An Analysis of The Use of Artificial Intelligence in the United States of America's Healthcare System

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ABSTRACT

In order to assist policymakers and healthcare professional towards the adoption and application of AI tools to the USA healthcare system, this study was designed to unearth some of the challenges facing the adoption and application of AI tools to healthcare system. The study further presents information about success stories in countries that are currently using AI in their healthcare systems, and also presents information about the areas that AI tools have impacted in the healthcare system as well as benefit or importance of using AI in healthcare system. This study followed a narrative literature review analysis. With the help of a Boolean search technique, articles and other publication materials were selected for the study analysis. In all 15 articles were included and considered for the analysis. As part of the study's findings—examples of health-related AI applications include the following: Hippocratic AI, Merative, Viz.ai, Enlitic, Regard, Twill, Linus Health, PathAI, VirtuSense, Cleerly, and Freenome. Also, from the literature, some of the areas in the healthcare system that AI tools have been applied and impacted include the following: medical equipment preparers, medical assistants, occupational health and safety technician, pharmacy technicians, etc. Furthermore, the study found that challenges that stakeholders need to address in order to ensure smooth adoption of AI into US healthcare system include but not limited to the following: (1) Working together to deliver quality AI in healthcare, (2) Rethinking education and skills, (3) Strengthening data quality, governance, security and interoperability, (4) Managing Change, (5) Investing in New Talent and Creating New Roles, (6) Working at Scale, (7) Regulation, Policymaking and Liability, and Managing Risk, and (8) Funding. Above all, the study found that AI application to health care sector, and associated benefits or importance of AI application to healthcare system include the following: assisting in human resource crisis in healthcare, primary care services, neuroscience, thoracic surgery, cardiac management, and applying to nursing and medical science. The study therefore recommended that policymakers should make available funding resources, education and skills training to the healthcare system through budgetary allocation in order to ensure smooth adoption and implementation of AI in health care system. Above all, the study further recommended that policymakers and government officials should also provide and/or make available AI Virtual Care to complement the traditional healthcare ecosystem by integrating AI electronic health records, telemedicine, wearable devices, data analytics and artificial intelligence.

Keywords: Healthcare, Medicine, Health, Informatics, Adoption, Challenges, Artificial Intelligence

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INTRODUCTION

Health care, or healthcare, is the improvement of health through the prevention, diagnosis, treatment, cure of disease, illness, injury, and other physical and mental impairments in people. In fact, health care is delivered by health professionals and allied health fields (World Health Organization, 2020, Adu-Frimpong, 2022). For example, medicine, dentistry, pharmacy, midwifery, nursing, optometry, audiology, psychology, occupational therapy, physical therapy, athletic training, and other health professions all constitute health care (Millman, 1993). The term includes work done in providing primary care, secondary care, and tertiary care, as well as in public health (World Health Organization, 2020, Adu-Frimpong, 2022). It is an undeniable fact that healthcare is a necessity to healthy population, and also one of the major success stories of our times. As a result, medical science has improved rapidly, by raising life expectancy around the world, but as longevity increases, healthcare systems face growing demand for the healthcare/medical services, rising costs and a workforce that is struggling to meet the needs of its patients.

Meanwhile, according to Spatharou, Hieronimus and Jenkins (2020), such health care demand is driven by a combination of unstoppable forces, which include the following: (a) population aging, (b) changing patient

expectations, (c) a shift in lifestyle choices, and (d) the never-ending cycle of innovation being but a few. Of these, the implications from an aging population stand out. By 2050, one in four people in Europe and North America will be over the age of 65—this means the health systems will have to deal with more patients with complex needs (Spatharou, Hieronimus & Jenkins, 2020). So, managing such patients is expensive and requires systems to shift from an episodic care-based philosophy to one that is much more proactive and focused on long-term care management (Spatharou, Hieronimus & Jenkins, 2020).

Nonetheless, as argued in the literature, the global health systems, including the US health system also need a larger workforce due to aging population, but although the global economy could create 40 million new health-sector jobs by 2030, there is still a projected shortfall of 9.9 million physicians, nurses and midwives globally over the same period, according to the World Health Organization (2016). It is important to state that nations and policymakers across the globe need not only to attract, train and retain more healthcare professionals, but they also need to ensure their time is used where it adds most value—caring for patients. Therefore, by building on automation, artificial intelligence (AI) has the potential to revolutionize healthcare and help address some of the challenges the healthcare system is currently facing in United States. Artificial intelligence in healthcare is a term used to describe the use of machine-learning algorithms and software, or artificial intelligence (AI), to copy human cognition in the analysis, presentation, and understanding of complex medical and health care data, or to exceed human capabilities by providing new ways to diagnose, treat, or prevent disease (Sara, 2023; Mullainathan & Obermeyer, 2022). Specifically, AI is the ability of computer algorithms to approximate conclusions based solely on input data (Sara, 2023; Mullainathan & Obermeyer, 2022).

