TECHNIUM
SOCIAL SCIENCES JOURNAL

Vol. 73/2025

A New Decade for Social Changes

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International
Communication & PR

TECHNIUM SOCIAL SCIENCES JOURNAL

Technium Social Sciences Journal
Vol. 73, 460-476, July, 2025
ISSN: 2668-7798
www.techniumscience.com

Artificial Intelligence's Expanding Role in Healthcare Administration: A Technological Revolution or a Risky Disruption?

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Abstract. The power of Artificial intelligence (AI) can be harnessed to transform healthcare administration into a more efficient and cost-effective system that drives improved patient outcomes. In this review, we examine the broader role of AI in healthcare within the contours of healthcare systems, with specific emphasis on the current use of AI in data, predictive analytics, and decision support. The paper provides a critical appraisal of the opportunities and challenges of integrating AI, from data privacy and algorithmic fairness to over-dependence upon technology. It also delves into the moral and regulatory grey area that these healthcare administrators must navigate as AI technology becomes further integrated into institutional structures. Focusing on the strategic leadership, multidisciplinary cooperation and organizational readiness, this study highlights that a successful implementation of AI requires not only investments in technology but also a whole strategic design and ethical anticipation. The review is outlined and as well as the current trends and up-and-coming areas is presented and the continuous medical education and updating of the healthcare professionals are emphasized. At its core, this study aims to provide policymakers with a better understanding of how they can best embrace AI's game-changing potential in a way that minimizes the risks, providing as a counterweight to guide healthcare institutions as they navigate this rapidly evolving technological landscape.

Keywords. artificial intelligence (ai), healthcare administration, predictive analytics, ethical and regulatory challenges, digital health transformation

1. Introduction

Artificial intelligence (AI) is poised to dramatically change the way business is done across industries and sectors. Healthcare administrators need to understand the implications of AI for their organizations, their work, and those around them. In healthcare, just as in other industries, there is growing interest in AI technologies and their implications for operations, decision-making, service development, and patient experiences. AI is expected to affect workflows and approaches in a similar manner to information technology and Internet-based technologies. In healthcare, AI promise to help organizations encounter increasing patient care demands, grow volumes of data, and concerns surrounding decision support. Potential AI applications include the analysis of imaging studies, prediction of disease progression, and monitoring of chronic conditions. Despite these benefits, AI technology largely remains immature, and implementation is expected to take decades [1].

The barriers that have delayed the deployment of AI in healthcare must be understood and addressed, or organizations will not realize the promise of the technology. Although some initial AI technologies for healthcare delivery have reached commercialization, implementation into the practice of established organizations, particularly in U.S. healthcare systems, is still in the infancy. Ethical concerns regarding data acquisition, nurturance of AI processes, governance, and algorithm transparency also hinder widespread acceptance and accessibility. Expanding commercialization of AI products means that health providers and systems need to consider several relevant questions [2]. Top- and middle-level executives must ensure that investments in AI technologies are continuously nurtured. Organizational learning and readiness initiatives are foundational to the implementation of any change, but the sociotechnical issues associated with AI expansion exceed those of other changes. Adequate preparation personnel must be recruited and trained for the proper monitoring of AI technologies, and there must be a comprehensive understanding of how AI technologies either align with the organization's mission and structures or require wholesale alterations. Potential AI implementation also must be studied and explored at various administrator and nursing levels to mitigate possible resistance [3].

2. Overview of AI in Healthcare Administration

The term artificial intelligence (AI) represents the goal of implementing machines that can mimic cognitive functions normally associated with human thought. AI holds the promise of machines executing tasks normally requiring human intelligence and the term is being used broadly to describe a range of technologies and algorithms that can support and augment more traditional, human-oriented processes across all industries. In healthcare, AI has the potential to radically change the way data is captured, stored, and applied to improve patient care and simplify administrative tasks. The ability to identify patterns, understand context, and augment decision-making, while integrating unstructured data, situates AI as a key enabler in areas such as precision medicine, workflow optimization, and more generalized population health methodologies. In healthcare administration, the application of AI has the potential to reduce the administrative burden, enhance quality of care, augment decision-making capabilities, and optimize resources for revenue cycle management, while fostering scalability through efficiency [4].

The ability to increase automation based on complex machine learning methodologies available in AI will greatly reduce the administrative burden on care providers, while ensuring simple and equitable service across a broader set of patients. AI is critical to the hunt for patterns in complex datasets, such as population health analytics, where health record data can be walked across constructs to generate insights that support early intervention and improved outcomes. AI can improve processes of care, enabling simultaneous service to large numbers of patients, and eliminating paper-based bottlenecks. There is a strong incentive for increases in efficiency through AI applications in all aspects of administration. In addition, new forms of consumerism require new forms of proactive care delivery and patient engagement. AI is fundamental to synthesizing large amounts of data in smart, adaptive ways to counteract unproductive and costly administrative processes in revenue cycle management [1].

