improving outcomes (Elendu et al., 2023). DL has revolutionized specific fields within health care, such as radiology, by supporting diagnoses like pneumonia on chest radiography or brain development on brain MRI (Davis et al., 2023) This usage of AI algorithms increases the capacity to identify relevant information in medical imaging, leading to more targeted patient care pathways (Tripathi et al., 2023). Furthermore, AI-driven telemedicine and remote monitoring offer improved health care access to underserved or remote populations, addressing geographic disparities in health care delivery which has never be done before prior to the installation of AI within health care (Elendu et al., 2023)

Improvement of Clinical Disease Outcome

AI has assisted professionals in treatment plan recommendations, identifying drug interactions, and improving diagnostic accuracy. Generative AI has played a significant role in providing clinical diagnoses, where generative models can be taught on vast datasets of medical records and imagery to identify patterns in a patient's health data (Reddy, 2024). For example, generative models have been used for image reconstruction, disease registration and classification (Lan et al., 2020). Large language models (LLMs) have also showed some promise in synthesizing and providing solutions on existing diseases, such as GPT-4, which can generate a list of potential diagnoses based on symptoms described and provide suggestions on what tests run to check the health of the patient (Kanjee et al., 2023). Such advancements underscore the transformative potential of AI in health care. As AI continues to evolve, its application extends beyond the diagnosis and treatment to various aspects of clinical research and drug development.

AI has significantly impacted clinical drug trials by enhancing research into efficacy and adverse events, with tools like DeepSea employing DL techniques to forecast chromatin effects of sequence alterations (Al Kuwaiti et al., 2023). Moreover, AI can speed up drug discovery by analyzing vast datasets for existing drugs and predicting their efficacy (Iqbal et al., 2023). This rapid integration of AI not only accelerates the development of new therapies but also holds the potential to revolutionize personalized medicine, ensuring more effective and tailored treatment options for patients.

Use of AI to Examine SDOH

Social Determinants of Health (SDoH) refer to the non-medical factors that influence health outcomes. These factors include conditions in which people are born, grow, live and other factors that encompass elements across education, socioeconomic, employment and access to health care (Feller et al., 2020). Over the past couple of years, there has been interest in using AI/ML to detect and predict Social Determinants of Health (SDoH). One way that they can be utilized is through patient navigation programs. Patient navigation programs have proven effective when it comes to identifying barriers for patients who are navigating a complex bureaucracy, such as deciding the outcome of the patient by creating patient profiles that can effectively optimize the effectiveness of patient navigators by bolstering information from the data that ML gives to the user and thus provide tailored recommendation plans for patients to address SDoH (Iacobelli et al., 2023). This innovative approach enhances the efficacy of patient navigation programs and significantly improves patient outcomes by addressing individual social and health needs comprehensively.

Improved Patient Outcomes

AI integration into healthcare systems has led to improved outcomes across various medical specialties, where not only has it supported medical decision making processes through evaluating the patient's medical record but also providing the most suitable diagnostic treatment for the patient (Coppola et al., 2021). AI has opened the door to more in-depth understanding of a patient's health status, where AI-models can be trained to images that might be invisible to the naked eye and provide more effective diagnostic treatment that can improve the health of the patient. Applications in clinical oncology, dermatology, and mental health have shown the ability to enhance diagnostic accuracy, facilitate timely interventions, and improve health outcomes for rural patients (de Hond et al., 2022). By optimizing treatment plans and tailoring interventions to individual patient needs, rural health care providers can reduce disparities in health care access and outcomes.

Overcoming Language Barriers

Language barriers often hinder effective communication between health care providers and rural patients with limited English proficiency, which can increase disparities in the quality of care received and health outcomes for those patients. A qualitative study conducted by Barwise and colleagues, looking into medical personnel' perceptions of using AI to promote care for inpatients with language barriers, saw that participants recognized the potential of AI to improve patient prioritization, which can allow interpreters to prioritize their resources to other patients without being stretched thin (Barwise et al., 2024). They also recognize that AI can also help providers with overcoming the challenge of arranging convenient times with interpreters, which the struggle of locating an appropriate interpreter can deter appropriate communication channels between the provider and the patient and thus increase health. AI-based language translation tools offer a promising solution to overcome these barriers, enabling more effective communication and improving access to care for rural patients who may not have access to an in-person interpreter (Johnson et al., 2022). Real-time language translation services provided by AI technologies can facilitate better communication between health care providers and patients, ensuring that disparities in communication and care is reduced through the reduction of clinician bias.