So, AI introduction into the United States of America's healthcare system is expected to assist in solving some of the healthcare delivery challenges the system is currently facing in the midst of technology innovation. In today's rapidly changing and technology-focused landscape, exceptional healthcare does not depend on clinicians alone. Healthcare organizations need functional, dependable technology to meet patient care needs and optimize processes. From the rapidly expanding world of virtual care and clinical mobility, to patient data security and streamlined vaccine distribution, technology is essential to providing the best care while enhancing experiences (U.S. Government Accountability Office, 2020). Very importantly, as the U.S. population ages and the healthcare industry faces clinician shortages, technology is expected to play a more critical role than ever to help the citizens and patients get access to quality healthcare services (Robert, 2019). Thus, by achieving point of care excellence in the midst of shortage of healthcare workers will begin with the implementation and optimization of electronic health records, unified communication and collaboration, enterprise resource planning and IT service management. This in effect will lead to the maximization of the performance of healthcare technology investments that will requires integrating platform solutions with professional and managed services with the help of Artificial Intelligence (AI).

According to U.S. Government Accountability Office (2020), Artificial Intelligence tools show promise for improving healthcare in the US healthcare system, but no current study has been conducted to help inform policymakers about the prospects and some of the challenges associated with the adoption of AI tools to help ensuring quality implementation of AI tools in the healthcare space across the 50 states in United States. Meanwhile, the U.S. Government Accountability Office (2020) further argued in the literature that AI tools adoption and implementation to the healthcare system will aid in the prediction of health trajectories, and also assist in recommending treatments as well as providing automotive administrative tasks. To assist policymakers and healthcare professional across the 50 states of United States of America towards the smooth adoption and implementation AI tools, this study is design to unearth some of the challenges facing the adoption and application of AI tools to healthcare system. It will also present information about success stories in countries that are currently using AI in their healthcare system, and also presents information about the areas that AI tools have impacted in the healthcare system.

LITERATURE REVIEW

Examples of AI tools Use in Healthcare System

There are numerous examples of AI tools that are being used in different healthcare systems (see Table 1a-1c). The primary aim of health-related AI applications is to analyze relationships between clinical data and patient outcomes (Adams, Henderson, Yi & Paul, 2021; Coiera, 1997; Sun, 2021). AI programs are applied to practices such as diagnostics, treatment protocol development, drug development, personalized medicine, and patient monitoring and care. What differentiates AI technology from traditional technologies in healthcare is the ability to

gather larger and more diverse data, process it, and produce a well-defined output to the end-user (Adams, Henderson, Yi & Paul, 2021; Coiera, 1997).

Table 1a: Examples of AI Tools Use for Healthcare Services

Name	Logo	Primary Function	Overview & Application to Healthcare System
Hippocratic AI		Best for Enhancing Medical Diagnosis	This tool offers a powerful platform that leverages artificial intelligence to enhance medical diagnosis and treatment. It uses algorithms and machine and deep learning, capabilities and learns from experience to correctly and quickly look at medical data. This helps doctors and other health workers make better decisions. The AI system is built to make work easier, make patients healthier, and make medical offices work better overall.
Merative		Best for Health Data Management	Merative tool (formerly IBM Watson Health) offers innovative data and analytics solutions for the healthcare and government social services sectors. Their strong focus on patient-centered data interpretation places Merative at the forefront of AI medical software providers.
Viz.ai.		Best for Stroke Detection	This tool (Viz.ai.) is a groundbreaking AI medical software that revolutionizes disease detection and treatment coordination. Founded by two doctors, CEO Chris Mansi, and CTO David Golan, this diagnostic tool can identify hypertrophic cardiomyopathy, a commonly undiagnosed genetic heart abnormality. Their intelligent care coordination solution is designed to recognize patients, provide crucial information for informed decisions during treatment, optimize care pathways, and ultimately enhance patient outcomes.

Source: Author's modification and (Renaissance Rachel, 2023)

Table 1b: Examples of AI Tools Use for Healthcare Services

Name	Logo	Primary Functions	Overview & Application to Healthcare System
Enlitic	ENLITIC	This tool is best for reading medical images	This tool stands out as a leading AI medical image analysis software, seamlessly integrating advanced technology into existing healthcare systems. Enlitic offers quality assessment by comparing radiology reports against corresponding images, helping prevent both over and under-called findings. This software enhances workflow, efficiency, and quality at scale, revolutionizing medical diagnostics.
Regard	regard	This tool is best used for predictive healthcare analytics	Regard, formerly known as Health Tensor, is on a mission to revolutionize patient care and alleviate physician burnout. They achieve this by using artificial intelligence and machine learning to automate diagnosis, create accurate notes for doctors, and remove administrative tasks. Their smart platform easily works with electronic health records (EHR) to examine patient information, suggest diagnoses, automate note- writing, and capture missed income. With Regard, doctors can improve their medical practice and concentrate on patient well-being. At the same time, everyone involved in the healthcare system benefits from smoother workflows and increased effectiveness.
Twill	twill	This tool is best used for personalized patient care	Twill, previously called Happify Health, pioneered the concept of The Intelligent Healing Company™. Twill redefines patient care by providing a health tech infrastructure that seamlessly integrates various digital solutions. Their main product, Sequences, acts as a foundation that links wellness apps, digital treatments, virtual coaching, telehealth platforms, and other tools to create a personalized and guided patient care experience.
Linus Health	LINUS HEALTH	This tool is best used for brain health checkups	Linus Health aims to enable a future where people can lead longer, happier, and healthier lives with improved brain health. This digital platform offers early detection of cognitive and brain disorders, provides actionable clinical insights for healthcare providers, and delivers personalized action plans for individuals.