3. Current Applications of AI in Healthcare Administration

AI is taking root in a wide variety of applications throughout the healthcare space, but mainly in the lowest tiers of the administrative work pyramid, where the basic requirements are simple repeatable procedures for poor quality vetting and data entry. AI is being employed wherever data-intensive processes can be improved or carried out even by non-human agents. The first and foremost benefits are in the areas of behaviour detection like fraud, waste, and abuse monitoring. AI also enhances patient and pharmacy triages and follow-up visits via automated outreach efforts, AI chat bots, email, or texting. In the higher echelons of administrative work, such as planning, recruiting, and human resources, conflict of interest, quality improvement prevention, or the major diagnostic categories (MDC) examination monitoring, AI is also slowly conveyed across the board, but at a much slower rate [5]. The media focus is looking at healthcare in wide terms, hence, the “appreciation-gratitude usage”. Scope cutting, however, is a major factor when looking into the wider picture. Most of the credit for this change should be levelled at government regulations being published, which expedited the investment and speed of applying AI in a competitive manner.

The wide range of uses of AI within the healthcare sector highlight its role as an enabling technology. AI diagnostic systems rely on machine learning to identify patterns within vast quantities of data which would be infeasible to program manually [2]. These systems require large and representative datasets to produce accurate outcomes. As a result, the application of AI technologies in healthcare presents considerable implementation challenges. AI systems require a considerable amount of data to operate, yet such data is not easily collected nor coded uniformly across healthcare systems. Additionally, there is a credible threat of AI systems yielding biased decisions, either because of unrepresentative datasets or biased algorithms used to analyse those datasets. The implementation of AI systems in healthcare requires both the right data to yield meaningful results and a sufficiently extensive dataset to train algorithms in a way that represents the individuals associated with those datasets. It must also be ensured that training datasets are appropriate for the population that the AI algorithms will ultimately serve [6].

3.1. Patient Data Management.

AI’s application in the development and use of patient records and data systems has implications for accountability in data governance. Health information management (HIM) professionals have duties related to governing healthcare data including policy development, oversight and specialist supportive clinical management (SSCM) [1]. Given increased adoption of machine learning and AI-enabled applications by healthcare providers, HIM professionals can participate in guiding the responsible development and governance of healthcare data moving forward. HIM professionals can play an important role in the culture shift required to govern AI models, providing oversight of prior knowledge and foundational errors on training and test data sets, monitoring use and performance in individual health systems, and auditing and assessing unintended consequences of AI tools to refine and change these tools. Policy development can include increasing transparency and accountability for data development and model management, training, and testing on more diverse data. With the advent of more AI tools integrated into existing electronic health records (EHRs) in daily workflows, HIM professionals must maintain close ties to information system governance groups regarding health systems’ information policies for AI tools. Ensuring AI-enabled products and decision-support tools can reflect accountability for any decisions made, verification of model predictions or transformations, and sustained quality of model outcomes would be critical policy issues [7].

Many newly available data types are affecting data practice. Healthcare data has long been based almost entirely on encounter-based data – structured data captured during clinical visits – with notes germane to this data type written asynchronously. AI-enabled applications such as

EHR solutions for capturing social determinants of health data, speech transcription applications capturing interactions/notes asynchronously in different clinical workflow stages, and streaming data from wearable sensors monitoring vital signs or emotional/interpretive data are changing what patient data is and how it is used. The past five years have seen the production and possession of many different and new data types by healthcare organizations. The Internet of Things (IoT) is a significant technology development that is expanding the amount and diversity of data generated in healthcare. IoT would today generally be understood to refer to devices connected the internet that identify themselves with automated systems, collecting and exchanging data. In healthcare, IoT devices are usually sensors attached to patients that passively collect biomedical data such as electrocardiogram readings, glucose levels, or interpretive readings of cognitive and emotional health in different audio frequency bands [8].

3.2. Operational Efficiency

Hospitals use various health administrative information technologies (IT) software and systems for operations measurements, such as customer identity and access management (CIAM) systems, enterprise data warehouse (EDW) frameworks. The raw data from different transaction systems is captured, processed, and communicated in the clinical and administrative workflow for services measurement, quality assurance, and planning. However, healthcare data currently have limited potential. They have not yet been used as a strategic asset at the managerial level. Hospital managers face barriers in data integration, interpretation, and timely availability. An important take-home message from the inventory and case studies is that health data integration is paramount in both a technical and a managerial perspective. The technical integration should first focus on delivering the patient's world-view data supporting the patient's clinical journey, and once accomplished, move to the whole hospital perspective. Only then will it be perceived as relevant in the managerial decision-making process. Health management is perceived as a data-poor field and sometimes as second-class science [9]. In addition, adopting AI technology in hospitals is not just a matter of technical solution implementation but also affects fundamental components of operations and capability organizations. It challenges the organizational architecture by influencing the division of labour (what, who, and how tasks are allocated), organizing the tasks (technical systems and workflow), and the underlying basis on which the divisions and organizing choices are made (on which grounds organization and management make trade-offs between technical and social factors). The managerial implications extend beyond assessing and implementing a technical improvement in a functional area. Hence, there are potential challenges on how to integrate AI systems into the firm's operations and clarify the changed hierarchy of decision rules by which some upgraded computers decide, given the consequences of such upgrades [10].

3.3. Predictive Analytics

Numerous machine learning (ML)-based predictive analytics platforms are in development. A discussion of the working principles of those platforms and their advantages and drawbacks based on in-depth literature analysis has been included. A wider discussion of opportunities and challenges offered by predictive analytics in healthcare is also included.

In ML-based statistical predictive modelling, there is no necessity for the modeller's in-depth understanding of the statistical principles underlying the various algorithms applicable to predictive analytics. The model sameness, i.e., accuracy, precision, and recall, of various ML methods can be clearly stated numerically. The algorithm selection problem can be resolved by estimating the resources obtainable in an organization and by estimating the problem size and its complexity. The isolation of an accurate presenter for strategic modelling (SM) is simple based on the model sameness. ML-based strategic modelling is commonly used these days for predictive analytics [11].