Reduction of Biases

AI systems have the potential to reduce biases inherent in traditional decision-making processes, particularly those related to race, ethnicity, and socioeconomic status. By implementing fairness constraints and postprocessing techniques, AI algorithms can mitigate biases and ensure equitable treatment for all patients, regardless of demographic characteristics (Chin et al., 2023a). The review by Asa E. Radix and colleagues provides a comprehensive overview of how digital health technologies can significantly enhance health care access and outcomes for transgender and gender diverse (TGD) individuals (Radix et al., 2022). These technologies, encompassing health information technology (HIT)-enabled clinical decision support, telehealth, telemedicine, and mobile health (mHealth), offer innovative ways to address the substantial health disparities TGD populations face (Radix et al., 2022). These disparities are largely due to intersectional stigma, which affects access to both general and transgender-specific health care, leading to higher incidences of HIV and other health issues. Efforts to address biases in AI algorithms are essential for promoting equity in rural health care settings and reducing disparities in access to quality care.

Personalized Care

Digital health interventions are highlighted for their potential to deliver personalized health care and support. mHealth applications, in particular can provide vital health information, facilitate HIV testing and prevention strategies, and support medication adherence through features like reminders and motivational messages (Radix et al., 2022). The review by Asa E. Radix and

colleagues emphasizes the importance of mHealth in overcoming barriers to health care by allowing transgender individuals to engage with health services in a discreet and accessible manner, which is particularly crucial in reducing stigma and improving health outcomes along the HIV Care Continuum (Radix et al., 2022). Ong et al identified the potential of GPT technology, specifically ChatGPT and GPT-4, to address longstanding barriers to care in free medical clinics. They suggested utilizing prompt engineering to tailor ChatGPT responses to patient-specific needs, such as language preferences, country of origin, and family history. By providing relevant prompts and contextual information, ChatGPT could assist health care professionals in understanding patient concerns and risk factors, thereby improving the quality of care provided (Dave et al., 2023). Additionally, ChatGPT could generate user-friendly discharge summaries, treatment plans, and follow-up reminders to ensure continuity of care beyond the clinic visit.

PERILS & CHALLENGES OF AI IN ENSURING HEALTH EQUITY

Potential Perpetuation of Inequities

Despite its promises, AI in health care may perpetuate existing health disparities faced by rural populations. Biases in AI algorithms, inadequate representation of rural patient populations in training data, and lack of awareness about the unique health care needs of rural communities may exacerbate health inequities (Abramoff et al., 2023). Addressing these challenges requires incorporating equity considerations into AI development and deployment strategies.

James Zou and Londa Schiebinger emphasize the critical need for fairness and equity in the development and implementation of biomedical artificial intelligence systems to benefit diverse global populations. They highlights the risk of AI exacerbating existing health disparities due to biases in training data, outcome metrics, and algorithm evaluations (Zou & Schiebinger, 2021). To combat these issues, James Zou and Londa Schiebinger propose short-term solutions, such as diversifying data collection and implementing rigorous post-deployment monitoring systems to continuously assess and correct biases. They also recommend long-term structural reforms, including policy adjustments for more inclusive funding, publication standards, and educational programs. They also call for intersectional analysis in health AI research to uncover nuanced biases that occur at the intersections of race, gender, and other demographic factors, such as the compounded biases faced by darker-skinned women in facial recognition technology (Zou & Schiebinger, 2021). A holistic approach in deploying AI in health care is needed and technological advancements must be paired with robust social policies to truly enhance health care outcomes for all sectors of society.

Black Box Technology

The black box phenomenon can be defined as algorithms within AI technology that make it hard to track, which can be problematic for health professionals who could be fed inconsistent/incorrect information but are unable to change it due to the convolutional nature of the device (Goisauf & Cano Abadia, 2022). A significant challenge of AI is its "black box" nature, obscuring how algorithms import, analyze, and interpret data from human observers (Jr et al., 2023). AI's lack of transparency may lead health care providers to mistrust AI-based clinical decision support systems due to unidentified risks, hindering extensive adoption within the health care setting (Al Kuwaiti et al., 2023).