Source: Author's modification and (Renaissance Rachel, 2023)

Table 1c: Examples of AI Tools Use for Healthcare Services

Name	Logo	Primary Functions	Overview & Application to Healthcare System
PathAI	PathAI	This AI too is best used for AI-powered pathology	PathAI was founded in 2016. The key aim of PathAI is to provide patients with access to accurate diagnoses and effective treatments. By harnessing the power of artificial intelligence, PathAI enhances the accuracy of pathology diagnosis, clinical trials, and the efficacy of disease treatment, with a particular focus on cancer.
VirtuSense	VIRTUSENSE™	This tool is best used for prevention solution	VirtuSense AI tool aims to transform healthcare by alerting care teams to adverse events such as falls, sepsis, and heart attacks before they occur. This tool was founded in 2013 by an engineer who believed in the power of proactive care. VirtuSense is committed to making healthcare simple, affordable, and accessible without compromising quality.
Cleerly	cleerly	Cleerly is an AI-driven heart imaging technology	This AI tool is a medical software that uses advanced technology to analyze heart scans and detect early signs of heart disease. By examining the amount of plaque in the arteries and calculating the risk of a heart attack, Cleerly helps doctors provide personalized treatment plans. This innovative tool reduces heart attack risks and provides clear insights for doctors to discuss with their patients, improving overall heart health outcomes.
Freenome	freenom	This tool is best used for cancer detection	Freenome is a pioneering AI medical software that focuses on developing high-quality diagnostic tests for the early detection and treatment of diseases, especially cancer, through a simple blood draw. Through their multiomics platform, Freenome's tests analyze disease-associated patterns in the blood, enabling the identification of suspicious molecular patterns associated with tumors. This breakthrough technology bridges the accessibility gap by offering a standard blood test that can detect cancer at its earliest stages, significantly improving the chances of successful treatment.

Source: Author's modification and (Renaissance Rachel, 2023)

Countries Currently Using AI Tools

Currently, advancements in artificial intelligence (AI) are sweeping across all organizations and countries, and the health sector is no exception. It is no surprise that established, developing, and growing countries are all focusing on AI adoption to better their healthcare prospects. While AI technology progresses globally, several big AI powers compete for the first position.
Below are some top nations in the world when it comes to artificial intelligence (AI) in healthcare: India, USA, China, France, Russia, Canada, UK, Sweden, Germany, and Norway (Banik, 2022). So, in order for USA to become an AI superpower across all sectors, including healthcare, the USA is giving China genuine competition.
According to Banik (2022), India is a rapidly rising and developing country experiencing a massive digital revolution. The economic and GDP effect of digital technologies, which is 8%, may be used to assess the influence of technology such as artificial intelligence (AI) on the country. Meanwhile, China is aiming to become the world's leader in artificial intelligence (AI). The pursuit of global domination has always been ambitious. In light of this goal, China's State Council has said that the nation would be a $150 billion AI leader in the world by

2030. In France, the French government has invested over $1.8 billion in AI technologies through 2022. The French AI initiatives will rely on data, requiring private businesses to release their data openly to use it as AI utilization in the healthcare sector.