Healthcare analytics is the method of combining healthcare data and information with analytical tools to generate knowledge and insights that support decision-making regarding healthcare services and organizations. The American healthcare industry is predicted to spend 34 billion USD on big data IT in 2020. However, recent research indicates that even if healthcare organizations have access to big data IT, many are not recognizing the intended business benefits. Out of 100 healthcare executives surveyed, 121 claimed their organizations presently invest in big data analytics. Most of the organizations in these studies acknowledged the privacy and ethical concerns that go along with healthcare data analytics. Of all the US healthcare organizations included in these surveys, more than 70% of resources and investments now go towards the storage of data [12].

4. Benefits of AI Integration

The COVID-19 pandemic has brought the healthcare administration system into the spotlight, highlighting its complexities and instances of failure. However, it has also forced health systems to act quickly to improve services, and research and literature have quickly acknowledged the difficulties but equally the advancements in health administration. Despite patient-centric efforts and the automation of multiple administrative tasks, healthcare systems post-COVID-19 are in crisis. The slow processes have been highlighted with the arrival of rapid mass data generation systems, but they require equally rapid technological disruption for health administrators to re-examine the fundamental constructs of health administration or run the risk of becoming irrelevant [2]. AI, followed by the term "systems," should be a large part of the conversation. This article analyses whether the integration of AI systems within healthcare administration is a genuine technology revolution or a risky disruption.

AI systems are smart machines capable of performing tasks that require human intelligence. They can sense and capture data from the environment, comprehend it, learn from it, extract knowledge, reason about the information, and act upon it. They can perform cognitive tasks, typically considered human without human intervention, assisting or augmenting humans in performing these tasks. The most common and simplest examples of AI systems are defined as a combination of algorithms and technology to solve specific problems or perform tasks that normally need human intelligence; they include expert systems, natural language processing and generation systems, machine learning, deep learning, neural networks, robotic processing systems, and vision systems [13].

The foundation of AI systems consists of data, algorithms, and processing power. They are dependent on this technological triad serving fundamental functions prior to their human-directed processes. Data need to be digitized and structured for the selection of algorithms that take advantage of computing power. When raw data are stored and collected, they need to be further processed to allow easier understanding and manipulation of knowledge for non-tech people. When a final form of information is reached, it is time to formulate questions that would lead a decision-maker to decide on a course of action. AI systems without data are like speed watches without the ability to read time. Humans define the format and scope of questions, and potentially the pace of processes. Given the progress related to data – the larger the data formats, the more detailed, the more continuous – a new question arises about the distinct role of AI in "smart without human decisions" (resurrection of the word "AI") [14].

4.1. Cost Reduction

Administrative AI addresses critical challenges with impact on cost reduction, workforce recruitment and retention, and improving service delivery. Administrative AI lowers costs by automating labour-intensive information-handling tasks, improving workforce productivity by allowing human workers to off-load more mundane tasks to AI, and improving service access and design. Examples include natural language processing applications to automate the invoice-searching task in finance departments, or providing injury, sick, or leave notes automatically generated for employees rather than endlessly back-and-forth human email chats. Improving healthcare services informally and formally using AI is staggeringly broad. Informally, general-purpose AI chatbots provide personal AI-powered assistants to business and research scientists and other professionals, for example running searches for more detailed queries and summarizing and automating task reporting on large document bodies within organizational constraints, cross-organization construction, or formal ethical channels [13].

Administrative AI opportunities and readiness levels vary widely by sector and within institutions. While finance completed a digitization effort for foundational data years ago and invested up to 24 times more initial effort than healthcare or education in re-engineering uses for more efficient digital channels rather than existing labour processes, healthcare and other industries seek answers on where to begin. Implementation readiness levels need to consider encouragement of existing labour-friendly AI bots (e.g., AI in EHR, clinical coding). Assessing whether existing workflows are conducive to these choices, particularly as healthcare reimbursement links payments to linguistic complexity, is also important. The transition from institutional computerized systems to platform-ed, cloud-knitted systems is radical and complex and cannot be done unless advance assistance is provided to parties with clear governmental, professional, and ethical mandates to help ensure full information system adjustments complement existing hardware in a flexible manner [15].

4.2. Improved Patient Outcomes

The capabilities of modern AI techniques yield a powerful foundation for a technological revolution in the healthcare sector. AI is fundamentally an enabling technology with a vast range of possible uses in the healthcare sector. The applications of AI can be grouped into four broad categories corresponding to the different layers of the digital health systems architecture, namely content, service, network and device layer [2]. At the content layer, different forms of patient data can be integrated into a wide range of outputs. Integration from disparate sources generates deeper data findings over and above the individual records themselves. At the service layer, the capabilities of analytics extend from guiding screenings and diagnostics for one sole disease to other diseases. New business models can be enabled to deal with a wide range of data analytics and software services with a single piece of machinery. At the network layer, information from different hospitals can be integrated so that data that are currently unorganised in different siloed infrastructures can be integrated into a shared and bigger dataset. Network integration takes information from different machines already deployed in different hospitals and generates aggregate insights over the entire patient population that is currently infeasible with shared models. At the device layer, physical machinery is being developed. As much as new AI chemical and biological mechanisms need to be developed, new AI logical capability lies on a spectrum of a whole range of available hardware.

