Artificial Intelligent Tools: Evidence-Mapping on the Perceived Positive Effects on Patient-Care

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Abstract

The global healthcare system is fraught with serious challenges including scarcity of critical healthcare professionals, changes in disease patterns, pandemics, access and equity issues among others. Considering that there is no quick fix to the myriad of healthcare challenges, World Health Organisation proposed a full integration of artificial intelligent (AI) tools into patient-care to stimulate efficiency and guarantee quality in patient-management. Therefore, this review maps evidence on the perceived positive effects of AI tools on patient-care. The review considered time expand between January 1, 2010 and October 31, 2023. Consistent with the protocol by Tricco et al., a comprehensive literature search was executed from Nature, PubMed, Scopus, ScienceDirect, Dimensions, Ebsco Host, ProQuest, JStore, Semantic Scholar, Taylor & Francis, Emeralds, WHO, and Google Scholar. Upholding the inclusion and exclusion standards, 14 peer reviewed articles were included in this review. We report the use of that AI tools could significantly improve accuracy of clinical diagnosis and guarantee better health-outcomes of patients. AI tools also have the ability to mitigate, if not eliminate, most of the factors that currently predict poor patient outcomes. Furthermore, AI tools are far more efficient in generating robust and accurate data in real-time, and could help ease and accelerate the workflow. If properly integrated into the healthcare system, AI could help accelerate the attainment of Sustainable Development Goals 3.4, 3.8, and 3.b. We propose that AI developers collaborate with public health practitioners and healthcare managers to develop AI applications that appreciate socio-cultural dimensions in patient-care.

Introduction

The global healthcare system is grappling with scarcity of critical healthcare professionals, changes in disease patterns, high cost of healthcare, adverse effects of climate change, pandemics, access and equity issues, among others [1–3]. According to estimates, the global healthcare system will need an additional forty million healthcare staff by 2030 [3, 4]. Historically, the healthcare system has always contended with well-known and seemingly intractable challenges with safety, quality, efficient and effective clinical and administrative patient-care services [5, 6]. Other challenges include treatment-diagnosis mismatch, misdiagnosis, under- and over-prescription, inaccurate and incomplete patient records, inadequate resources and workforce to sustain the ever stretched patient-care services [5]. Given that the deadline set for the realisation of the Sustainable Development Goals (SDGs) is fast approaching, healthcare managers are adopting several strategies to sustainably fix the challenges [3, 7]. Considering that there is no quick fix to the myriad of healthcare challenges, WHO proposed, in addition to other interventions, a full integration of artificial intelligent (AL) tools to stimulate efficiency and accelerate the realisation of the health-related SDGs [3, 7, 8].

AI tools are a set of technologies with computerised features that have capacity to simulate intelligent human behaviours [5, 8]. These tools possess speed, huge data storage and processing capacity, reliable, interoperable with other technological systems, by far more accurate in their interpretations and inferences of patients’ diagnosis [9, 10]. When effectively combined with human reasoning, AI tools have the ability to accurately establish patterns, subtle and complex correlations in large and high-dimensional datasets that often escape the traditional techniques [8, 11]. Though their full adoption into healthcare is yet to be realised, there is evidence of wide application of AI tools in patient-care globally [10, 12, 13]. So far, AI applications in patient-care are getting more sophisticated, effective, and efficient in supporting clinical and administrative decisions [2, 12].

While there is growing recognition of the utility of AI tools in patient-care, their coverage in the developing world is rather on a small scale [7, 14, 15]. So far, Europe and United Kingdom appear to be the continent with the fastest AI coverage and with widespread application in patient-care services [13, 16, 17]. Though the continent is far from
realising full adoption of AI applications in all aspects of their healthcare systems, there are modest gains in most parts of the continent [18, 19]. For instance, funding for research projects in AI adoption in healthcare through European Union Horizon 2020 scheme shot up between 2014 to 2020 [20]. Moreover, the European Commission developed several ethicolegal instruments to regulate and guarantee responsible design and use of AI systems in patient-care and beyond [16, 20].