For the case of Russia, according to Russian President Vladimir Putin, Russia is the AI leader, and the country is expected to dominate the globe. Each year, the country spends $12.5 million on AI. It's also worth mentioning that Russia's real AI resilience is aided by the government's modest involvement in both public and private AI activities (Banik, 2022). Several of the country's Artificial Intelligence demos are also tied to the military. Apart from that, Russia has made significant investments in the medical business to incorporate AI into care delivery. In Canada— The Canadian government invests heavily in AI programs, particularly in healthcare. The Canadian government stated in March 2017 that it will invest US$125 million in ai research. Following Donald Trump's presidential election victory in the United States, Canada began chasing AI expertise (Banik, 2022). Furthermore, the Quebec government has warned that Canada must match the United Kingdom's and China's large artificial intelligence expenditures or risk falling behind in the race to become a worldwide leader in the area (Banik, 2022).
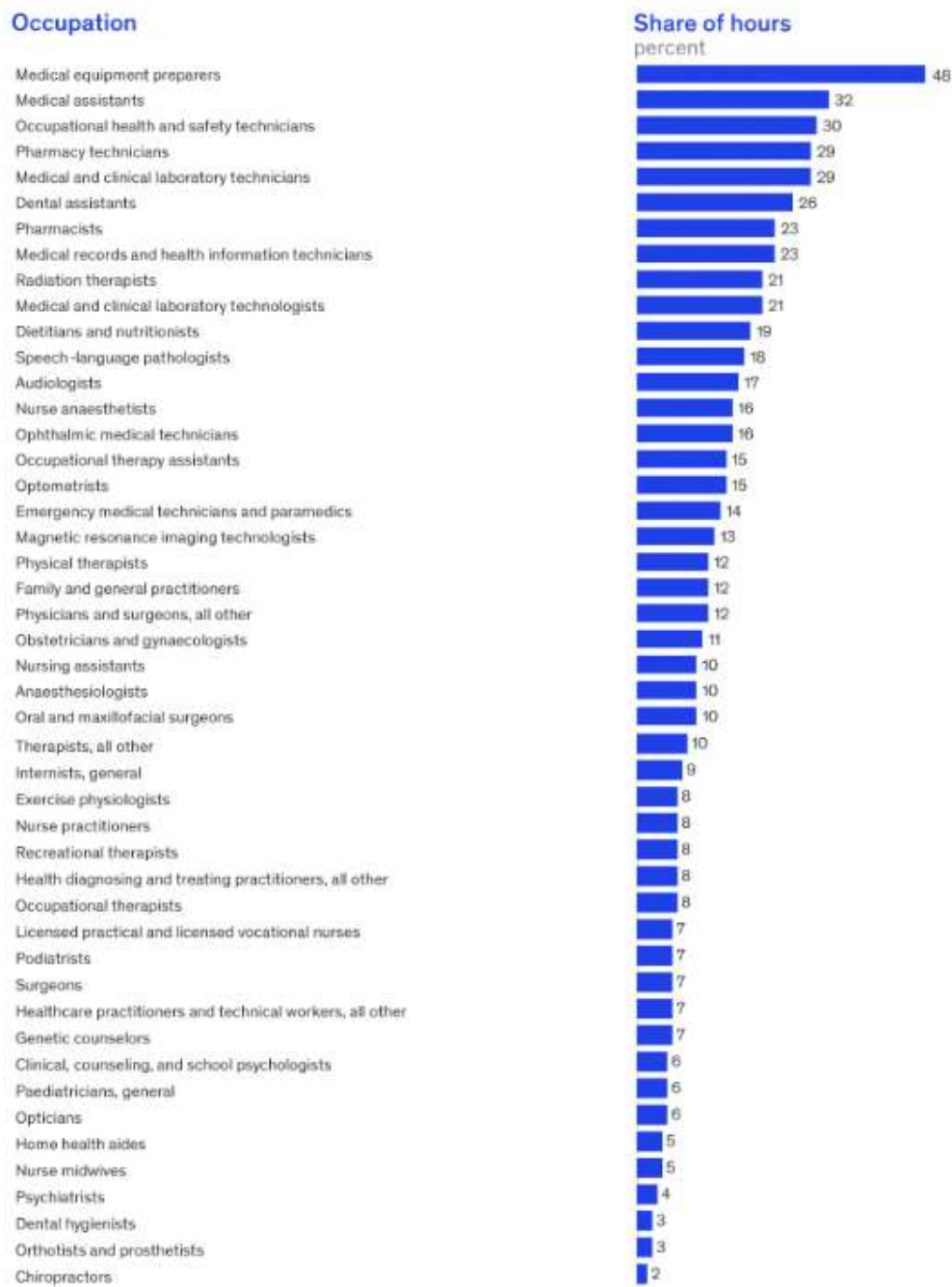
The United Kingdom is the most AI-enabled country in Europe, with 121 AI-enabled businesses. According to a recent poll conducted in Sweden, 80 percent of residents are favorable about AI and robots, meaning that AI might easily replace human employment (Banik, 2022). Those being well in Artificial Intelligence and technology, on the other hand, are more likely to favor the expansion of automation throughout Sweden's different industries. AI is also receiving a thumbs up from Swedish healthcare unions and employees, who believe this will improve the number of human skills and provide them with a competitive edge in the global market (Banik, 2022).

For Germany— the country is well-known for its mechanical efficiency and technological competence. Germany is poised to merge history and technical progress. The country is confident in its leadership position in robotics, self-driving vehicles, and quantum computers. In the fields of healthcare and technological innovation, Germany has achieved significant progress (Banik, 2022). Toward this end, Norway has also demonstrated its desire to expand its technology capabilities outside its oil-drilling and fisheries heritage (Banik, 2022). Even though Norway has a bit of a way to go before being a leader in AI, the acceleration program, which was created in 2017 with US$11 million in financing to help Norway become a technology powerhouse, has set some significant leadership goals. It has made it impossible for AI to be used in almost any field, notably healthcare (Sun, 2021; Banik, 2022).

Areas AI Tools Have Been Applied and Impacted

In a study conducted by McKinsey Global Institute (2020) studied how automation and AI are likely to affect the future of work. The study concluded that automation will affect most jobs across sectors, but the degree varies significantly, and healthcare is one of the sectors with the lowest overall potential for automation—only 35 percent of time spent is potentially automatable and this varies by type of occupation (McKinsey Global Institute, 2020). According to McKinsey Global Institute (2020), the potential for automation is different to the likelihood of adoption. McKinsey Global Institute (2020) analysis used a midpoint scenario, which estimates that 15 percent of current work hours in healthcare are expected to be automated. Table 2 shows the share of hours currently worked that could be freed up by automation by 2030 for a wide range of healthcare occupations in selected European countries. According to McKinsey Global Institute (2020), this does not reflect the potential for further disruption through other factors, such as personalization, that may revolutionize healthcare by focusing on a 'segment of one'.