High quality healthcare knowledge is mostly tacit, derived from a wealth of information with a heterogeneous nature. Doctors have available a wealth of information regarding individual patients that will assist the diagnostics and treatment decision-making process. This wealth of information is diverse: it consists of patients' medical records, prescription history, demographic information, social circumstances, real-time data such as medical test result and heavy symptoms, etc. Much of this information is unstructured and, therefore, mostly not easily modifiable. The information upon which humans base their decisions cannot directly flow into computational systems without this codification [16]. AI systems that rely on machine learning and are a product of the recognition with logical underpinnings have an alternative way to encapsulate knowledge and take decisions. AI systems process other data types, looking for patterns to identify outputs, which would be infeasible to programme analytically. However, to produce credible outputs, machine learning and other AI systems require large datasets that are representative of the entity that they will serve. AI systems with logical underpinnings face two sources of possible bias: biased datasets and biased algorithms. Datasets that fail to capture a representative sample of the possible population of inputs underlying the tested logic/concept results in biased systems. AI algorithms can also be inherently biased. Before AI systems can be fully implemented, extensive testing needs to be conducted, and the appropriateness of the training datasets will need to be ensured given the population group onto which these algorithms will ultimately operate [17].

4.3. Enhanced Decision-Making

The increased access to vast unstructured data, boosted by the development of deep-learning algorithms and enhanced computational power, has allowed healthcare organizations to analyse and interpret health data on an unprecedented scale. Relying on pre-existing knowledge-based systems, AI technologies can integrate and analyse large sets of medical records, such as demographic, clinical, genomic, and social determinants, to find novel patterns. Brought together in one place, new datasets can reveal new relationships between pieces of patient data, resulting in better predictive analytics algorithms. Automated analysis reveals complex relationships and patient patterns that far outstrip human capabilities in terms of time, effort, and accuracy. The result is efficiently predicting patient risk across different types of risk, such as readmission, mortality, and fall risk [18]. AI technologies can also challenge existing assumptions used by healthcare professionals to classify risk. The potential risk prediction for an individual patient may very well differ from their already known risk classification. Despite the excitement surrounding predictive analytics, AI-based risk prediction models can end up propagating biases and racism present in the datasets used to train them. Understanding disease prediction would benefit from knowledge of which patients were in the dataset, which diseases they had, which demographics they belonged to, which hospital they came from, and which subgroup suffer from the illness more than it should. The design of many machine-learning models results in the so-called black box problem, where it becomes impossible to explain how algorithms extract their input datasets. Hence, while a health system may adopt an AI system capable of extracting, interpreting, or predicting appropriately, it does not mean the model is right, responsible, unbiased, or fair. By applying predictive analytics, prediction algorithms could help make optimal recommendations to both patients and healthcare professionals at intervention, diagnosis, and treatment levels. Intervention-level decisions refer to making health-related behaviours and lifestyle changes that lead to better health outcomes. Other decisions, such as suggesting suitable screening tests where no symptoms exist, also count as diagnostics. Treatment-level decisions refer to drugs or therapeutic solutions [19].

5. Challenges and Risks of AI

Despite the revolutionary potential of AI in healthcare administration, eight indispensable challenges and risks need to be addressed. The first challenge pertains to governance and regulation. Understanding AI's impact on patient and data safety, as well as equity of care and healthcare jobs, requires a comprehensive knowledge of AI's functioning. Overregulating AI could rapidly make it obsolete, while under regulating AI could run a risk of lethality. Also, healthcare needs cross-border AI regulations that can keep pace with the rapidly evolving technology [2]. However, policymakers and regulators lack the knowledge needed to do either, leading to either too slow or too blunt a response to adoption challenges.

The second challenge is algorithmic fluctuation. Covariate shift can occur when the real-world environment where AI is deployed shifts from the environment where it was trained in. Predictive performance loss due to distribution shift can result in healthcare AI that was once accurate producing erroneous predictions or judgements over time, which creates a serious safety hazard [13].

The third challenge concerns the unique clinical context and domain knowledge. More than simple correlations in the data, regression assumes that the data-generating process is scientific. Healthcare AI solutions are often formulated outside healthcare by firms lacking domain expertise. Synthetic datasets lacking clinical, physiological, or pathological context are standard. AI products could make misleading predictions and judgements. AI often needs context, including domain-specific interpretation, verification by experts, and medical knowledge. The language of AI is statistics, while clinical variables speak medicine.

The fourth challenge pertains to efforts to explain AI. As AI applications proliferate, health services need to have some means of explaining hospitals' AI, data, quality, and evidence needed for risks to be balanced against their anticipated benefits. However, given their fast-changing nature, it is challenging to both explain AI outputs and accept liability. Further, explaining AI could inadvertently raise concerns about its reliability rather than clarify how it generates safe and valid interpretation [10], [20].

5.1. Data Privacy Concerns

Unlike their clinical counterparts, the implementation of AI technologies in the business aspects of healthcare has largely gone unnoticed. As has been pointed out, however, rapid advances in AI technologies for healthcare administration also raise significant concerns—especially with the deployment of natural language processing (NLP) and machine learning tools that rely on patient data [21]. In this respect, it is important to recognize that the implementation of AI technologies in healthcare administration is likely to occur very rapidly. It is thus critical to ensure that concerns over the ethical and safe implementation of such tools are engaged with quickly.