North America is the next continent with a reasonably wide adoption of intelligent machines in patient-care services [1, 13]. For example, AI tools are currently being applied in the management of cancer, hypertension, cerebrovascular accidents and conditions, and in obstetrics as well as paediatric care services [6, 9, 21]. The other continents, including Australia, Asia, and Africa have also recorded modest successes in the application of AI tools in their healthcare systems [7, 13, 15, 22]. Though records exist about AI application in invasive and non-invasive procedures in these continents, especially in Africa, their use is more associated with smart devices aided by applications such as AiCure and a gamut of AI ChatBots [15, 23, 24].

Regardless of the level of AI use in patient-care across the globe, these intelligent machines appear to be super-supportive and could redefine the future of healthcare and change its face for the better [10, 16, 25]. While at this, the patient remains the ultimate "subject" in this whole discourse and in whose best interest AI tools are deployed in the healthcare system [2, 24, 26].

Despite the growing research about AI application in other fields worldwide, there seems to be inadequate evidence about AI utilisation in the field of healthcare [13, 25]. Moreover, most of the studies involving AI use in health were conducted in non-clinical circles and devoid of the views of patients and other key stakeholders in healthcare [2]. As primary stakeholders in the healthcare system, the opinions of patients, especially, are key to determining the level of acceptability of AI tools in patient-care, which could help in ensuring their cooperation [2, 24, 26]. Meanwhile, the SDG 3.4 provides for the attainment of universal health coverage, including access to quality essential healthcare services, medicines and vaccines for all, by 2030 [3, 7, 8]. Certainly, AI would be a critical resource in this pursuit, and reviews collating such evidences are of urgent need. Therefore, this review maps evidence on the perceived positive effects of AI tools on patient-care, from between January 1, 2010 and October 31, 2023. Such reviews are essential for developing policy and evidence-based integration of AI tools into healthcare for improve patient outcomes.

**Methods**

We examined, synchronised, and analysed peer reviewed articles using Tricco et al. [27] guidelines. This includes developing and examining the purpose for the study, crafting, reviewing, examining the research questions, then identifying and discussing the search terms. The others include identifying and exploring relevant databases, downloading articles, conducting data mining, organising and synthesising results and, carrying out consultation. Five questions defined the review: What are the perceived positive effects of AI tools on: (1) healthcare data? (2) patients’ diagnosis? (3) patient-care? (4) stress-related medical errors? and (5) medical emergencies?

**Search Strategy**

This review was conducted consistent with the Preferred Reporting Items for Reviews and Meta-Analyses extension for Scoping Reviews - PRISMA-ScR [27, 28]. We searched peer reviewed articles from the following databases: Nature, PubMed, Scopus, ScienceDirect, Dimensions, Ebsco Host, ProQuest, JStore, Semantic Scholar, Taylor & Francis, Emeralds, World Health Organisation, Research Square, medRxiv, and Google Scholar (see Fig. 1 & Table 1). To inject rigour and comprehension into the search process, we first explored PubMed for MeSH terms on the topic
Search for articles was executed at two levels based on the MeSH Terms. First, the search terms “Confidentiality” OR “Artificial Intelligence” yielded a total of 4,344 articles. Second, the search was based on 30 MeSH terms and produced a total of 1,364 articles (see Fig. 1 & Table 1).