Table 2: Areas of Impact for AI in Healthcare for Selected European Countries: France, Germany, Hungary, Italy, Portugal, Sweden & UK

Occupation	Share of hours percent
Medical equipment preparers	48
Medical assistants	32
Occupational health and safety technicians	30
Pharmacy technicians	29
Medical and clinical laboratory technicians	29
Dental assistants	26
Pharmacists	23
Medical records and health information technicians	23
Radiation therapists	21
Medical and clinical laboratory technologists	21
Dietitians and nutritionists	19
Speech-language pathologists	18
Audiologists	17
Nurse anaesthetists	16
Ophthalmic medical technicians	16
Occupational therapy assistants	15
Optometrists	15
Emergency medical technicians and paramedics	14
Magnetic resonance imaging technologists	13
Physical therapists	12
Family and general practitioners	12
Physicians and surgeons, all other	12
Obstetricians and gynaecologists	11
Nursing assistants	10
Anaesthesiologists	10
Oral and maxillofacial surgeons	10
Therapists, all other	10
Internists, general	9
Exercise physiologists	8
Nurse practitioners	8
Recreational therapists	8
Health diagnosing and treating practitioners, all other	8
Occupational therapists	8
Licensed practical and licensed vocational nurses	7
Podiatrists	7
Surgeons	7
Healthcare practitioners and technical workers, all other	7
Genetic counselors	7
Clinical, counseling, and school psychologists	6
Paediatricians, general	6
Opticians	6
Home health aides	5
Nurse midwives	5
Psychiatrists	4
Dental hygienists	3
Orthotists and prosthetists	3
Chiropractors	2

Source: McKinsey Global Institute (2020)

METHODS AND MATERIALS

This study follows a narrative literature review analysis. The **literature review research design** is different from other research designs because rather than patients, data to write the report are collected from the published literature (Crombie, 1999; Gray, 1997). Narrative literature review referred to as a systematic review that synthesizes the individual empirical studies—by systematically extracting, checking, and narratively summarizing information on their methods and results (Petticrew & Roberts, 2008). In relation to narrative research studies, an in-depth search and inclusion criteria are explicitly explained and underscored. "Narrative research inquiry is a group of approaches that rely on the written or spoken words or visual representation of individuals" (Lichtman, 2013, p.95). These approaches emphasize the lives of individuals as told through stories. The emphasis, in these approaches, is on the story and often the epiphany. Narrative can be both a method and the phenomenon under study (Lichtman, 2013, p.95). These definitions are pertinent to this particular review study because "narrative methods of research consider, "real world measures" that are appropriate when "real life problems" are investigated" (Lieblich et al., 1998, p.5). In addition, narrative reviews are beneficial in providing conclusions for researchers who examine topics that do not have one optimal way of measuring outcomes (Baumeister, 2003). The narrative nature of this review allowed the researcher to examine and describe a wide range of outcomes of research designed to address the challenges, and importance of animatronic humanoid production within the robotic space.

Data Collection and Sources

Selection of articles. Based on the definition of Artificial Intelligence, Machine Learning & AI application Healthcare, and AI applications, the researcher used the following criteria to select articles for the purposes of the review: (a) Study content included a focus on importance of AI tools to healthcare system. (b) Study content included also focus on AI tools, challenges, and importance of AI to healthcare, and AI adoption in healthcare system within and outside United States of America. (c) Researcher reported findings from empirical research designs (i.e. qualitative, quantitative, survey, or mixed methods designs). (d) All AI tools, practices, application, and implementation in healthcare system related articles published in peer-reviewed journals. (e) Whole books, book chapters, dissertations, and theoretical manuscripts were excluded based on the lack of peer-review in such publications.

As part of the literature search, the data collection procedure considered the first and second authors of the completed simultaneous electronic and ancestral searches for peer-reviewed articles by using these online databases, which includes: MySQL, Apache Cassandra, AI Database Management System (DBMS), Google BigQuery, AmazonRDS, PostgreSQL, Couchbase, Elasticsearch, Redis, DynamoDB, MLDB, Microsoft SQL, and MongoDB as well as Google scholar and advanced Google scholar.

With the help of Boolean search indicators, "or", "and" and "not" the following search terms were entered into databases, Artificial Intelligence, AI in Health care, AI applications, Challenges associated with AI adoption, Challenges associated with AI implementation to healthcare services, Challenges associated with Artificial Intelligence and health care delivery, Significance/Importance of AI application to healthcare system, Types of AI tools for healthcare operation, and Significance/Importance of AI tools to healthcare sector. It is important to note that the initial search results yielded about 1,846 relevant articles on MySQL, Apache Cassandra, PostgreSQL and AI Database Management System (DBMS), 400 on Couchbase, Elasticsearch, and Redis, 250 on DynamoDB, Machine Learning Database (MLDB), Microsoft SQL, and MongoDB, and 1,200 on both Google scholar and advanced Google scholar. Based on the large number of authors using the terms like "AI", "Artificial Intelligence", "Healthcare", and "AI tools" in numerous ways, an abstract filter was also applied to the selection criteria.

