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Review article

Smart healthcare: Artificial intelligences impact on drug development and patient care

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ABSTRACT

The integration of artificial intelligence (AI) into healthcare has catalyzed significant advancements in drug development and patient care, revolutionizing traditional methodologies. This review explores the multifaceted impact of AI on critical areas, highlighting its transformative potential and addressing associated challenges. In drug development, AI facilitates accelerated discovery processes, enhances precision in predicting drug efficacy and safety, and optimizes clinical trial designs. AI-driven technologies such as machine learning (ML) algorithms and deep learning models enable the analysis of vast datasets, leading to the identification of novel therapeutic targets and personalized treatment strategies. In patient care, AI enhances diagnostic accuracy, enables predictive analytics for disease management, and supports telemedicine as well as remote monitoring, thereby improving patient outcomes and accessibility to healthcare services. Despite the promising advancements, the review critically examines the ethical, regulatory, and implementation challenges that accompany AI integration in healthcare. By providing a comprehensive overview of AI's current and potential contributions, this paper aims to provide an elaborative guide that future research and policymaking in smart healthcare.

1. Introduction

The sphere of healthcare has been experiencing a profound transformation due to the emergence of synthetic AI technologies. As we venture into an era of unprecedented digitalization, the healthcare industry seeks to harness the entire capacity of AI to revolutionize patient care and improve common nicely-being.[1] AI integration into healthcare holds the promise of enhancing diagnostic accuracy, personalizing remedy tactics, optimizing healthcare processes, and empowering sufferers to take an active position in coping with their fitness.[1] The approbations of AI in healthcare are measured with the aid of how AI is enhancing the healthcare effects, assist caregivers in paintings, and reducing healthcare charges. AI markets in healthcare have also a excessive marketplace ability with 28% international compound annual increase rate.[2] Figure 1 is an illustrative image showcasing the applications of AI in healthcare.

Some other regions of AI's impact on healthcare that the narrative illuminates are drug discovery and development. Historically, the process of discovering and developing new drugs has been costly and time-consuming.[1] However, AI technology, consisting of machine studying and natural language processing, which is presently being employed to boost up drug discovery through reading widespread databases of chemical compounds and predicting potential drug candidates. This exciting development has the ability to expedite the delivery of life-saving medicines to patients in need.[3] Figure 2 demonstrate the

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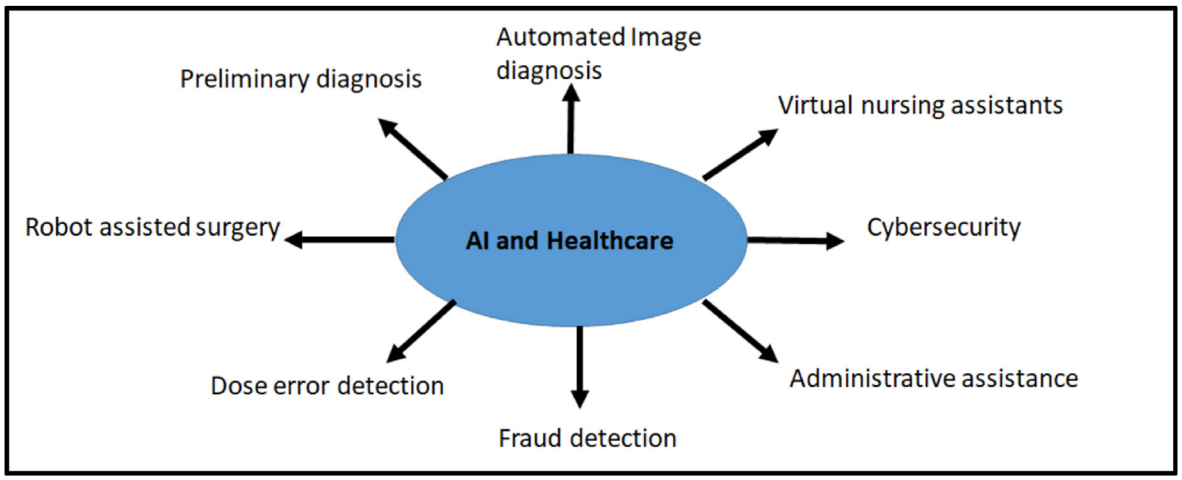

Fig. 1. AI in healthcare leverages ML and data analytics to improve diagnostics, personalize treatment plans, and predict patient outcomes.