### Table 1

**Search Strategy**

<table>
<thead>
<tr>
<th>Search Strategy Item</th>
<th>Search Strategy</th>
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<tbody>
<tr>
<td><strong>Databases</strong></td>
<td>Nature (93), PubMed (131), Scopus (74), ScienceDirect (164), Dimensions (75), Ebsco Host (43), ProQuest (54), JStore (43), Semantic Scholar (91), Taylor &amp; Francis (69), Emeralds (41), World Health Organisation (11), Research Square (89), medRxiv (145), and Google Scholar (241).</td>
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<tr>
<td><strong>Language filter</strong></td>
<td>English</td>
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<td><strong>Time filter</strong></td>
<td>January 1, 2010 to October 31, 2023</td>
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<td><strong>Spatial filter</strong></td>
<td>Worldwide</td>
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| **MeSH terms used**  | 1. **Confidentiality** – “Entry Terms” OR “Secrecy” OR “Privileged Communication” OR “Communication, Privileged” OR “Communications, Privileged” OR “Privileged Communications” OR “Confidential Information” OR “Information, Confidential” OR “Privacy of Patient Data” OR “Data Privacy, Patient” OR “Patient Data Privacy” OR “Privacy, Patient Data”.
| **Inclusion criteria** | Articles must be AI and health-related, primary research and conducted in the English Language, applied either quantitative, qualitative, or mixed methods. In addition, the articles must provide details on perceived positive effects of AI use in healthcare, and conducted between January 1, 2010 and October 31, 2023. Again, articles must provide details on author(s), purpose, methods, country, and conclusion. |
| **Exclusion criteria** | Articles on AI and health but did not touch on perceived positive effects of AI tools use in healthcare, reviewed articles on AI use in health, and articles on AI and health conducted in languages other than the English Language. Furthermore, abstracts, opinion pieces, short reports, incomplete articles, commentaries, grey literature, and media reports on AI and health were also ignored. |

The search covered studies conducted between January 1, 2010 and October 31, 2023. The current study was executed between January 1 and October 31, 2023. Through detailed and exhaustive data screening process, all duplicate articles were deleted, including articles considered incoherent with the inclusion standards (described below). The first level screening was executed by authors F.S.A., S.M., R.V.K., L.A.A., and I.S.T. but where the suitability of an article was in contention, that article was referred to authors E.W.A., C.E.S., V.K.D., and N.N.B. for further assessment until consensus attained. To ensure comprehension and rigour in the search process, citation chaining was done on all articles that met the inclusion standards to identify relevant additional articles for further assessment.

**Inclusion Criteria**
Articles must be AI and health-related, primary research and conducted in the English Language, applied either quantitative, qualitative, or mixed methods. In addition, the articles must provide details on perceived positive effects of AI use in healthcare, and conducted between January 1, 2010 and October 31, 2023. Again, articles must provide details on author(s), year of publication, purpose, methods, country, and conclusion.

**Exclusion Criteria**

Articles on AI and health but not on perceived positive effects of AI tools use in healthcare, reviewed articles on AI use in health, and articles on AI and health conducted in languages other than the English Language. Furthermore, abstracts, opinion pieces, short reports, incomplete articles, commentaries, grey literature, and media reports on AI and health were also excluded.

**Quality Rating**

We conducted quality rating on all candidate articles consistent with the guidelines provided by Tricco et al. [27]. That is, the shortlisted articles must have a research background, aim, context, clear method, sampling technique, data collection and analysis, reflectivity, value of research, and ethics. Thus, all candidate articles were examined and scored according to the majority of the sections. Articles which scored “A” had little or no limitations, “B” had some limitations, “C” had substantial limitations but carried some relevance, and “D” had substantial flaws that could undermine the study as a whole, so were not used for this review [27].