The study further widens the scope of the search to minimize the sampling of the selected articles by focusing on the challenges and importance of AI tools application to healthcare. This particular search yielded about 220 articles through the help of abstract filters. After the abstract filtration to reduce the size of the articles' selections, the researcher uses the two concepts, "AI" and "Healthcare" to determine whether those remain articles meet the inclusion criteria, and 40 articles were chosen for inclusion. The researcher gave the 40 articles to two different AI experts, and one Health Informatic professor with knowledge in AI tools and AI application to healthcare at University of Denver to further review the 40 articles independently in order to ensure the reliability and validity of the analysis (or results). As a result of the three independent reviews by experts in the field, and a completed total of three ancestral searches resulted in 15 articles for final inclusion. Therefore, a total sample of 15 articles/publications which met the inclusion criteria were used for the purposes of the review analysis.

General Findings

Table 3: Challenges that Stakeholders Needs to Address in Order to Ensure Smooth Adoption of AI in Healthcare System

Challenges	Percentage (%)	Number (*n*)
Working together to deliver quality AI in healthcare	33	5
Rethinking education and skills	27	4
Strengthening data quality, governance, security and interoperability	40	6
Managing Change	20	3
Investing in New Talent and Creating New Roles	27	4
Working at Scale	20	3
Regulation, Policymaking and Liability, and Managing Risk	33	5
Funding	47	7

Note: fifteen total articles.

Figure 1 and Table 3 presents the discussion for the challenges that stakeholders need to address in order to ensure a smooth adoption of AI healthcare system. Based on the review, it was observed that researchers of 5 (33%) articles explicitly stated that "working together to deliver quality AI in healthcare" is one of the challenges that stakeholders need to address in order to ensure smooth adoption and implementation of AI in health care system (see Table 3 and Figure 1). It was further observed that four researchers representing 27% (includes Ahadi, 2023; Mullainathan & Obermeyer, 2022, Ackerman, 2021; Banik, 2022) explained in their research that one of the challenges that stakeholders need to address in order to ensure smooth adoption and implementation AI in health care system is "Rethinking education and skills".

Additionally, six other researchers (i.e., Davenport, & Kalakota, 2019; Ganapathy, Abdul, & Nursetyo, 2018; Reddy, Fox, & Purohit, 2019; Nadikattu, 2017; Etienne et al., 2020; Lin, Mahoney, & Sinsky, 2019) concurrently argued that one of the challenges that stakeholders need to address in order to ensure smooth adoption and implementation of AI in health care system is "Strengthening data quality, governance, security and interoperability" (see Table 3 for more details).