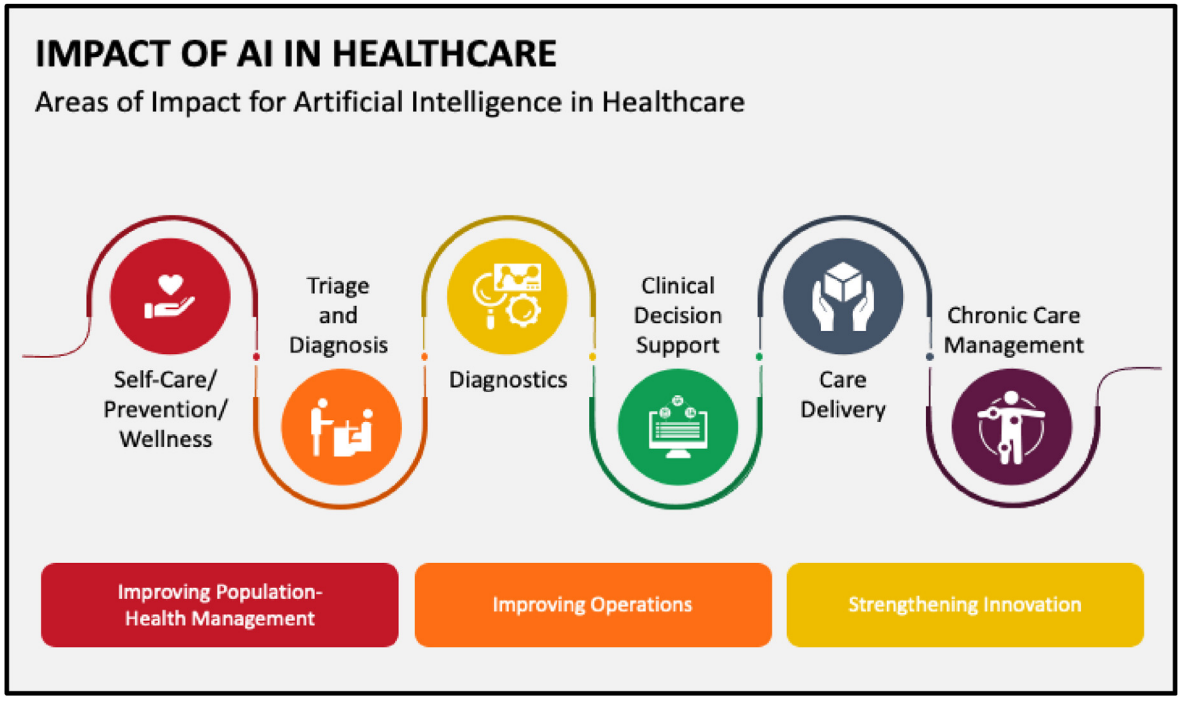

Fig. 2. Impact of artificial intelligence in healthcare.

impact of AI in healthcare.

The objective navigates via the numerous dimensions of AI adoption in healthcare, such as diagnostic accuracy, precision medicinal drug, drug discovery, and technique automation. Moreover, the review present a concept of intelligence that accounts for the code of conduct for artificial entities that enable smart behaviour.[3]

2. Drug development through AI

2.1. Accelerated drug discovery

The area of ML has brought an essential change in the research and development sectors of the pharmaceutical industry that help to develop prediction tools for learning properties related to different structures. Ineffective drug targets are a significant reason for the failure of late-stage clinical trials.[4] Due to this few drugs can make it to the drug approval process finally. AI is becoming a powerful tool to expand the drug discovery process and pathway. The development of AI platforms and processes has fuelled AI-based drug development.[5] A detailed illustration showing drug development process showing AI's application each stage is presented in Fig. 3.

2.2. Role of AI in identifying potential drug candidates

With the use of sophisticated data analysis and predictive modelling, AI is of great improving the identification of possible drug candidates by expediting the drug discovery processes. AI algorithms are capable of effectively analysing biological and chemical data to find new therapeutic targets and forecast the toxicity and efficacy of drugs. This is made possible by the use of large datasets from open-access databases such as DrugBank and ChEMBL.This strategy reduces the typical 10–15 years needed for drug development and speeds up the discovery process. It also lowers expenses and attrition rates related to late-stage failures. With the ultimate goal of bringing new therapeutics to market more quickly and