**Data Extraction and Thematic Analysis**

Data were independently extracted by all authors. Authors C.E.S., R.V.K., L.A.A., and I.S.T. extracted data on “authors, purpose, methods, and country”, while authors E.W.A., V.K.D., F.S.A., S.M., and N.N.B. extracted data on “perceived positive effects and conclusions” (see Table 2). In consonance with Cypress [29] and Morse [30], thematic analysis was done by authors E.W.A., V.K.D., C.E.S., S.M., R.V.K., and N.N.B. Data were coded and themes emerged directly from the data in line with the review questions [31, 32]. Thus, the analysis included reading over and over to familiarise ourselves with the data, identifying candidate codes, identifying and assessing emerging themes. Additionally, emerging themes were reviewed, clearly named and defined, and extensively discussed till consensus was established. Finally, a qualitative report was developed and extensively reviewed to guarantee internal and external homogeneity of themes.
<table>
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<th>No.</th>
<th>Author(s)</th>
<th>Purpose/Objective</th>
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<th>Opportunities</th>
<th>Conclusions/Recommendations</th>
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<tr>
<td>1</td>
<td>Fritsch et al. (2022)</td>
<td>Perception about artificial intelligence in healthcare.</td>
<td>Quantitative survey, 452 patients and their companions.</td>
<td>Germany (Europe)</td>
<td>1. Accurate diagnosis. 2. Improved patient outcomes. 3. Promotes personal care.</td>
<td><strong>Conclusion:</strong> Patients and their companions are open to AI usage in healthcare and see it as a positive development. <strong>Recommendations:</strong> AI diagnosis, therapy, and operations should be closely monitored and supervised by physicians.</td>
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<td>2</td>
<td>Isbannet et al. (2022)</td>
<td>Public judgments about AI use in healthcare.</td>
<td>Quantitative survey, 4448 respondents (general public).</td>
<td>Australia</td>
<td>1. Enhanced speed of service. 2. Improved patient outcomes. 3. Accurate diagnosis.</td>
<td><strong>Conclusions:</strong> AI systems should augment rather than replace humans in the provision of healthcare. <strong>Recommendations:</strong> Qualitative research needed to understand the reasons behind the findings.</td>
</tr>
<tr>
<td>3</td>
<td>Mehta et al. (2021)</td>
<td>Knowledge, perceptions, and preferences about AI use in medical education.</td>
<td>Quantitative survey, 321 medical students.</td>
<td>Canada (North America)</td>
<td>1. Improved clinical and administrative functions. 2. Provide useful preventive health suggestions to patients. 3. Accurate diagnosis. 4. Improve referral procedures.</td>
<td><strong>Conclusions:</strong> Optimistic about AI's capabilities to carry out a variety of healthcare functions, including clinical and administrative. Sceptical about AI utility in personal counselling and empathetic care.</td>
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<td>4</td>
<td>Morgenstern et al. (2021)</td>
<td>Impacts of artificial intelligence (AI) on public health practice.</td>
<td>Qualitative (inter-continental interviews), 15 experts in public health and AI.</td>
<td>North America and Asia (several countries).</td>
<td>1. Improved diagnosis and disease surveillance.</td>
<td>Conclusions: Experts are cautiously optimistic AI’s potential to improve diagnosis and disease surveillance. However, perceived substantial barriers like inadequate regulation exist. Recommendation: Investment and research into AI for public health practice needed, increased access to high-quality data, research and education about limitations of AI needed.</td>
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<tr>
<td>5</td>
<td>Ploug et al. (2021)</td>
<td>Preferences for the performance and explainability of AI decision making in health care.</td>
<td>Quantitative survey, 1027 respondents (general public).</td>
<td>Denmark (Europe)</td>
<td>1. Improved diagnosis and treatment. 2. Improved patient outcomes.</td>
<td>Conclusions: Physicians must take ultimately responsibility for diagnostics and treatment planning, AI decision support should be explainable, and AI system must be tested for discrimination. Recommendation: Clear public policy on AI system use in healthcare.</td>
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<td>6</td>
<td>Richardson et al. (2021)</td>
<td>Patient views of diverse applications of AI in healthcare.</td>
<td>Qualitative (FGDs), 87 patients.</td>
<td>America (North America).</td>
<td>1. Improved patient outcomes. 2. Wider range of conditions. 3. Accurate diagnosis.</td>
<td>Conclusions: Addressing patient concerns relating to AI applications in healthcare is essential for effective clinical implementation. Recommendation: It is critical that AI developers engage the public in dialogue about both the potential benefits and harms of applications of AI in healthcare.</td>
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<td>9</td>
<td>Sujan et al. (2022)</td>
<td>Views about AI in healthcare.</td>
<td>Qualitative, 26 patients, hospital staff, technology developers, and regulators.</td>
<td>United Kingdom (Europe).</td>
<td>1. Diagnostic precision. 2. Faster services.</td>
<td>Conclusions: Safety and assurance of healthcare AI need to be based on a systems approach that expands the current technology-centric focus. Recommendations: Existing standards and best practices for the design and assurance of systems should be followed, and wider ethical, legal, and societal implications of the use of AI in healthcare need to be addressed.</td>
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| 10  | Terry et al. (2022) | Views about the use of AI tools in healthcare. | Qualitative, 14 primary healthcare and digital health stakeholders. | Canada (North America). | 1. Improved healthcare. | **Conclusions:** Use of AI in primary healthcare may have a positive impact, but many factors need to be considered regarding its implementation.  
**Recommendations:** Before a full rollout, elements required to support the uptake of AI tools, including co-creation, availability and use of high quality data must be secured. |
2. Eliminate the cost and inconvenience of travelling to access essential healthcare.  
3. Promotes efficient and immediate essential healthcare.  
4. Very useful during national emergencies like pandemics (SARS-CoV-2) and disasters (earthquakes, flooding).  
5. Allows for automation of critical health services.  
6. Promotes personnel care. | **Conclusions:** AI promoting health democracy and personal healthcare.  
**Recommendations:** AI brands and services should measure and understand user behaviours and patterns for better satisfaction. |
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<tr>
<td>13</td>
<td>Visram et al. (2023)</td>
<td>Attitudes towards AI and its future applications in medicine and healthcare.</td>
<td>Qualitative (FGD), 21 young persons.</td>
<td>London (Europe).</td>
<td>1. Improved health outcomes. 2. Accurate diagnosis.</td>
<td>Conclusions: Children and young people to be included in developing AI. This requires an enabling environment for human-centred AI involving children and young people. Recommendations: Healthcare staff should be transparent about AI use, success stories and when things go wrong and how it was resolved.</td>
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<td>14</td>
<td>Wittal et al. (2022)</td>
<td>Public perception and knowledge of AI use in healthcare, therapy, and diagnosis.</td>
<td>Quantitative survey, 2001 respondents</td>
<td>Germany (Europe)</td>
<td>1. Rapid and accurate diagnoses. 2. Longer and better quality of life.</td>
<td>Conclusion: Need to improve education and perception of medical AI applications by increasing awareness, highlighting the potentials, and ensuring compliance with guidelines and regulations to handle data protection. Recommendation: Need for uniform and generally applicable data protection and high security standards; public education about AI; ethical issues to be considered.</td>
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**Findings**