Figure 1: Challenges that Stakeholders Needs to Address in Order to Ensure Smooth Adoption of AI in Healthcare System
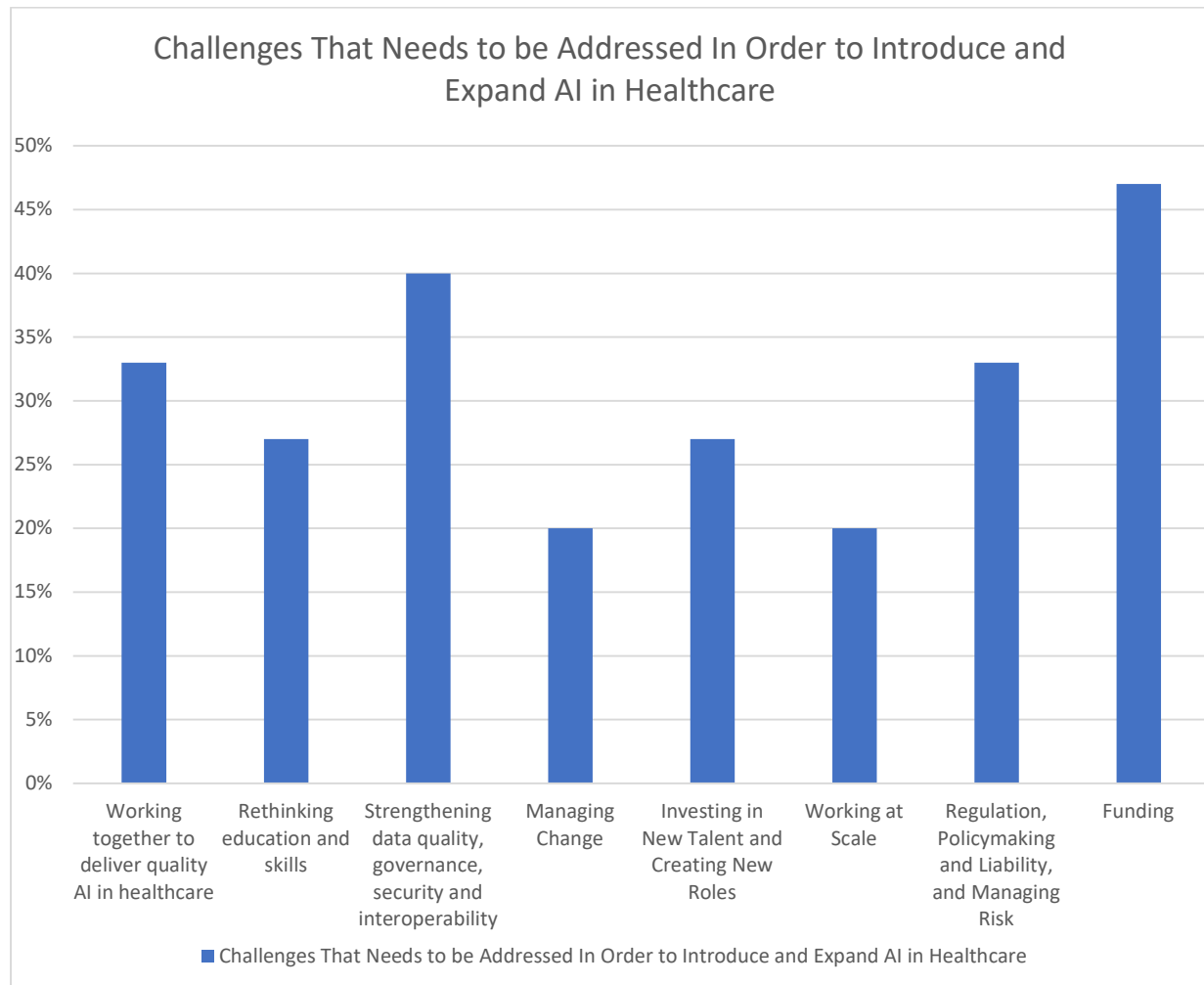
Also, three (14%) researchers (Mesko Hetenyi, & Gyorffy, 2018; Ahadi, 2023; McKinsey Global Institute, 2020) arguably discussed that "Managing Change" is one of the challenges that stakeholders need to address in order to ensure smooth adoption and implementation of AI in health care system. Again, Figure 1 reveals that four (27%) researchers (McKinsey Global Institute, 2020; Gray, 1997; Coierra, 1999; Millman, 1993) provided detailed discussion in the literature about the fact that "Investing in New Talent and Creating New Roles" is one of the challenges that stakeholders need to address in order to ensure smooth adoption and implementation of AI in health care system.

Furthermore, Figure 1 and Table 3 revealed that three (20%) separate studies (conducted by Reddy, Fox, & Purohit, 2019; Nadikattu, 2017; Etienne et al., 2020; McKinsey Global Institute, 2020, respectively) argued concurrently that one of the challenges that stakeholders need to address in order to ensure smooth adoption and implementation of AI in health care system is "Working at Scale". Additionally, it was also underscored in the literature that five researchers (representing 33% of the datasets) revealed that "Regulation, Policymaking and Liability, and Managing Risk" is one of the challenges that stakeholders need to address in order to ensure smooth adoption and implementation of AI in health care system. Toward this end, seven (47%) researchers (Mesko Hetenyi, & Gyorffy, 2018; Davenport, & Kalakota, 2019; Ganapathy, Abdul, & Nursetyo, 2018, Reddy, Fox, & Purohit, 2019; Etienne et al., 2020; Lin, Mahoney, & Sinsky, 2019; McKinsey Global Institute, 2020) argued that one of the challenges that stakeholders need to address in order to ensure smooth adoption and implementation of AI in health care system is "Funding" (see Table 3 and Figure 1 for more details).

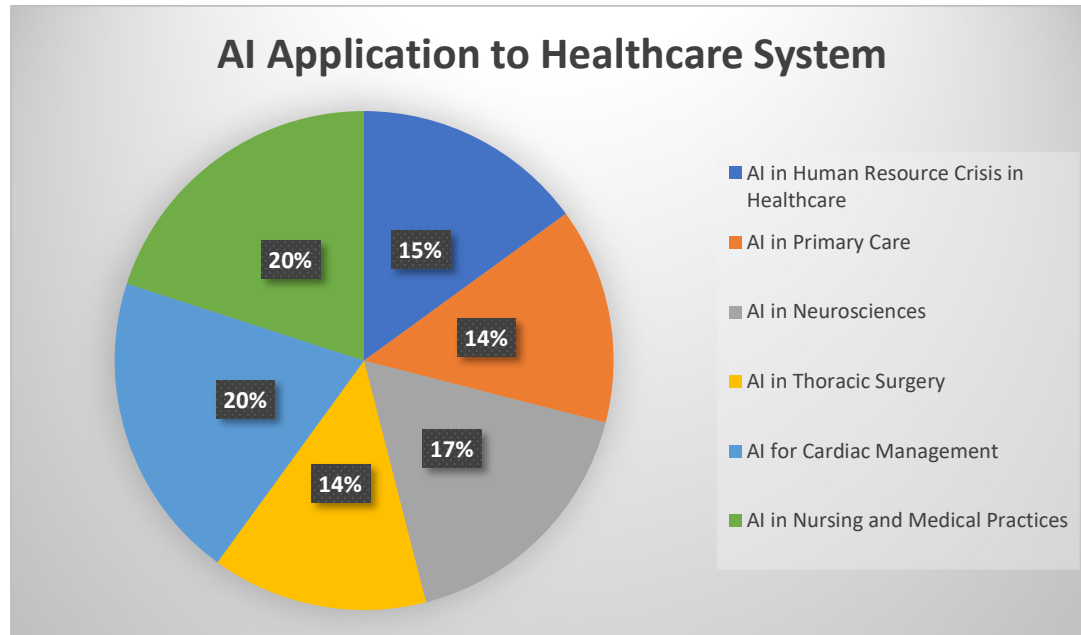**Figure 2:** Importance of AI Application to Healthcare System