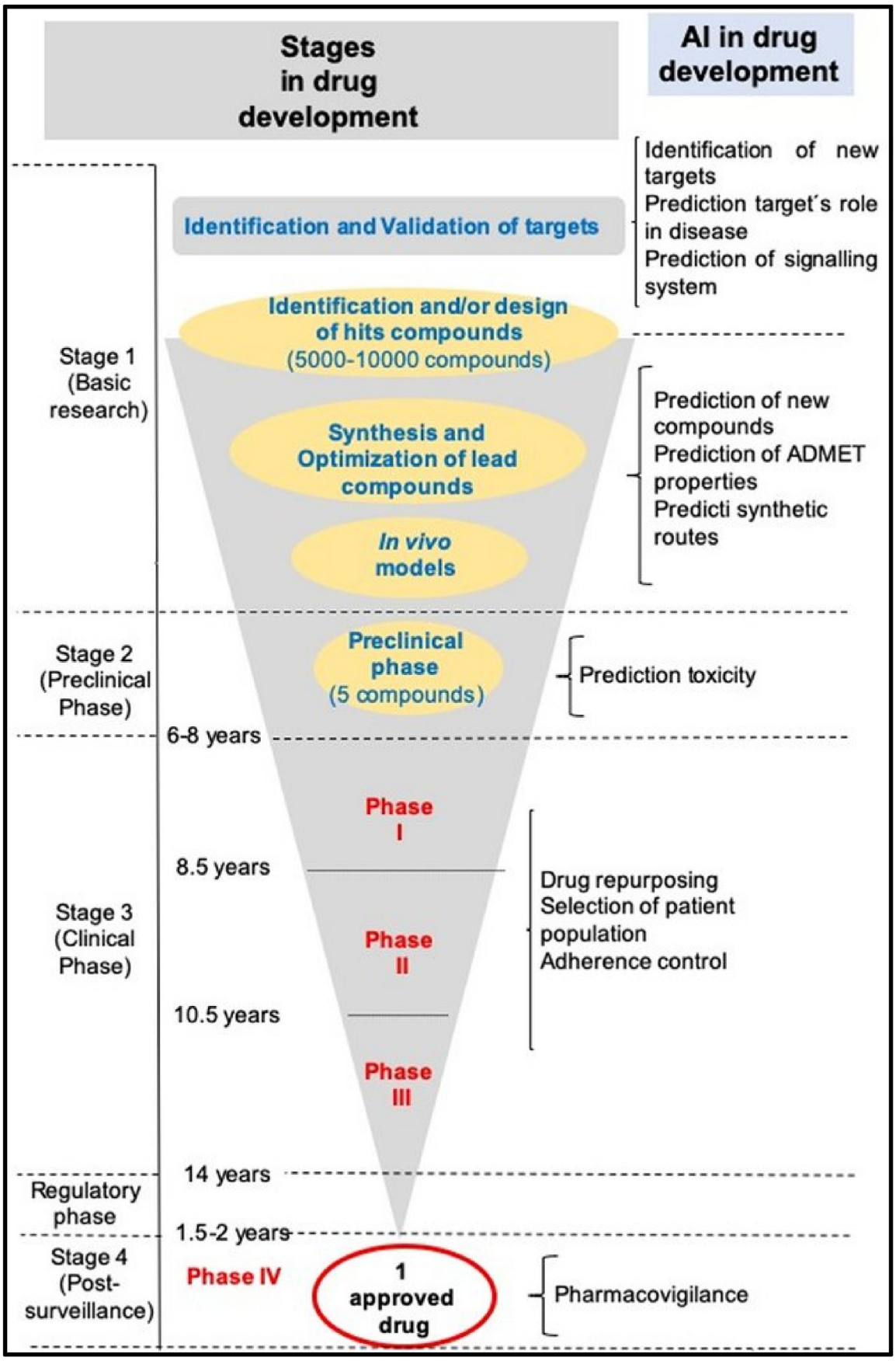

Fig. 3. Drug development process showing artificial intelligences application each stage. Reproduce with permission from [6] under CCBY4.0.

efficiently, the incorporation of AI in drug development signifies a move from old serendipitous methods to more logical and data-driven strategies.[7,8,9]

2.3. Case studies and examples of AI-driven drug discovery

Artificial intelligence has significantly transformed the landscape of drug discovery by enhancing efficiency, precision, and success rates in identifying therapeutics targets and developing new drugs. Figure 4 illustrate how AI shortens the time and expense of bringing new pharmaceuticals to market by speeding up the process of finding and evaluating possible therapeutic candidates by analysing large datasets.

2.4. Precision in predicting drug efficacy and safety

AI has completely changed the way drugs are predicted for safe use to work and be safe, making it possible to identify possible drug candidates more precisely and quickly. Through the use of ML techniques, AI models are able to estimate drug pharmacokinetics, toxicity, and therapeutic potential by analysing large datasets from freely accessible databases such as DrugBank and ChEMBL.[10] The usual medication development process, which takes over ten years and billions of dollars, is greatly shortened by this data-driven method. The development of safe and efficient treatments can be speed up by utilizing AI models like CODE-AE, which can precisely forecast patient-specific reactions to novel drugs. With the ultimate goal of bringing customised medicines to market more quickly and successfully, the involvement of AI in drug discovery signifies a departure from conventional techniques and towards more logical approaches.[11]

2.5. Machine learning models for predicting outcomes

Because AI improve the prediction of therapeutic results, ML models are becoming more and more important in hastening the drug discovery process. These sophisticated algorithms look for patterns that influence drug safety along with efficacy by analysing large datasets from a variety of sources, including preclinical and clinical research.[12] CUNY Graduate Centre researchers have developed the CODE-AE model that can precisely anticipate human reactions to novel pharmacological molecules. This model addresses the obstacles associated with translating laboratory discoveries in clinical efficacy.[13] ML improves prediction reliability by identifying inherent biological signals from noisy data that cuts down the time and expense of drug development processes, which can take up to ten years and billions of dollars. By customising treatments to each patient's unique profile, this novel method not only expedites the identification of possible medication candidates but also advances personalized medicine, ultimately producing more efficacious therapeutic interventions.[14]

2.6. Enhancing safety profiles and reducing adverse effects

AI is revolutionizing drug discovery by increasing safety profiles and lowering side effects, which will greatly accelerate the process overall. Before a drug candidate enters clinical trials, researchers can forecast probable toxicity and bad reactions by analysing large databases using ML algorithms. To prioritise safer possibilities for continued research, AI algorithms, for example, might evaluate chemical structures and biological data to select substances with reduced safety hazards. This predictive ability expedites the search for efficient treatments while reducing the possibility of late-stage failures brought on by safety concerns. Additionally, platforms such as Ignota Labs use sophisticated data-driven methods to identify the underlying reasons of toxicity that facilitates the improvement of medication formulations and patient safety. In this case, the use of AI highlights a substantial advancement in pharmaceutical research that eventually result in safer and more efficient pharmacological therapy[15](13).

2.7. Optimizing clinical trial designs

Artificial Intelligence is transforming clinical trial design optimization and speeding up the drug discovery process. AI is capable of analysing large datasets from prior trials and real-world evidence by utilizing sophisticated algorithms techniques of ML. This allows AI to improve patient recruiting strategies, optimise eligibility criteria, and estimate the chance of success. Pharmaceutical companies can improve their designs, for example, by using the HINT algorithm developed by academics at the University of Illinois Urbana–Champaign, which forecasts trial outcomes based on variables including drug molecules, target diseases, and patient eligibility.[16] AI-driven platforms such as Criteria2Query and TrialGPT make it easier to find eligible participants by translating eligibility requirements into formal database queries and producing pertinent questions for patients. AI has the ability to drastically cut the costs, shorten the schedules, and broaden the participant pool by optimizing trial design and enrolment technique. This will ultimately hasten the development of safe and efficient treatments.[17]