We explored previous studies conducted from 2010 to 2023 on the perceived positive effects of AI tools on patients care. A total of 1,364 articles were screened, of which 477(36%) discussed AI tools in healthcare. Upon further assessment of the 477 articles, 14(3%) met the inclusion standards and were included in this review. Of the 14 articles used, 1(7%) was published in 2023, 6(43%) in 2022, 6(43%) in 2021 and, 1(7%) in 2019. The articles also applied quantitative design (8 articles), qualitative (5 articles) and, mixed method (1 article). Additionally, most of these articles covered Europe – 8(57%) [33–40] and North America – 5(36%) [35, 41–44]. Also included are Australia – 2(14%) [45, 46] and Asia – 1(7%) [42]. Though Africa is conspicuously missing from the list, it may not mean that the continent has no record of AI use in healthcare, but rather that none of the articles on Africa met the inclusion standards for this study, that call for more and quality research.

**Accurate and reliable data**

Healthcare decisions, especially those regarding patients’ diagnoses, rely very much on data that is incontrovertible, accurate, and reliable. Therefore, it is incumbent on healthcare managers to develop health information management systems that guarantee uninterrupted supply of accurate and reliable patient data in real-time, for both administrative and clinical decision-making [34–36, 43, 46]. According to the reviewed articles [37, 38, 44], AI tools hold enormous potentials to process large volumes of patients’ data and make timely and accurate inferences. Apart from providing rich and accurate data for decision-making in typically clinical settings, AI tools provide expeditious and reliable data for a quick action in the epidemiological and public health fields [33, 45]. Although concerns have
been raised about data privacy [41, 42], the public believes that AI tools would positively impact healthcare decisions and enhance trustworthiness.