The most pressing issue in this area is data privacy. Rapid implementation of these AI technologies, with little oversight or regulation, poses severe risks to patient privacy. The emergence of technologies has raised the profile of similar tools that would enable language generation with medical reports or other data. Such technologies design neural networks using vast amounts of publicly scraped information. If encrypted healthcare data were to be ingested, either intentionally by bad actors or unintentionally through lax adherences to protections, even with de-identification it is likely that protected health information (PHI) at individual or group levels could be decrypted and replicated. These risks are magnified by the growing trend of cloud computing in the healthcare sector, which is expected to exceed $40 billion by 2026. Making health data more portable both enhances efficiency but also broadens the attack surface for bad actors. This challenge has been compounded by the emergence of new "super" large language models and foundation models, which, because of their size, require far more complex architectures than previous AI systems, and are often inaccessible for examination [10], [22].

5.2. Bias in AI Algorithms

AI algorithms and datasets, including some for-healthcare administration, have shown bias in many ways. It is all too evident that some of the leading natural language processing (NLP) algorithms produce racially and physically biased outputs when fed a prompt related to a person of colour, say, a Hispanic woman [23]. As AI algorithms and datasets conquer more tasks in middle-aged work such as healthcare administration and medicine, they can produce similarly biased outputs, but in very different ways. For example, a neural network algorithm which uses patient race as one of its features to predict a patient's risk of a subsequent poor health outcome will likely be "fair" from a legal and ethical perspective. Since its training dataset is race-stratified, it is legal and of high ethical standing for its user to apply it to assess Black patients' risk of COVID outcomes. However, its decision boundaries are borne from training data, which thus inherently reflects the prejudices or biases of the medical decision-making that patients of different races have historically received. Users of such algorithm will tend to under-treat Hispanic patients since low-resource and less access to screening/treatment claims are likely to be present in the training data [24]. The nature of AI datasets and algorithms will make assessment of their equity and accuracy hard as their outputs will likely be unbiased in probabilistic terms. The importance of this is underscored by the fact that some of the first AI algorithms getting health regulatory approval for tasks in healthcare administration have these properties. A major challenge here is thus defining exactly what equality/delivery use means in terms of either testing or auditing the engineering or medical validity of an AI algorithm like that above. Furthermore, since AI data generation and algorithm engineering will soon be in the hands of untrained personnel in other industries, there will be little-to-no standards on best or accepted practices or tools for users to conduct the testing necessary to ensure either equity or accuracy. Nevertheless, there are attack models amenable to the definition of what unfair means with respect to testing datasets [25].

5.3. Dependence on Technology

The digital technologies that comprise AI can make expert systems. They can do so by converting specialised human knowledge into programmable rules, procedures and algorithms that can be executed by machines, which can then replicate the detailed performance of a well-credentialed human expert. If such knowledge is made computable, this can result in automation and efficiencies, though decisions over what knowledge is to be converted into algorithms will, ultimately, be anthropocentric [2]. Digital technologies and AI are inherently dual-use technologies that have transformative capabilities as well as the potential to be misused. AI is inherently dual use: the same technology can be used for both benevolent and malevolent applications. AI thus combines hype and extreme optimism on the one hand with an acknowledgement of risks and negative consequences on the other. The primary concern about digital technologies is loss of control. The purposes of loss of control, automation and efficiency, are now ubiquitous, targeted at both highly monetised and social goods: dominance of social media and advertising markets; undermining privacy; domination of search and recommendations; and fraud by synthetic data and fake news [13]. These mass implementations typically occur despite operators having limited control over the data, models and algorithms and in environments which are often highly complex and chaotic. This widespread digital dependence requires relinquishing some degree of responsibility to machines; organisations have liabilities over the performance of digital systems, but a greater responsibility is borne by the technology developers. As new services are engineered out of existing data and technologies, accountability may also be removed unless appropriate mechanisms exist to govern data and AI systems. This collective loss of control suggests an inadvertent but increasing risk that future systems may be capable of inflicting considerable harm and impact. Such loss of control can come about because existing digital technologies are often highly complex and thus opaque. The resulting unpredictability and non-comprehensibility render the machine-learning core of the system a mystery even to the designers and builders. It may thus be impossible to provide adequate assurances of safety and reliability [22], [25].

6. Regulatory and Ethical Considerations

Technological advancements present exciting new possibilities for healthcare AI: novel tools offer opportunities to mitigate burnout, improve communication, and develop new workflows [21]. The rapid change in the field necessitates considering guidelines and regulations to ensure AI continues to develop in ways that augment healthcare providers' work and remain focused on patient interests. Existing oversight may not provide a sufficient foundation to guide healthcare AI, so frameworks and rules are needed. Limitations of existing regulatory approaches are outlined, including considerations for oversight and the role of both initial and ongoing technology development and implementation. Development outside a regulatory space is concerning, as AI has already begun to play a role in the healthcare system, and the speed of development is expected to increase substantially. These systems are being introduced prior to an established or foreseen regulatory scheme, creating an imbalance between developers, healthcare organizations, and regulators. Without oversight or input from stakeholders directly affected by these systems, unintended detriments to their use can occur, causing delays, waste, and harm to patient and clinician interests [25]. The proposed new approaches are examples of what is feasible and should serve as a foundation for collaboration between clinical experts, regulators, and developers to outline suitable and necessary rules for the oversight of healthcare AI, establishing a promising path forward.