The lack of transparency behind the algorithms of these tools can make it more difficult to detect errors in a model, which can lead to disproportionately more errors among patients in underserved communities, further perpetuating inequities within the healthcare system (Quinn et al., 2022). Some of these biases can arise from incomplete data, where poor sampling of existing data on patients can ultimately lead to poor treatment plans for marginalized populations.

A research article conducted by Obermeyer and colleagues identified a widely used algorithm, used in identifying and helping patients with complex health needs, displayed significant racial bias due to relying on health care costs rather than illness, which ultimately led to less money being spend on black patients than white patients (Obermeyer et al., 2019). To combat this, it is important to consider the various stages of developing AI systems, such as the Conception Phase, where it is important to design AI-tools that target conditions that are more likely to be affected among specific populations can potentially improve the health of those groups ((Abramoff et al., 2023). Developing algorithms with an understanding of health systems' specificities requires multidisciplinary data science teams and appropriate regulation (Al Kuwaiti et al., 2023).

Algorithmic Bias

Despite AI's innovations, ethical concerns have grown regarding its increased presence. AI may cause errors that are challenging to detect or induce adverse effects with severe consequences. For instance, an AI app predicting pneumonia-related complications erroneously advised physicians to discharge asthma patients due to a failure to consider relevant information (Al Kuwaiti et al., 2023). Systemic inequities in societies and health systems complicate defining a standard of fairness, especially when algorithms rely on biased data (Panch et al., 2019). Algorithms are trained on data, further complicating matters, necessitating a broadly quantitative metric for fairness (Panch et al., 2019).

A significant challenge associated with AI in health care is biases within AI algorithms. Biases can arise from the data used to train AI models, leading to disparities in diagnosis and treatment

across demographic groups. Addressing biases requires rigorous validation techniques, data quality assurance measures, and ongoing monitoring and evaluation to ensure equitable treatment for rural patients (Murphy et al., 2021). Chin et al aimed to develop algorithms to predict various pulmonary diseases due to the high burden of such diseases in LMICs like India. (Chin et al., 2023b). Models were developed to predict the risk of pulmonary diseases, including asthma, COPD, and allergic rhinitis, using data from pulmonary function tests and informed diagnoses by experienced physicians (Chin et al., 2023b). Significant systematic bias observed for COPD, with higher accuracy for females. Systematic bias observed for COPD, with higher accuracy for high-SES patients. Sampling Bias was not significant for any disease model, indicating robustness to variations in demographic proportions in the training set. The case study illustrates the practical application of machine learning in diagnosing pulmonary diseases, emphasizing the importance of addressing bias, fairness, and appropriateness in model development and deployment

Lack of Regulatory Framework

The absence of comprehensive regulatory frameworks governing AI use in health care poses a significant challenge to ensuring equity in health care settings. While AI technologies within the health care spaces increases, there needs to be an holistic approach to implementing and designing AI within the health care realm that takes into account the safety of the patients and their families (Amini et al., 2023). AI introduces new challenges that goes against current frameworks of health professionals and the usage of medical devices which requires specific attention.

One challenge is who is responsible for the potential issues that AI can cause within healthcare system, which according to the 2021 WHO guidance on the Ethics and Governance of AI, can place the burden on the victim or the health care worker who used the technology but was not involved in the development or the design (Rosemann & Zhang, 2022). With the many actors involved in the creation of AI technology, it can be morally difficult to sign responsibility to one specific person or group, which can ultimately lead to inadequate compensation to the parties harmed. This coincides with the other challenge of a lack of standardized regulatory framework, which differs between each country and even to the point of different interpretation amongst the varying levels of government (Jobin et al., 2019). Developing robust regulatory frameworks prioritizing equity considerations is essential for promoting equitable access to AI-driven health care solutions in rural areas, which requires a diverse range of stakeholders such as policymakers, health care professionals and patient representatives to help address the challenge of creating a framework that is ethical, equitable and effective.

Lack of Governance

The opacity of AI systems, as we previously referred it as “black box” technology makes it difficult to understand how decisions are made. This lack of transparency can lead to mistrust

among clinicians and patients, as they cannot easily verify the accuracy or fairness of the AI's recommendations, raising concerns about reliability, accountability and especially data privacy that breaches ethical concerns (Giansanti, 2022). As previously stated in the last section, regulatory differences exist not only within countries but also between the public and private sector, making it harder for governments to regulate power for internet and big tech companies on a global scale (kellybrendel, 2021). The rapid development of AI technologies outpaces the creation of relevant laws and regulations, leaving a gap that can be exploited (Stewart et al., 2021).