**Improved patient diagnosis**

The society is also very hopeful that AI tools would significantly improve the accuracy of clinical diagnosis. While these intelligent machines could act independently during patient-care, they may also influence the quality of decisions reached by clinicians [33, 34, 41, 42, 45]. According to van der Zander et al. [38], Visram et al. [39], and Wittal et al. [40], given that AI tools thrive on large datasets, they are better at diagnosing far more diseases in relatively shorter time than clinicians. This looks very promising, considering the ability of AI tools to leverage algorithms that help to predict accurately future outbreaks of diseases within specific populations [36, 37, 44]. Although the public is worried about the ability of AI tools to act independently, they are cautiously optimistic that these intelligent machines could still be controlled to act responsibly [35, 46].

**Improved patient-care**

Artificial intelligent tools are credited for their ability to mitigate, if not eliminate, most of the factors that currently predict poor patient outcomes [39, 40, 43]. These include errors in clinical diagnosis, long waiting time, poor staff attitudes, inaccurate and missing patient data, workload and staff burnout, discrimination, and large number of patients needing care [39, 40, 45]. According to Fritsch et al. [33], Isbanger et al. [45], Mehta et al. [41], and Ploug et al. [34], when AI tools are applied in combination with human clinicians, a rich and valuable context is provided for healthcare professionals to improve the quality of care provided. Moreover, AI tools provide valuable opportunity for patients to receive needed care remotely without having to physically report at the hospital [40, 41, 45]. Additionally, domestic caregivers could receive valuable guidance from AI tools when confronted with difficult decisions regarding patients with chronic conditions such as cerebrovascular accident and conditions, hypertension, and diabetes. This reduces the stressors associated with caring for patients with chronic conditions and improves the needed quality of care [34, 39, 41].

**Reduced stress-related medical errors**

The review revealed that as AI tools are increasingly introduced into the workflow, incidence of medical errors associated with worker workload and stress will significantly reduce [35–37, 39]. The global healthcare system is seeing rapid reduction in the workforce per unit population while the number of patients seeking care is ever increasing [36, 37, 39], a situation that increases incidence of medical errors (sometimes fatal) [33, 43]. However, if properly deployed, AI tools can offer superior care and significantly reduce these errors [41, 42, 45]. This is significant because patients can be assured of adequate protection from avoidable medical errors.

**Predict medical emergencies**

Changes in the conditions of patients can sometimes be sudden and unpredictable especially during emergency care [37, 41]. With the introduction of AI tools into healthcare, clinicians can now detect and act swiftly in providing life-saving care to patients during medical emergencies. These are possible because AI tools have features that could trigger instantaneous alerts on imminent changes in patient conditions, such as seizures and strokes, and ensure timely medical intervention. The public [37, 41] is hopeful that if well implemented, AI tools could become major game changer in the management of medical emergencies.

**Discussion**
Artificial intelligence and its utilisation in governance, academia, manufacturing, security, entertainment, space and marine exploration, health, etcetera, is gaining popularity among researchers globally [20, 25]. There are several studies about the utility of AI tools in other fields [10], yet very few studies exist in patient-care [13]. Moreover, most of the studies that examined the application of AI tools in health were not conducted in the area of patient-care [2].

Affirming this, the current study found that out of 477 articles on AI use in health screened for this review, only 14(3%) met the inclusion standards. Besides, consistent with Khalid et al. [13] and Naik et al. [17], the current study report that most, 8(57%), of the articles used in this review are about Europe, 5(36%) North America, 2(14%) Australia and, 1(7%) Asia. We discuss this review under AI use in healthcare by provision of accurate and reliable data, improved patient diagnosis and care, reduced stress-related medical errors and medical emergencies.