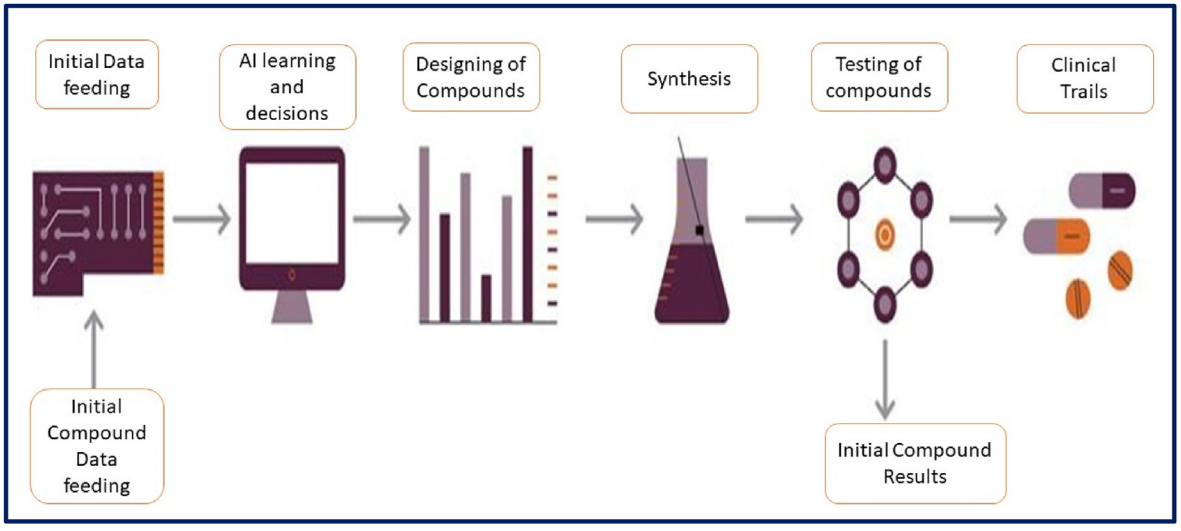

Fig. 4. AI shortens the time and expense of bringing new pharmaceuticals to market by speeding up the process of finding and evaluating possible therapeutic candidates by analysing large datasets.

2.8. AI in patient selection and trial management

AI is speeding up the drug discovery process by transforming trial management and patient selection. AI can evaluate enormous datasets from genomic data, health records derived electronically, and empirical evidence by utilizing sophisticated algorithms to find appropriate candidates for clinical trials[16](18). By matching participants to trials according to their respective features and disease profiles, our data-driven method guarantees improved patient outcomes. AI also improves eligibility requirements, streamlines patient recruitment tactics, and forecasts trial success, all of which optimise trial design. AI continually analyses patient data during the study, giving real-time insights and facilitating preemptive changes to increase efficacy and safety. AI dramatically cuts the time and expenses associated with drug development by automating various parts of patient selection and trial management, thereby speeding the delivery of safe and effective medicines to patients in need.[18]

3. Patient care utilizing artificial intelligence

AI is revolutionizing the management of chronic diseases by enabling people to take charge of their own health. Continuous tracking of vital signs, medication adherence, and lifestyle factors is possible by wearable technology and remote monitoring combined with artificial intelligence algorithms. By the help of these real-time insights, medical professionals may act quickly to modify treatment regimens and offer patients immediate assistance. Better long-term health outcomes and increased adherence to treatment regimens are the outcome, as the patient population becomes more involved and knowledgeable. AI exhibit a high impact on medication discovery and therapy optimization. AI can find new therapeutic targets and forecast a drug's efficacy by examining large databases about proteomics, genomes, and patient reactions to therapies. This expedites the process of finding new drugs and enables the creation of individualized, focused treatment plans that reduce side effects and optimise therapeutic gains for patients.[19] Predictive analytics enable early sickness prevention and analysis by way of identifying patterns and threat elements, contributing to progressed affected person outcomes and value effective healthcare. ML enables personalized treatment plans, leveraging individual affected person facts for tailored interventions that enhance efficacy and decrease destructive consequences.[19]

3.1. Diagnostic accuracy

AI in medical imaging and diagnostics: the use of AI in diagnostic scientific imaging is undergoing massive assessment. AI has shown outstanding accuracy and sensitivity during identification of imaging abnormalities and promises to decorate tissue-primarily based detection and characterisation.[20] However, with progressed sensitivity emerges an important disadvantage, specifically, the detection of subtle modifications of indeterminate importance.[21] For instance, an evaluation of screening mammograms showed that synthetic neural networks are not any more accurate than radiologists in detecting most cancers; however, demonstrate consistently higher sensitivity for pathological findings, in particular for subtle lesions.[22] At gift, many AI imaging studies estimate diagnostic accuracy with the aid of calculating sensitivity and specificity, while others determine clinically vital effects.[23] However, as AI often detects minor image alterations, extra applicable results variables encompass new prognosis of superior sicknesses, sickness requiring remedy, or situations in all likelihood to have an effect on long-time period survival. The occurrence of clinically significant occasions, signs, want for disease-enhancing therapy and mortality, strongly influence nice of lifestyles and have to be the focus of AI-based investigations. Even though numerous research displayed that AI has better specificity and lower bear in mind prices than preferred studying, such investigations do not typically consider the type and organic aggressiveness of a lesion when estimating accuracy and sensitivity. Non patient-centric endpoint choice may boom sensitivity on the rate of increasing fake positives and possibly over diagnosis due to identifying minor adjustments that could replicate subclinical or indolent ailment[24](22).