Guidelines and regulations will carry increased weight if stakeholders responsible for initial design and development of healthcare AI are engaged. Shifting oversight to incorporate initial designer concerns, with continued input from regulators, will build on existing frameworks while addressing some concerns with sufficient oversight. New guidelines for initial designers could balance innovation with risk reduction and the protection of patient interests. Developers will be motivated to incorporate guidelines and regulations into their design processes, or risk delays or losses. Initial oversight flow could incorporate feedforward processes do not present with existing oversight structures. Initial regulations could be constructed from existing types, including product rules, procedure rules, and ethics rules, explicitly addressing reasonable expectations of healthcare AI designers, potential technologies, and design rationale [22]. As the field matures, regulatory frameworks could develop further refinements to reflect capabilities and risks with the use of more advanced technology.

6.1. Compliance with Healthcare Regulations

Among the myriads of global healthcare assets, credibility and integrity are the assets on which any healthcare organization, agency, or regulation is built. Failing to maintain these assets means losing everything. All healthcare organizations are incumbent to be following healthcare regulations framed by both public and private organizations. Such compliance is ensured using an exhaustive approach with various human resource requirements and an information management system capable of gathering, storing, retrieving, linking, and elucidating the right information out of thousands of millions of it [1].

Organizations calculate compliance risk using hypothetical methods, and they apply checks and balances to manage this risk exposure. In public healthcare organizations, the consequences of failing to comply with regulations may also cost jobs and reputations not only for the non-

Technium Social Sciences Journal
Vol. 73, 460-476, July, 2025
ISSN: 2668-7798
www.techniumscience.com

compliers but also for agency heads, far (and above) from the organization. Healthcare compliance is becoming an area to delve into by benefitting from both healthcare and data science domains. Investigative data visualization should be coupled with AI methods able to elucidate meaningful and out of the ordinary patterns in healthcare continuity datasets [26].

Medical diagnoses and prescriptions are often unintelligible for the general public's naked eyes. Hence, it is hard to tell whether the medical staff's decision on a patient case solely relied on medical means and coerced none-continuation of the care by offering non-standard remarks. For that reason, the regulators of healthcare agencies are obliged to rummage through thousands of millions of clinical notes to unearth possible compliance breaches. For this, regulators conduct a thorough examination for each regulated health care organization at least once in three years; such examination is prohibitively time-consuming in human-hours altogether. Hence, governments need to standardize medical records and enabling their interrelation, which sacrifices the essence of record languages to some extent. Also, data drawn this way will require enormous high-scale storage facilities. Distributed ledger technologies could potentially be a viable alternative, which may also result in the transformation of medical practice as we know it today, too [27].

6.2. Ethical Implications of AI

The current adoption of AI technology for administrative purposes in healthcare brings new ethical challenges that will affect the operations of healthcare organizations and their leadership. Many of the current ethical issues brought by AI are not new to healthcare or other industries that rely on information technology, but these issues take on new implications for healthcare organizations and their leaders when brought into the light of AI technology. The AI ethical principles identified in recent years have garnered consensus and have been endorsed on many levels [19]. These include articulating the "who," the inclusion of more diverse stakeholder interests in the development and application of AI algorithms; the establishment of clear accountability for AI decisions; a transparency-accuracy-trustworthy framework to guide the development, implementation, and oversight of AI; the fairness-health equity-culture of care pillar; and equity to ensure all people have access to AI tools regardless of race, ethnicity, socioeconomic status, or geography.

A "big picture" understanding of the ethical implications of AI technology in healthcare organizations, and the necessary steps toward addressing these implications constructively, is crucial for healthcare leaders and strategic decision-makers. AI technology recently began augmenting or replacing health professionals' roles, giving rise to new, pressing ethical dilemmas such as patient safety, misinformation, patients' rights, and the trustworthiness and accountability of AI technologies that have been developed outside clinicians' oversight. AI adds developmental complexity to existing ethical issues, including data privacy, bias, and AI's effect on positive clinician-patient interaction and care culture [10]. There is little empirical evidence regarding how healthcare users view these technologies' ethical implications, what ethical implications they are concerned about, and how they prefer healthcare organizations and regulators to pre-empt or address these ethical concerns.

7. Future Trends in AI for Healthcare Administration

AI has emerged as an important tool for the healthcare industry. Thoughts about where the healthcare AI industry is heading. Many companies are focusing on the administrative use of AI, believing the healthcare industry is ready to bring efficiencies, as other industries have done. Others are focused on the clinical use of AI, deeming it too early to invest in the administrative side. Development will progress and create value for the healthcare industry [2].

A few start-ups are already showing the power of generative AI-backed tools to process natural language in radiology reports. Reports that were taking weeks to get finalized are now turned around in two to three days. However, some worry that some start-ups may be over-hyping their capabilities. Early drafts produced regarding which procedures ran and anomalous findings; the later drafts were much improved but still missed key attributes of the exam, such as which breast had the cancer audit. More broadly, some worry that hospitals may not be ready for the frictionless adoption of a new technology. For example, doctors may need to trust the technology fully and be willing to allow the system to gain a foothold in their workflow [1].

