Issue At A Glance:

Artificial Intelligence in Healthcare

Technological advances have changed many aspects of daily life, including the integration of artificial intelligence in healthcare. This brief provides an overview of the Executive Order on artificial intelligence, the use of ChatGPT in healthcare, and the broader applications of AI in medicine and healthcare.

Introduction

Defined as "the science and engineering of making intelligent machines, through algorithms or set of rules, which the machine follows to mimic human functions, such as learning and problem solving," the use of artificial intelligence (AI) has become increasingly prevalent in various sectors, including healthcare.[1,2] The use of AI has the potential to transform patient care significantly and simplify administrative tasks related to provider, payer, and pharmaceutical services.[1] Despite the significant attention AI has received in recent years, its integration into clinical practice remains limited, with many AI healthcare products still in the design and development stage.[2]

It is widely acknowledged that AI could enhance and complement human intelligence, rather than replacing it. When developing AI systems in healthcare, it is crucial to preserve the essential aspects of human interaction in medicine, while enhancing its focus and improving efficiency and effectiveness of healthcare delivery.[2]

This brief provides an overview of the Executive Order on AI, ChatGPT in healthcare, and the applications of AI in medicine and healthcare.

Terms and Definitions

Machine Learning	A fundamental element of AI, enabling computers to improve predictive outcomes autonomously, without direct programming.[3]
Deep Learning	An AI technique and subset of machine learning which employs numerous parameters to identify intricate patterns within images, sound, and text.[3]
Generative AI	Machine learning based AI that focuses on creating new content, such as images, text, or audio that resembles or is inspired by existing real-world data.[4]

Executive Order on Artificial Intelligence

On October 30, 2023, the Biden Administration issued Executive Order (EO) 14110, aiming to ensure responsible development and use of AI through federal agency leadership, industry regulation, and international collaboration.[5,6] The EO mandates over 50 federal entities to undertake more than 100 specific actions to implement guidelines across eight overarching policies.[5,7]

- **Safety and security**: The EO advocates for the development and implementation of standardized processes to comprehend and mitigate risks with AI adoption, including biosecurity, cybersecurity, national security, and critical infrastructure.[5,7]
- **Innovation and competition**: The EO requires actions to bring AI talent to the US, addressing emerging intellectual property concerns, safeguarding inventors and creators, and fostering AI innovation, especially within startups and small businesses.[5,7]
- **Worker support**: The EO acknowledges potential workforce disruptions due to AI adoption by instructing agencies to research and develop strategies to mitigate such disruptions.[5,7]
- **AI bias and civil rights**: The EO emphasizes equity and civil rights considerations in AI usage, particularly within the criminal justice system and federal program administration.[5,7]
- **Consumer protection**: Agencies are directed to enforce existing authorities to minimize consumer harm and identify necessary authorities related to AI.[5,7]
- **Privacy**: The EO calls for the assessment and mitigation of privacy risks associated with AI-driven data collection, use, and retention of user information.[5,7]
- **Federal AI usage**: The EO mandates the Office of Management and Budget to establish an interagency council to coordinate AI usage among federal agencies and develop guidance on AI governance and risk management activities.[5,7]
- **International leadership**: The EO advocates for engagement with international allies and partners to develop common regulatory and accountability principles and establish global standards for AI.[5,7]

ChatGPT in Healthcare

Launched in 2022, Chat Generative Pre-trained Transformer (ChatGPT) continues to be the fastest-growing consumer internet application and serves as an AI tool for natural language processing.[8,9] Although it is currently under intense investigation, the potential applications of ChatGPT in medicine are vast, offering significant capabilities to assist experts in clinical and laboratory diagnoses, as well as in planning and executing medical research.[9] However, there remain gaps in research regarding ChatGPT's involvement in research and clinical practice, including its accuracy in generating reliable health information, ethical and legal implications, integration with healthcare systems, patient perspectives, and data privacy concerns.[9,10]

Applications of Artificial Intelligence in Medicine and Healthcare

As AI technologies continue to advance in machine learning algorithms and bioinformatics techniques, it has become an integral component to contemporary healthcare. AI can aid clinicians in healthcare record management, diagnosis, clinical decision-making, medication prescribing and distribution, mental health assessment, and imaging analysis.[11] This can facilitate clinicians' rapid access to relevant patient information and research, improving health and patient-physician interactions.[11,12]

Clinical Documentation

The process of clinical documentation has become increasingly burdensome for clinicians, contributing significantly to burnout and job dissatisfaction. Time spent on clerical tasks during patient interactions can negatively affect the patient-physician relationship and undermine effective communication. The use of AI scribes, which uses machine learning in real-time conversations, can alleviate documentation burdens with the potential of improving patient-physician encounters and bolster clinician capabilities.[12]

Imaging

The use of AI in imaging includes efficiently detecting diseases within medical images. Computational resources enable the storage of vast medical image volumes, aiding clinicians and radiologists in tracking patient histories and enhancing treatment where needed.[13] Some AI platforms, such as Precision Imaging Network from Nuance, utilize algorithms to process images and offer suggestions to radiologists.[11,14]

Remote Patient Monitoring

Using various AI platforms, medical providers are able to expand remote patient monitoring (RPM) because of technology such as wearable devices that use AI to track and analyze data.[13,14] Using AI and RPM to remotely monitor patients' health can decrease the necessity for frequent face-to-face appointments. Furthermore, as AI continues to advance, algorithms enhancing RPM technologies can analyze extensive patient data and histories to identify trends and anomalies, enabling early identification of potential health issues.[14]

Robotics

Robotics are widely used in the medical field today, assisting surgeons in delicate procedures and aiding in rehabilitation through innovative exoskeletons.[15] While surgical robots have been used for some time, the rapidly expanding field continues to push boundaries, with the goal of enhancing human capabilities and overcoming limitations in surgery.[16] Additionally, robots equipped with AI-driven medication identification software can expedite medication distribution in hospitals.[17]

Conclusion

AI can have a positive effect on medical practice in several ways, whether through accelerating research progress or assisting clinicians in making more informed decisions. As technology continues to advance, it is becoming evident that AI will play a crucial role in expanding services and pushing the boundaries of what was once constrained by human limitations. However, there remain ethical concerns regarding the use of AI in healthcare, including patient privacy; safety and liability; concern for reliability; and data ownership. As AI tools continue to develop and expand, the goal is to complement rather than replace human clinicians to enhance patient care, allowing clinicians sufficient time to focus on tasks requiring human skills, such as empathy and big-picture thinking.[18]

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Did you know?

Research has shown that around 10% of medical professionals across the nation utilize AI-powered tools, such as Med-PaLM2 or ChatGPT.[19]

LOMA LINDA UNIVERSITY HEALTH

Institute for Health Policy and Leadership

11209 Anderson Street
Loma Linda, CA 92354
Phone: 909-558-7022
Fax: 909-558-5638
www.IHPL.llu.edu

Questions?
Please contact Renée Chuang, MS, Doctoral Graduate Assistant at the Institute for Health Policy & Leadership (RChuang@llu.edu).