3.2. Comparison of AI performance with traditional methods

Coming across new capability customers is a essential requirement in sales and advertising for coming into new geographic markets, exploring novel segments, or exploiting new product programs.[25] The process of detecting and assessing new potential clients is called sales prospecting,[26] which is the starting point of the customer acquisition process.[25] Identifying prospects; however, is a difficult exercise especially in the Business-to-Business (B2B) context.[26] Different approaches exist to tackle this issue, among them manually working with a list of suspects which are then further selected into a list of prospects.[27] Another approach is to use commercial data acquired from specialized suppliers to cut down to a limited list of firms.[27] However, the full-size portions of records in the ones datasets generally tend to crush B2B marketers, frequently resulting in the usage of arbitrary policies to qualify prospect. Table 1 highlights the benefits and drawbacks of each strategy by comparing the performance of traditional and AI methods across several measures.[28,29]

3.3. Predictive analytics for disease management

Patients with acute diseases and illnesses need prompt, specialized care since their situations might change quickly often within 48 h of admission.[30] These illnesses frequently cause major side effects that worsen swiftly and demonstrate potentially lethal. Severe problems make it more difficult for patients to recover, significantly lower their quality of life, cause permanent disability, or even result in death.[31] In general, a complication may have multiple subtypes or phenotypes, which signify and display distinct disease presentations.[30] Effective forecasts of critical complication phenotypes are essential for doctors to make prompt diagnoses and administer therapeutic treatments in order to enhance patient care and lower death rates. This is because phenotypes involve unique symptoms and manifestations that call for particular interventions. Several data-driven methods seek to anticipate significant clinical occurrences, such complications are recognized by phenotypic expressions through electronic health records. Moreover, this data-driven methods for predicting complication phenotypes are aided by predictive analytics; nonetheless, for a number of reasons, this capacity poses difficulties in acute disease scenarios. Initially, during the early phases of an acute illness, crucial clinical traits and attributes (such as risk variables) linked to complication phenotypes could not be adequately accessible to forecast the phenotypic consequences. This constraint on data inadequacy can significantly lower the forecasting capabilities of data-driven methods.[31] Second, patients get a range of diagnostic procedures, clinical assessments, and therapeutic

Table 1
Comparison of AI performance with traditional methods.

Metric	Traditional methods	AI methods
Accuracy	Generally lower accuracy especially for complex tasks	Higher accuracy for complex tasks with sufficient data
Speed	Faster for simple and rule-based tasks	Faster for complex tasks post-training
Scalability	Limited scalability, challenging to handle large datasets	Highly scalable, can efficiently process large datasets
Flexibility	Rigid, difficult to adapt to new tasks	Flexible, can learn and adapt to new tasks
Interpretability	More interpretable, easier to understand decision-making	Less interpretable, often seen as a "black box"
Data requirements	Requires less data, effective with smaller datasets	Requires large datasets for training, particularly in deep learning
Generalization	May struggle to generalize beyond training data	Can generalize well if trained on diverse datasets

interventions, all of which are given at varying times and frequencies. Phenotype forecasts face extra challenges due to the temporal heterogeneities that result, such as pattern, time interval, and frequency. Lastly, critical complication phenotypes may occur in a very small subset of patients for any given acute illness, further contributing to unbalanced patient outcome distributions.[30]

3.4. Personalized treatment plans based on AI predictions

By enabling precision medicine through the analysis of massive patient datasets, AI is revolutionizing the field of chronic heart disease (CHD). This method has the power to completely change patient interventions, treatment plans, and diagnosis. Clinical records, social media, and environmental variables are just a few of the layers of medical data that AI can combine to provide individualized insights that can enhance patient outcomes. Exact medicine with the use of large datasets and AI, precision medicine for CHD is transforming diagnosis and therapy through individualized care. Healthcare is changing as a result of the incorporation of AI into CHD management, which offers the possibility of more precise diagnosis, individualized treatment plans, and better patient results.

The key to AI's efficacy is its capacity to analyze enormous volumes of data from patients suffering from CHD, including clinical data, environmental factors, imaging data, and social influences. Based on this wealth of data, predictive models are developed that can guide personalized treatment plans. For instance, research on serum metabolite panels and DNA methylation as screening techniques demonstrates the promise of AI in identifying unique biomarkers for early diagnosis of CHD.[32] Digital twin technology enhances customisation by developing virtual patient models that mimic real-time clinical data. Through the integration of statistical and mechanistic models, these virtual counterparts enable clinicians to make better informed decisions and predictions. This technology integrates data from medical imaging, clinical reports, and mobile health monitoring to enhance clinical insights and offer tailored therapies.[33] Research using deep learning algorithms to diagnose, prognosticate, and guide treatment for adult CHD patients demonstrate the promise of AI. These algorithms examine a plethora of medical records with remarkable accuracy rates to offer insights into diagnosis, disease complexity, and disease progression.[34]

3.5. Telemedicine and remote monitoring

Telemedicine refers to the delivery of healthcare services through telecommunications technology, allowing patients to consult with healthcare providers remotely. This approach has gained significant traction, especially in recent years, due to its convenience and the need for accessible healthcare solutions. Telemedicine and remote monitoring through IoT devices to collect patient data, which is transmitted to healthcare providers for real-time analysis and personalized treatment, enhancing patient outcomes has been briefly illustrated in Fig. 5.