Big-Tech firms like Microsoft are investing heavily in healthcare efficiencies. MS Teams is designed to minimize distractions in a doctor's environment. The firm's work virtual reality platform may enable doctors to operate in a 3D simulation without ever having to hold a scalpel. This investment environment may rapidly change the current landscape. Ultimately, many believe that the future of generative AI in healthcare is bright, with the opportunity for thousands of companies to prosper and provide value to patients. Healthcare executives must grapple with their priorities and how to best allocate resources [25]. As of today's writing, the question for many executives and their firms is that of timing.

7.1. Emerging Technologies

In the past few years, new and emerging technologies have been readily adopted in the healthcare sector. The most prevalent are mobile technologies, electronic health records, telehealth, remote patient monitoring, usage of AI for patient care, and big data analytics, among others. Telehealth or telemedicine is the scope of technology-based health care services. Telemedicine includes telehealth education or training, data gathering using mobile devices, live video consultations, asynchronous data sharing, remote monitoring using sensors, and physician delocalization that may be performed by advanced technology. The new term "telehealth" is broader than telemedicine, which means healthcare provision performed remotely from a distance through telecommunications technology. Telehealth has been used in early detection, chronic disease management, prescriptions, browsing medical information, imaging, patient education, and other fields. A variety of healthcare services can be delivered remotely except for surgery [1].

With the rapid development of telemedicine applications, internet-based electronic health records (EHRs) have emerged, which is a digitized version of a person's health care record maintained over time. Enhanced interoperability and data standardization of EHRs help different health care disciplines share patient health information, resulting in enhanced efficiency and patient safety. Mobile devices and related mobile applications have been adopted to improve health care quality and access, especially among the underserved and rural population. The proliferation of smart mobile devices has added new digital channels for evidence-based health information and patient education. Emerging mobile technologies have reduced the cost and burden of data gathering. Weight and other simple measurements can be taken by patients at home, with collected data automatically transmitted to physicians through devices connected to smartphones or the internet. Mobile health information has become the largest transaction volume among all other healthcare-focused websites. Despite these advantages, there is a void of information on telehealth among primary care physicians, which may limit potential applications [2].

7.2. Potential for Growth

The rapid growth of AI technologies is partly driven by the increasing complexity of healthcare data. However, AI poses a challenge to how healthcare data is structured and governed. The use of AI in healthcare will require changes to the way data is stored, shared, and used, with implications for health information network management and health information management professionals. The future application of AI in healthcare management environments places control of health data in algorithms often produced by organizations with limited accountability. This creates an environment that favours the rapid commodification of personal health data, to the detriment of both individual rights and public interest data stewardship. Existing approaches to ethics, regulation, and policy need to be reconsidered as new ethical challenges arise for health data in AI environments.

Healthcare systems and business models worldwide are under extreme pressure to provide high-value care amid increasing costs and growing and aging populations. Healthcare processes are enormous data generators that must be better interpreted to avoid data overload. Once transcribed, processed, and integrated into a usable form, health data is an asset that can be mined for actionable insights. AI-based technologies show great promise, a rapid pace of evolution, a wide range of applications, and increasing commercial value, for harnessing healthcare data to provide actionable insights [25]. AI is powerful, distinct from a rule-based system, creates complementary functionality, is highly productive and economical, is primarily machine-driven, and requires large amounts of high-frequency data. There are significant technical issues, ethical concerns, equitable governance, and an evolving architecture. Industry players must tackle steep competitive and accountability terrain as well. The technology is already viewed as somewhat disruptive by health information network (HIN) management and HIM professionals, as it has consequences on functions, competencies, team composition, and data structure [1].

8. The Role of Healthcare Professionals

With the emergence of AI, the healthcare sector in the coming decades may undergo significant transformations. As it has been the case with other industries, many low-skilled jobs will be rendered redundant by automating robot access to a wealth of data. Nevertheless, like in other sectors, many jobs will still require a human touch that AI cannot deliver. Empathy, emotional intelligence, critical human interaction, and human connection are expected to be required. This transformation will demand upskilling of the current workforce of healthcare professionals, including both management and clinical professionals. Healthcare professionals with a higher education degree will be required to rapidly develop and integrate their skills into their day-to-day tasks if productivity and efficiency are to be boosted by AI. AI systems deal with structured data with strictly defined rules and a clear definition of values. Questions without precise and specific answers, colloquial language, and humour will be difficult for the AI systems to handle. Finally, questions that require the careful analysis and weighing of values will also be a challenge for AI systems.

The work involved in the management of healthcare information and data in the healthcare industry will see significant changes and shifts in work and responsibilities with a more rapid deployment of AI technology and machine learning algorithms. The AI-enabled processing of unstructured documents in semi-automated and automated information workflows relying even less on intricate interrelation management is expected, as is the urgent demand for more technical skills among HIM professionals. AI technology is expected to be applied to many areas of healthcare. Even though AI, machine learning, natural language processing, and deep learning algorithms have recently been utilized and applied in a few isolated innovative projects, organizational AI and cognitive capabilities in the healthcare domain are still in their infancy. Transitioning from simple systems and projects to the operationalization of more sophisticated technologies and an increased degree of autonomy in AI-enhanced information processing is expected to be daunting and challenging [28].