Active governance at the hospital level can accurately address these issues, which involves setting up committees or task forces dedicated to overseeing the implementation and use of AI, which can help develop protocols for evaluating AI tools which can increase clinician confidence, acceptance, and ensuring significant health consequences for patients (Al Kuwaiti et al., 2023). As AI rapidly grows commercially, regulation concerning research and privacy is necessary. The establishment of national and international rules to help created standardized governance frameworks are essential to harmonize the diverse regulatory landscapes across different sectors, which should be developed collaboratively by international bodies, governments, and industry stakeholders (Al Kuwaiti et al., 2023). By continuous evaluation and adaptation of regulatory frameworks in a time of rapid growth, this can allow governments and other organizations to address emerging challenges and ensure that AI technologies are ethical, safe and effective.

Data Limitations and Representation

AI models may not adequately represent the diverse patient populations served by rural health care facilities, leading to skewed outcomes and perpetuation of health inequities. While the Institute of Medicine recommended that there should be at least 10 patient-reported SDOH domains reflected in the data already collected by federal funded clinics, other domains like social isolation and financial resource strains are not included (Gold et al., 2017). Addressing data limitations and representation issues requires diversifying study populations, incorporating social determinants of health into AI initiatives, and involving rural stakeholders in the development process (Uche-Anya et al., 2022). A retrospective cohort study investigating the effectiveness of existing and newly developed machine learning algorithms for predicting new-onset stroke showed a notable difference in model effectiveness between races, with all algorithms showing worse outcomes for Black individuals. This underlines the need for more inclusive risk factor pools and improved modeling techniques to enhance predictive accuracy and address racial disparities in stroke risk predictions. The results stress the importance of refining stroke prediction models to be more representative and accurate, particularly for at-risk populations (Hong et al., 2023).

Workforce Development for an AI-Literate Workforce

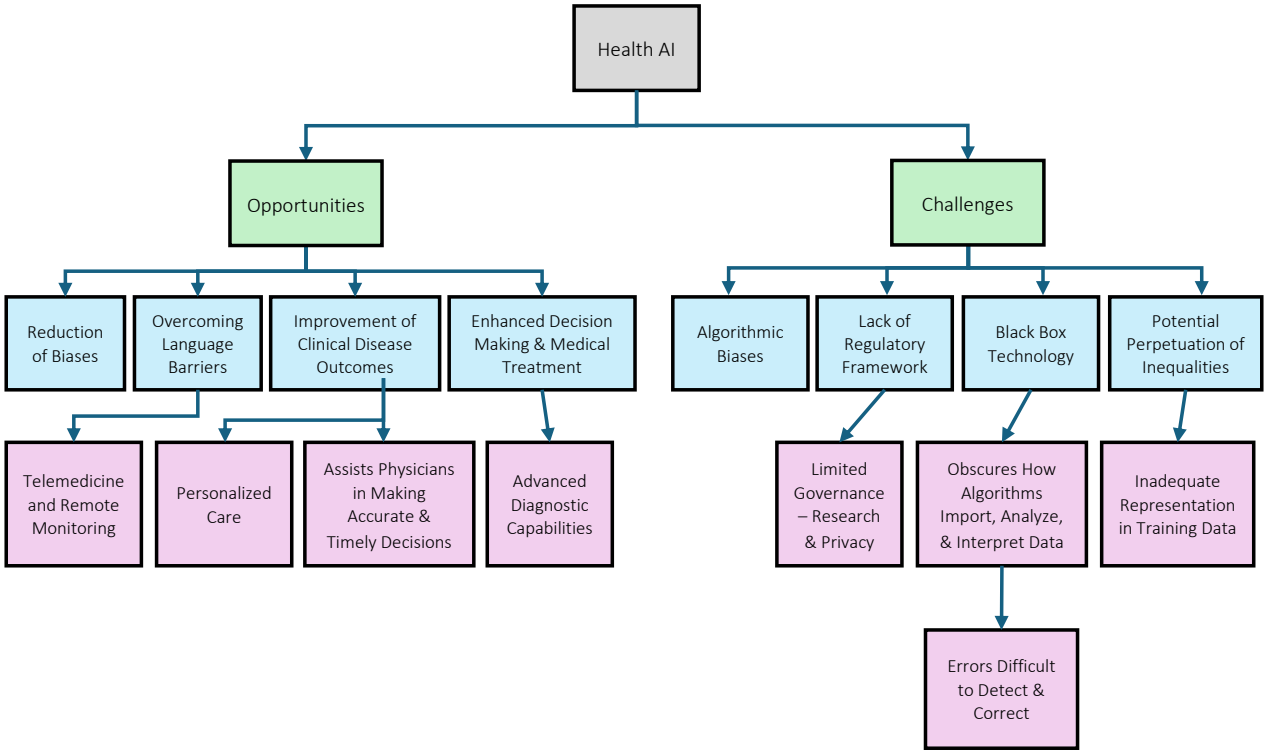
As AI continues to expand in other sectors within the health care field, current and incoming health professionals must be educated and updated about utilizing AI to assist their patients. Defining the roles of health care professionals when it comes to virtual care, such as providing training in undergraduate medical education programs and providing continuing medical education credits for current professionals, can increase technical readiness for health professionals and reduce the frustration of utilizing existing AI tools (Buyting et al., 2022). Another method that can ease health care professionals is for AI developers and implementers to create plain-language summaries of technical reports while creating AI tools for health care for health care (Solomonides et al., 2021). This comprehensive approach will ensure that health care professionals are not only equipped with the necessary skills to integrate AI effectively but also feel confident and supported in leveraging these advanced technologies to improve patient outcomes.