4. Case studies and real-world applications

Many case studies demonstrate the potential of AI in the context of drug discovery (see Fig. 6). For instance, Gupta et al. recently reported on the effective application of AI to find novel drugs for the treatment of cancer. The investigators used an extensive set of substances known to be linked to cancer and their corresponding biological activity to develop a deep learning algorithm.[37] As a result, new compounds with great potential for treating cancer in the future were discovered, revealing that this technology is capable of finding new therapeutic options. It has recently been shown that ML can be used to find small-molecule inhibitors of the protein MEK.[38] MEK is also a possible target for the treatment of cancer, but the development of effective inhibitors has been challenging. The ML algorithm was able to identify novel inhibitors for this protein. Another example is the identification of novel inhibitors of β-secretase, a protein involved in the development of Alzheimer's disease by using an ML algorithm. AI has also been successfully applied in the discovery of new antibiotics.[39,7]

From a pool of more than 100 million molecules, a cutting-edge ML technique recently identified potent classes of antibiotics, including one that combats a variety of germs, including tuberculosis and untreatable bacterial strains.[7] Over the past two years, research on the application of AI to medication discovery to treat COVID-19 has shown promise. The compounds with the greatest potential for treating the virus have been identified by analysing vast datasets of possible compounds using ML algorithms. In certain instances, these AI-powered methods have identified potential new drugs in a fraction of the time compared to traditional methods.[40] Additionally, there are numerous other examples that

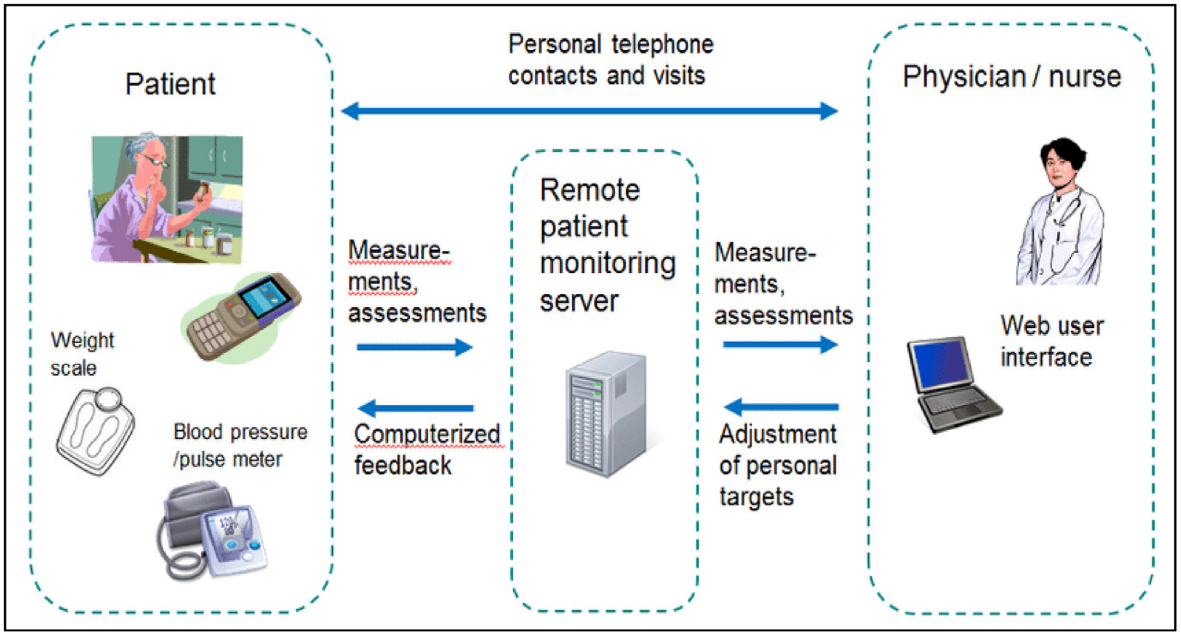

Fig. 5. Telemedicine and remote monitoring use IoT devices to collect patient data, which is transmitted to healthcare providers for real-time analysis and personalized treatment, enhancing patient outcomes. Reproduce with permission from[35] under CCBY 2.0.

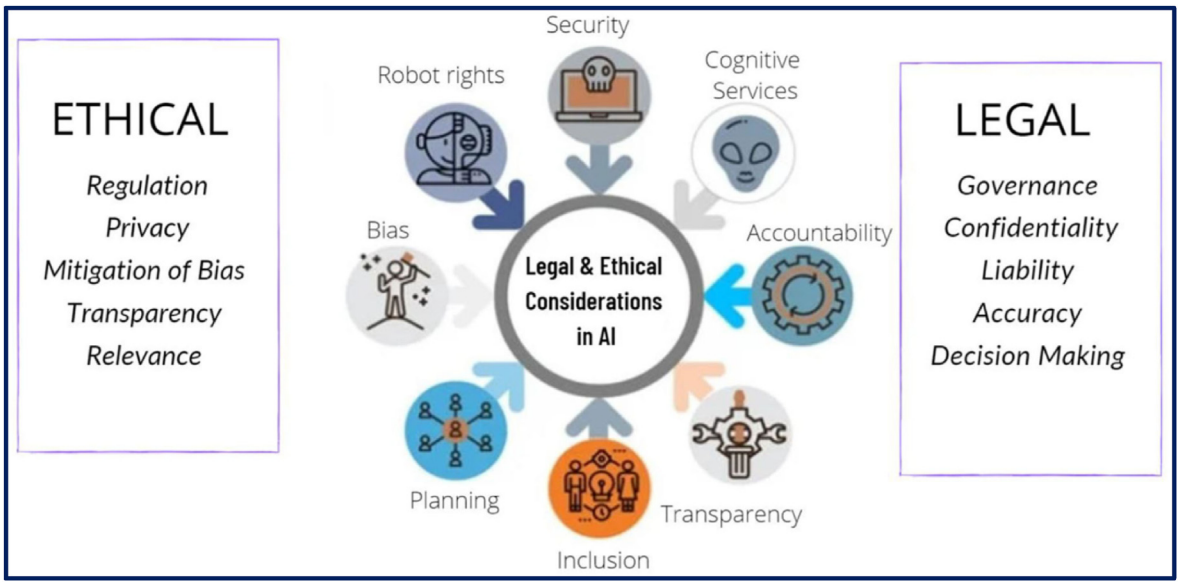

Fig. 6. Various ethical and legal conundrums involved with the usage of artificial intelligence in healthcare. Reproduce with permission from [36] under CCBY.