Accurate and reliable data

The role of robust, accurate, and reliable data in all decision-making processes regarding patient-care cannot be overemphasised [13, 25]. Several studies [11, 16, 47] recognised the super-abilities of AI tools in procuring, organising, and preserving large volumes of datasets for use in both clinical and administrative decisions of patient-care. For example, accurate, reliable and timely data is necessary for determining the cost of care, training of health professionals, procurement of medical commodities, budgeting, diagnostic and referral decisions, and carrying out invasive and non-invasive procedures [11]. Therefore, there is the need to properly integrate AI tools to improve and accelerate the creation, organisation, storage, and utilisation of data in patient-care. The current study opposes earlier ones [10, 12] suggesting that AI tools could seriously compromise data privacy. In addition, AI tools are vulnerable to attack by computer hackers who could misuse patient-records [9, 24]. Although these concerns are legitimate, some previous studies [2, 25] suggest that AI tools have inherent security mechanisms against data leak and theft. Moreover, in the long term, the odds are high that AI tools will guarantee more reliable, accurate, and timely data in patient-care. This is consistent with the core values underpinning the SDG 3.b which calls for research and development of vaccines and medicines for communicable and non-communicable diseases [3, 7].

Improved patient diagnosis

Accurate and timely determination of patient’s diagnosis defines the patient-clinician relationship and becomes a key prerequisite for administering treatment for improved patient outcomes [13, 47]. Center of Intellectual Property and Technology Law (2023) explained that it is both a legal and moral obligation for a clinician to exercise due diligence in diagnosing patients’ conditions and disclosing same to the patient. Horgan et al. [16] and Jiang et al. [21] suggest that the design of AI tools provides superior advantage of delivering accurate diagnosis in real-time. Consistent with this, our review found that AI tools could significantly improve the accuracy of clinical diagnosis. Moreover, integrating AI tools into the care process will provide a robust and trustworthy context for clinicians to shape and improve their own diagnostic decisions. However, the current review disaffirms previous studies [10, 11] reporting the possibility of AI tools committing serious errors in their diagnostic decisions based on factors like inaccurate and biased data, and inadequate machine training and learning. This notwithstanding, findings from the current review, based on large body of previous studies [12, 13, 16, 21, 47] suggest that AI tools in patient-care will significantly address shortcomings in the traditional diagnostic regime. If well implemented, AI tools in patient-care could stimulate and accelerate the realisation of the SDG 3.4, which calls for a decrease by one-third of the avoidable deaths from non-communicable diseases by the year 2030 [3, 7].

Improvement in patient-care

The traditional patient-care regime is largely characterised by delays in receiving care, discrimination, poor staff attitude, staff fatigue and stress, inadequate staff, misdiagnosis, treatment-diagnosis mismatches, under- and over-
prescription, missing patient records, etcetera [8, 25]. These factors contribute to the ever-increasing incidence of mortality and morbidity recorded in most healthcare facilities worldwide [16]. However, our review found that AI tools have the capacity to significantly reduce, if not eliminate, most of the factors that currently undermine patient-care. Thus, AI tools have more effective and efficient data storage and protection ability, data interpretation ability, accurate diagnostic ability, and guarantee exceptionally expeditious and reliable service to patients [8, 11, 16]. For instance, previous studies [7, 13], corroborated by our current review, found that AI tools have the ability to provide needed care remotely to patients who may not necessarily be present physically at the hospital. This will help reduce large patient numbers at the hospital and improve the overall turnaround time for care. Meanwhile, out review contradicts previous studies [15, 24] which raised concerns over AI tools providing care in a discriminatory care manner, questions their utility in mental health services, and sceptical about their ability to provide non-pharmacological care. Regardless of this, a large body of previous studies [7, 13, 16, 25] suggest that AI tools could significantly improve the total quality of care provided. Ultimately, AI tools would contribute significantly to the realisation of the universal health coverage provided in SDG 3.8.