Table 4: AI Application to Healthcare System

AI Application to Healthcare System	Percentage (%)	Number (*n*)
AI in Human Resource Crisis in Healthcare	15	2
AI in Primary Care	14	1
AI in Neuroscience	17	3
AI in Thoracic Surgery	14	1
AI for Cardiac Management	20	4
AI in Nursing and Medical Science	20	4

Note: fifteen total articles.

Figure 2 and Table 4 presents the discussion for AI application to health care sector, and associated benefits or importance of AI application to healthcare system. Figure 2 reveals that about 15% of the selected articles underscored that AI application to healthcare system carries special ability in addressing human resource crisis in the healthcare system. That is, according to Mesko et al. (2018), AI application to healthcare system can help address the huge crises of healthcare workforce due to doctor's shortage worldwide, aging and burnout physicians and more demand for chronic health care across the globe. It was further underscored in the literature that there is over 17 million shortage of healthcare workers globally in addition to aging workforce, due to the increasing number of patients and shortage of physicians, thereby putting pressure on the few workforces leading to sleep disorder and burnout of healthcare workers. Also, Figure 2 reveals that 14% of the datasets showed that AI application to the healthcare system could aid in the growth and assistance in Primary Care service delivery to patients. So, with regards to AI in Assisting Primary Care Services, Lin et al. (2019) underscored in the literature that as we move away from fee-for-service to value-based payments, the population of health management industry is expected to increase many companies, by exploring the role of AI to improve their ability to identify, and to optimize their performance by using population health tools for physicians. As a result, many companies are developing Artificial Intelligence doctors can use to provide health advice directly to patients (Lin et al., 2019).

Figure 2 and Table 4 further revealed that 17% of the selected articles underscored that AI application to healthcare system carries special ability in examining the human brain. That is, according to Ganapathy et al.

(2018), AI in Neurosciences application to the human brain is very complex to understand and perform related surgical practices. AI can help doctors to remain up to date by providing recent research about certain diseases and helping them to provide better care to their patients (Ganapathy et al., 2018). Above all, AI application to the Neuroscience aid in **the scientific study of the nervous system (such as the brain, spinal cord, and peripheral nervous system), its functions and disorders.**

With regards to AI application to Thoracic Surgery, Figure 2 and Table 4 reveals that about 14% of the datasets showed that AI tools could be applied to the healthcare system in the area of Thoracic surgery. According to Etienne et al. (2020), Thoracic surgeries are showing great improvement by recent advances in AI technologies. Improvements in fields such as radiology, pathology or respiratory medicine have helped surgeons to treat patient effectively. Above all, it was observed from the literature that about 20% of the datasets showed that AI application to the healthcare system could aid in the following: (a) Cardiac Management, and (b) Nursing and Medical practices, respectively (Robert, 2019).

CONCLUSION AND POLICY RECOMMENDATION

In conclusion, Artificial Intelligence tools show promise for improving health care. They can help predict health trajectories, recommend treatments, and automate administrative tasks. According to the literature and based on the dataset some of the challenges associated with the application of the AI tools include: ***transparency issue— that is, if*** a medical provider doesn't know how an AI tool works, it could reduce trust in the tool. Also, limitations and bias in data can reduce the safety and effectiveness of AI tools. Above all, in relation to data, by obtaining high-quality data needed to create effective AI tools can be difficult sometimes. As a result, it recommended that policymakers should make available funding resources, education and skills training to the healthcare system through budgetary allocation in order to ensure smooth adoption and implementation of AI in health care system. This will go a long way to help improve upon the knowledge and transparency issue that surrounds the use of AI tools. For example, among the investigated AI systems, the receptionist robot was the only patient-centric AI in which the users were patients rather than doctors or other hospital staff (Sun, 2021), therefore by increasing funding to educate patients and healthcare staff will help improve upon the knowledge-based power structure to make it effective in facilitating patient use and that the knowledge and skills of different stakeholders will also influence the usage of AI.

It is also recommended that policymakers and government officials should provide or make available AI Virtual Care to complement the traditional healthcare ecosystem by integrating AI electronic health records, telemedicine, wearable devices, data analytics and artificial intelligence. Therefore, by providing clinicians, administrators and patients with next-level AI or IT solutions will enhance future decision-making with remote-monitoring, and expands medical services to benefit underserved populations.

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