indicate how AI-based techniques may speed up the drug discovery process and facilitate the development of more potent drugs.[41]

4.1. Examples of successful AI applications in drug development and patient care AI

Applications in drug development have successfully increased efficacy and efficiency at several stages. AI-driven algorithms, for instance, have shown to be important in the target identification process, helping to find potential therapeutic targets through the analysis of massive genetic databases. The initial phases of drug discovery have been considerably expedited by this. Pfizer and other pharmaceuticals businesses utilize ML to predict the effectiveness of treatments and their side effects. This maximizes the utilization of their resources by assisting them in making well-informed judgments about which drug candidates to pursue.[42] AI has also facilitated the repurposing of pharmaceuticals, reducing the time and cost of development by recognizing previously approved compounds for new therapeutic uses. An extensive investigation reveals that AI technologies such as IBM Watson have been essential in assessing patient data for tailored treatment plans, indicating the potential of AI to revolutionize patient care in tandem with drug development.[40]

5. Challenges and considerations

5.1. Ethical challenges

The matter of whether AI "fits within existing legal categories or whether a new category with its special features and implications should be developed" is one that is constantly up for discussion. Although using AI in clinical settings has great potential to enhance healthcare, there are currently ethical concerns that need to be addressed. Four main ethical concerns need to be resolved for AI in healthcare to reach its full potential: Important considerations include: (I) informed consent to utilize data; (II) safety and transparency; (III) algorithmic fairness and biases; and (IV) data privacy.[43] It is controversial from a political as well as a legal standpoint whether AI systems should be regarded as legal (Resolution of the European Parliament, 16 February 2017).[44]

The goal is to assist policymakers in making sure that the ethically challenging circumstances brought about by implementing AI in healthcare settings are addressed in a proactive manner.[45] The majority of legal discussions around artificial intelligence have focused on the issue of algorithmic transparency limitations. The use of AI in high-risk scenarios has raised the need for transparent, fair, and responsible AI design and governance. The two most crucial components of transparency are the information's comprehensibility and accessibility. It is common for information regarding the operation of algorithms to be purposefully made difficult to access.[36]

The European Union first established the General Data Protection Regulation, which modified privacy laws in other nations, including the US and Canada. In compliance with these requirements, the union-based data processor or controller processes all personal data as well as the operations of foreign communities and businesses to ensure that the information of natural persons is adequately protected.[46] Employers are not allowed to make discriminatory choices based on an individual's genetic health information in the United States under the Genetic Information Non-discrimination Act. AI has a useful function in expediting health research activities, improving diagnosis and results, and analyzing consumer health data and medical device images.[46]

5.2. Bias and fairness in AI algorithms

Computers have long been seen as the perfect answer to the human dilemma of bias and discrimination in difficult choices since they are psychologically linked to unbiased, pure logic. Depending on the context, the term "bias" can mean many things. However, when it comes to algorithms, bias can be defined as a systematic error or an unanticipated tendency to favor one conclusion over another. When an algorithm exhibits an undesirable reliance on a particular feature in the data that can be linked to demographic upsizing, it is also referred to as bias. Gender, color, or religion are examples of protected characteristics that should not be taken into account by an ideal, impartial algorithm. Legally and morally, algorithmic bias may be considered unfair if it results in the treatment of one patient group more favorably than another.[47] Three criteria can be used to summarize algorithmic unfairness: (I) model variance (caused by incomplete data from minorities), (II) model bias (i.e., models chosen to best represent the majority and not necessarily underrepresented groups), and (III) outcome noise (the impact of a set of unobserved variables that may interact with model predictions; avoidable by identifying subpopulations to measure additional variables).[48]

5.3. Navigating regulatory frameworks for AI in healthcare

Realizing the advantages of AI requires an understanding and ability

to manage the hazards it poses. The numerous socio-economic benefits of AI that can support intelligent and sustainable development that include improved safety from using AI in safety-critical operations like healthcare, transportation, and emergency response, increased autonomy and mobility for the elderly and disabled, and increased quality and efficiency in the delivery of goods and services.[49] The development of particular governance mechanisms, such as those for healthcare, transportation, and autonomous weapons, as well as a more comprehensive global governance framework for AI, will therefore be necessary as AI systems grow and become more complex, increasing their risks and interconnectedness with other smart devices and systems.[50] The extensive and highly uncertain nature of the AI domain presents numerous obstacles for governments seeking to create and execute efficient rules aimed at regulating AI. The nature of AI presents numerous obstacles because it is very unexpected, unsolvable, and nonlinear, which makes it challenging for governments to develop specific policy objectives.[51] Governments face technological obstacles in guaranteeing the accountability of AI due to the inherent opacity and unpredictability of ML systems. Firstly, a significant obstacle to AI governance continues to be the opacity of complicated ML algorithms, which restricts the amount of accountability, explainability, and openness that can be attained in AI systems.[52] Even with the necessary degrees of transparency and explainability, experts are unable to understand how some algorithmic outputs are derived from their inputs. Moreover, making an algorithm more explainable reduces its complexity, which has been demonstrated to impair accuracy and performance.[53]

5.4. Implementation challenges

There are several significant barriers preventing AI in healthcare from being successfully incorporated into the systems that are in place. The lack of standardised data is a primary barrier that impedes the training of AI models and limits their application in diverse healthcare settings. Stakeholders are also uncomfortable about the deployment of AI technologies due to ethical concerns about algorithmic bias and data privacy (55). A qualitative study found that the main obstacles to the adoption of AI, according to healthcare leaders, are external constraints like public trust and regulatory frameworks, as well as internal challenges with strategic change management and the evolution of healthcare practices. Since these factors contribute to the uneven and sluggish adoption of AI developments, they highlight the need for comprehensive implementation strategies that address both the technological and human components of healthcare systems (56).