DISCUSSION

Health AI, as depicted in this peer-reviewed literature review, represents a convergence of advanced technologies aimed at revolutionizing the healthcare industry. This graph was produced through a detailed examination of various themes reported in the earlier sections. The themes were meticulously identified and categorized to highlight the core challenges and opportunities associated with the implementation of AI in health care. By systematically analyzing qualitative data, the significant factors influencing Health AI were distilled into clear visual components, providing a comprehensive overview of its potential impact on the health care landscape.

The opportunities presented by Health AI are substantial and diverse. As illustrated in Figure 1, Health AI can significantly enhance decision making and medical treatment, leading to improved clinical disease outcomes. Advanced diagnostic capabilities, personalized care and telemedicine/ remote monitoring are key areas where Health AI can assist physicians in making accurate and timely decisions, ultimately overcoming language barriers, and reducing biases in health care.

Figure 1. Concept Map of Literature Themes



Despite the promising opportunities, several challenges must be addressed to fully leverage Health AI. Figure 1 highlights critical issues such as algorithmic bias, the black-box nature of AI technologies, and a lack of a robust regulatory framework. These challenges can lead to potential perpetuation of inequities, inadequate representation in training data, and limited governance concerning research and privacy. The complexity of algorithms can obscure data interpretation processes, making errors difficult to detect and correct.

The interplay between the challenges and opportunities of Health AI reveals pathways to address the obstacles effectively. For instance, the challenge of perpetuating inequalities due to algorithmic bias can be mitigated by focusing on reducing biases through enhanced data representation and inclusive training methodologies. Similarly, the lack of a regulatory framework, which poses a significant challenge can be countered by developing comprehensive governance policies that ensure transparency and accountability. Addressing these challenges not only enhances the effectiveness of Health AI but also amplifies its potential benefits, fostering a more equitable and efficient healthcare system.

CONCLUSION

The promises and perils of AI in promoting equity in rural health care are closely intertwined. While AI technologies hold significant promise for enhancing decision making, improving patient outcomes, overcoming language barriers, and reducing biases, they also present challenges related to the potential perpetuation of inequities, biases in AI algorithms, lack of regulatory frameworks, and data limitations and representation issues.

Addressing these challenges requires collaborative efforts from health care stakeholders, policymakers, and technology developers to ensure that AI-driven health care solutions promote equity and improve access to quality care for rural populations (Solomonides et al., 2021). Leveraging AI technologies responsibly and ethically can work towards achieving more equitable health care outcomes for all patients.

AI has evolved to better serve providers and patients over the past few years, enabling efficient access to necessary information and potentially decreasing gaps for remote populations through telemedicine and mobile devices. However, the black-box nature of AI paired with algorithmic bias has deterred medical professionals from using AI/ML devices, potentially exacerbating existing disparities for marginalized populations, especially rural communities, from accessing health care. Transparency would enable clinicians and policymakers to understand the decision-making process and its potential outcomes, empowering them to make informed choices.

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