8.1. Adaptation to AI Tools

A well-designed regulatory framework can expedite the introduction of new digital health devices onto the market. It can keep in check companies that collect and use sensitive personal medical data obtained from citizens. Ethically, this framework can ensure that digital health policies are designed to benefit society at large rather than contributing to increasing socioeconomic inequality. Specifically, it can hold manufacturers of digital health devices and software accountable if their sales take precedence over transparency in design and operating principles [2]. The regulatory policy fostered by health authorities can set parameters for competition that maintains the developers' incentives for innovations that feature more carefully tailored products. The regulations can raise health professionals' remuneration for interpreting the analyses performed by digital machines. Policymakers can facilitate electronic health record systems' ability to interoperate, allowing data to flow from one health care provider it is gathered to another. Such data can help companies with algorithms, the costlier and more difficult-to-collect human decisions, and the scarce data from underrepresented groups, to improve their machine-learning-based systems [25].

AI will transform the strategy and tactics of administrative processes in health care. AI automatically recognizes, analyses, and assimilates vast amounts of sensitive data. Machine learning can identify hidden connections across patients' records, drug side effects, appointments, health conditions, underlying reasons for hospitalizations, epidemics, and morbidity and mortality distributions. Predictive and prescriptive models, implemented in clinical decision support systems, can quantify probabilities of likely deliveries. Therefore, AI will be able to bridge the gap between an ever-increasing need for more patient-centric care concepts and humans' limitations at the information processing level. Unfolding the promise of digital pounds goes against established duties of "do no harm" and "the need to disclose." Each patient deserves a fully individualized assessment of their care needs and delivery. Those care plans must be updated in prompt response to each patient's changes. Regular and timely exposure and explanation are crucial for gaining public trust in emerging health care AI systems. All intelligent health systems hold personal data on an unprecedented scale [10]. These data can be priceless intelligence assets for health care systems and toolkits for meeting political goals or societal changes.

8.2. Interdisciplinary Collaboration

If multiple, unique skills and competencies are to be exploited in a team, it is vital that all individual team members thoroughly understand the tasks and skills of the other team members. Otherwise, misunderstandings arise, and the team ultimately fails, resulting in poorer, inefficient collaboration with associated delays or wasted personnel resources. In-depth understanding of the profession of medicine is necessary for successful cooperation in the proposed multi-professional teams in radiology, dermatology, and pathology. The current study indicates a profound lack of understanding of AI and the engineering profession within the medical profession. Ultimately, this leads to fear, suspicion, and reluctance to embrace inter- and transdisciplinary collaboration. Doctors have either never learned about computer science, software engineering, data science, AI, or machine learning, or they feel that it is too technical or too far removed from their primary interest: the patient. Ideally, medical schools would teach computer science to preclinical students—a classic example of a subject that is thought to be too complicated to be introduced at a relatively early stage of medical education [29].

The new occupational profiles will arise only if new inter- and transdisciplinary teams are formed, which all share the common goal of improving patient care and healthcare efficiency. Moreover, these teams must be populated with the right mixture, number, and balance of individuals from each discipline. This requires a range of considerations spanning beyond the recruitment of team members: Who matches with whom? In which way will individuals with diverse expertise share information? How will progress be monitored? Will the AI solution ultimately used to be able to integrate successfully into the workflow of the medical specialists? What awareness is needed and what educational steps must be taken in both actions? There are many questions regarding circumstances that are vital for the team's success, and only those teams that address these questions will triumph.

9. Conclusion

The healthcare landscape is continually changing and transforming in ways that are more dynamic and complex than ever before. Healthcare organizations across the globe are increasingly looking to innovative technology to alleviate the burdens brought on by the pandemic and prevailing socio-economic factors influencing healthcare systems worldwide. Specifically, healthcare organizations are actively exploring how AI can build upon current technology to achieve multiple goals such as reducing operational costs, enhancing service quality, improving patient care experiences, growing revenue, and accelerating the yield on investments. AI is effecting monumental changes across diverse industries, generating a strong consensus among industry leaders, politicians, and futurists alike that AI is poised to transform industries in a manner reminiscent of past technological revolutions, such as those brought about by electricity, the internet, and mobile phones.

AI presents a wealth of promising opportunities for the healthcare sector; however, these opportunities come hand in hand with significant risks and concerns pertaining to safety, ethical use, integration, and deployment of such advanced technology within healthcare systems. This paper has thoroughly explored the myriad considerations facing organizations that are contemplating adopting AI or expanding their existing AI capabilities within their operations. In particular, the paper emphasizes the potential impact AI may have on the healthcare administration operations within these organizations and the overall health system at large. Furthermore, there are numerous technological risks, challenges, and limitations that healthcare organizations should proactively seek to address before they proceed with developing custom AI applications or deploying pre-packaged commercial AI solutions.

There are also many crucial ethical and due diligence questions that organizations must carefully consider before embarking on any exploration, piloting, or implementation of AI-related endeavours. Given the ongoing rapid emergence of new AI-capable software, it has never been more imperative for the health system, boards of various health organizations, political leaders, and all stakeholders in the healthcare field to comprehensively understand the associated risks, challenges, limitations, ethical issues, and leadership roles pertinent to healthcare AI. Health sectors must anticipate and prepare for the nuanced impact of AI on the health and patient safety standards, health data practices, robust health infrastructure, healthcare providers' work and job satisfaction, upstream social determinants of health, as well as healthcare decision-making, administration, policies, and the development of innovative next-generation health technologies.

This paper aims to raise critical awareness of these emerging issues and provide substantive guidance and tools to navigate the complexities of purchasing, developing, and implementing AI systems designed for health care. It offers a written overview of an increasingly urgent area of critical discourse that addresses accountability, safety, privacy, and autonomy in governance amidst the rapidly evolving landscape of healthcare AI.

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