6. Future directions

6.1. New developments and trends in AI for medical

AI trends and discoveries have the potential to drastically change how healthcare is managed and delivered. Predictive analytics driven by AI makes it possible to analyze large databases to predict disease outbreaks and individual health risks, allowing for early intervention. In the healthcare sector, artificial intelligence has become a game-changing technology that can improve patient outcomes, advance clinical decision-making, and expedite healthcare procedures.[46] An increasing number of research demonstrates the various ways AI is being used in healthcare, from automating administrative activities and boosting patient monitoring to bettering medication discovery and disease detection.[54]

6.2. Prospective directions for further study and advancement

Numerous important factors have contributed to the rapid advancements in AI-driven healthcare, including the exponential growth in the availability of large, complex healthcare datasets and the significant advancements in ML algorithms and computational power that have made it easier to create AI systems that are more accurate and efficient[47](49). The application of AI to digital pathology is a promising topic for future study and development since it can help with picture processing and enable more precise and effective diagnosis.[47] Healthcare systems have been using AI-powered solutions more and more in the wake of the COVID-19 pandemic to handle the spike in demand for medical services, track patient health, and facilitate remote care delivery. This has further accelerated the adoption of this game-changing technology.[48] In the end, healthcare professionals, tech specialists, and legislators are required to cooperate to overcome the ethical, legal, and integrative issues related to the application of AI in healthcare if the field is to continue to succeed and become widely used.[49]

6.3. Future prospects for intelligent healthcare

The foundation of the future vision for smart healthcare is the integration of state-of-the-art technology, including AI. This will enhance clinical operations, increase patient care, and improve healthcare results.[50] AI is expected to demonstrate significant positive impact on predictive analytics, enabling the early detection of illnesses and the development of customised treatment plans based on genetic and personal health data.[41] Innovations in medical imaging, such as AI-powered diagnostic instruments, have the potential to improve the accuracy and speed of disease identification, particularly in the early stages of conditions like cancer.[51] AI-powered tele-health is making healthcare services more accessible, particularly in rural and underserved areas, so that more patients may obtain prompt, high-quality care. Furthermore, clinical workflows and decision-making procedures are becoming more efficient thanks to AI-enhanced electronic health records, which also lessen administrative workloads and free up healthcare professionals to concentrate more on caring for patients.[52] The continuous advancement and assimilation of these artificial intelligence-powered remedies bear substantial promise for revolutionizing healthcare provision, rendering it more effective, customized, and attainable.[53]

7. Conclusion

Drug development and patient care have undergone radical transformations as a result of the incorporation of AI in smart healthcare. Among the important conclusions are that AI's capacity to evaluate large datasets speeds up the process of identifying potential drugs, cutting down on the time and expenses involved in drug research. Predictive modelling is made easier by ML algorithms, which can detect possible medication interactions and side effects early in the development process. By examining each patient's unique genetic profile and medical history, AI improves personalized medicine by developing individualized treatment regimens. As a result, there are fewer negative reactions and better patient outcomes. The accuracy and speed of illness diagnosis are increased by AI-powered diagnostic tools and medical imaging technology, especially for early-stage disorders like cancer. AI-driven telemedicine solutions guarantee prompt and efficient patient care while increasing access to healthcare, especially in underprivileged areas. AI-enhanced electronic health records optimise clinical workflows, lowering administrative costs and assisting medical professionals in making well-informed decisions.

AI has a wide-ranging and significant effect on patient care and medication development. Healthcare is about to undergo a paradigm shift thanks to AI's ability to speed up drug discovery procedures and customise therapies for specific patients. More accessible and efficient patient care is a result of the increased reach of telemedicine and the precision and efficiency brought about by AI-powered diagnostic tools. Healthcare systems stand to benefit from the continued improvements in AI technologies, which will make healthcare more patient-cantered, individualized, and efficient.

The following important factors should be considered for healthcare policy and practice due to AI advancements: In order to guarantee the

ethical and safe application of AI in healthcare, policies pertaining to data protection, algorithmic transparency, and accountability must change. To ensure they can use AI tools to improve patient care, healthcare personnel need to be trained in how to integrate them into their practice. Sustaining the creation and use of AI-driven healthcare solutions requires ongoing investment in AI infrastructure. Policies should address inequalities in healthcare availability and quality, especially in underprivileged areas, and work to guarantee equitable access to AI-enhanced healthcare services. To overcome obstacles and realise the full promise of AI in healthcare, policymakers, healthcare professionals, and AI researchers must continue to collaborate. In conclusion, the incorporation of AI into smart healthcare is revolutionizing patient care and medication development. This presents both potential and difficulties that call for careful modifications to practice and policy.

CRediT authorship contribution statement

Sachin Mendhi: Writing – review & editing, Writing – original draft, Methodology, Conceptualization. **Krutika Sawarkar:** Writing – review & editing, Writing – original draft, Methodology, Conceptualization. **Amruta Shete:** Writing – review & editing, Writing – original draft, Methodology, Conceptualization. **Kuldeep Vinchurkar:** Writing – original draft, Project administration, Data curation. **Sachin S. Mali:** Writing – review & editing, Writing – original draft, Methodology, Conceptualization. **Sudarshan Singh:** Writing – review & editing, Supervision, Project administration, Data curation. **Pooja V. Nagime:** Software, Formal analysis.

Data availability statement

The data presented in this study are available on request from the corresponding author.

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Competing interests

The authors have no relevant financial or non-financial interest to disclose.

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