**Reduced stress-related medical errors**

There is a correlation between increased workload, stress, and burnouts of clinicians and the occurrence of medical errors [9–11]. Some of these medical errors result in serious negative health outcomes (including death) of patients. Our review found that AI tools can help minimise incidence of medical errors associated with hospital-based stressors. This validates earlier studies [5, 11, 25, 48] which reported that AI tools could help reduce majority of the medical errors involved in patient-care. Thus, IA tools can enhance the trust that patients have for the healthcare professionals. Additionally, the reviewed studies [5, 11, 25, 48] reported that AI tools will serve the best interest of patients. AI tools seem to be the only way forward for now in healthcare.

**Predict medical emergencies**

Critically ill patients are constantly under close monitoring with clinicians on the lookout for even the slightest change in condition [25, 47]. So far, AI tools have proven to be very helpful in saving the lives of patients [11, 48]. For instance, with the introduction of AI tools into healthcare, clinicians can detect and act more swiftly in providing life-saving care to patients during medical emergencies [5, 25]. With its several algorithms, these intelligent applications could detect imminent changes in patient conditions and trigger instantaneous alerts for quick intervention [9]. Moreover, the reviewed studies [9, 16, 47] reported that there are AI applications that could significantly mitigate errors associated with AI tools. So far, there seems to be no better or more competent alternative to AI tools in the management of medical emergencies.

**Strengths and Limitations**

The review makes an attempt at exploring evidence globally on perceived positive effects of AI applications in patient-care. To ensure reproducibility, reliability, and trustworthiness of our findings, there was strict adherence to the following: first, all authors independently sought for articles using the MeSH terms, guided by the inclusion and exclusion guidelines and a checklist, all candidate articles were subjected to a quality rating. Additionally, to establish validity and replicability, all authors participated in a comprehensive and thorough data extraction process.

This review also has some limitations. First, relying on only peer reviewed articles and selecting articles written in the English Language only limited the literature sample used, which potentially excluded other relevant articles written in other languages. Moreover, we recognise that the study may have carried weaknesses and biases contained in the reviewed articles.
Recommendations for policy direction and research

We propose that governments leverage AI applications to aide and accelerate the realisation of the health-related SDGs. Public health experts and healthcare managers should collaborate with AI developers in developing applications that can efficiently provide non-pharmacological care. Additionally, we propose that AI developers collaborate with healthcare managers to develop AI applications that appreciate socio-cultural dimensions in patient-care. Lastly, we encourage WHO and other agencies to provide sponsorship for research into AI application, patient-care, and SDGs.

Conclusion

AI applications are steadily and rapidly shaping the relationship between clinicians and patients worldwide. This development has attracted some criticism including potential breach of privacy, bias and discrimination, and decline in humanity during patient-care. However, AI applications are proving to be forces of good and changing the course of our collective future for the better. AI tools significantly improve the accuracy of clinical diagnosis and guarantee better health-outcomes for patients and, have the ability to mitigate, if not eliminate, most of the factors that currently predict poor patient outcomes. Furthermore, AI tools are far more efficient in generating robust and accurate data in real-time, and could help ease and accelerate workflow. Additionally, AI devices and applications could be game changers in the management of medical emergencies.

If properly integrated into the healthcare system, AI could help accelerate the realisation of SDGs 3.4, 3.8, and 3.b. So far, there seems to be no going back on this journey of AI use in patient-care, and the focus must be on ensuring their responsible application. This study adds to few previous studies conducted on AI use in healthcare.

Abbreviations

Artificial intelligence – AI
Sustainable Development Goals – SDGs
Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews – PRISMA-ScR
Medical Subject Headings – MeSH

Declarations

Conflict of interests
The authors declare that they have no conflict of interest.

Ethical approval
Not applicable.

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Contributorship

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**Figures**

**Figure 1**

PRISMA flow diagram