GUEST EDITORIAL

The Pulse of Progress: AI's Role in the Future of Health Care

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We have had access to artificial intelligence (AI) in medical care for many years, although until recently it may not have been so visible. AI algorithms already assist radiologists in identifying abnormalities or potential issues in medical images, speeding up diagnostic processes. AI has been used in decision support technology, robotic surgery, virtual medical chatbots, and to analyze pathology slides, helping pathologists identify and classify diseases more accurately and efficiently. However, there is no denying that something is different now.

The latest iterations of Al feel quicker, more familiar, and more ... intelligent. Tim Smith, an investor and journalist, describes disruptive technology as one that "sweeps away the system or habits it replaces" because of its superiority.[1] AI now has the potential to be one of the most disruptive technologies ever seen, and health care will not be immune.

In 1993, I bought a copy of *Internet for Dummies* and logged into various university data centers through my dial-up modem. Through TCP/IP protocols I downloaded a copy of the Netscape browser, installed the program, and saw my first glimpse of the internet graphics interface as we recognize it today. I had feelings of both awe and anxiety, as if I was stepping through a great entryway. Thirty years later, it is hard to imagine not having daily access to the internet and the impact it has on our lives.

On November 30, 2022, ChatGPT was launched by the San Francisco-based company OpenAI. This advancement in AI is different, evoking the same sense of potential and change that I felt in 1993. Key to this development have been advances in the structures behind the artificial intelligence, moving away from a rules-based architecture (symbolic AI) to one built on the structure and relationships between data (connectionist AI). This model is engineered on principles that govern neural networks in the human brain and becomes more intelligent through increased exposure to data by learning the patterns and relationships associated with it.

Several technologies have converged to allow for this leap to utilizing connectionist architecture, including advances in understanding regarding deep learning and neural networks, availability of large datasets, and most importantly exponential increases in computing power at lower costs. Large language model algorithms are used by AI to act on these large datasets to understand, summarize, generate, and predict new content. This has resulted in a "conversational" aspect to the AI that seems to understand context and nuance.

HOW COULD AI HELP US IN HEALTH CARE?

Various stakeholders, including health care companies and electronic medical record vendors, are busy exploring potential applications for the new AI. Artificial intelligence in health care holds the promise of transformative advancements, with increasingly sophisticated algorithms driving more personalized and precise medical interventions. Within the next decade we will likely witness revolutionary changes in the realms of diagnostics, drug discovery, and treatment strategies, leading to more efficient health care delivery and improved patient outcomes.

AI may likely streamline administrative processes, optimize diagnostics, and offer invaluable decision support to physicians. This shift could allow health care providers to spend more time at the patient's bedside, fostering a more personalized and compassionate approach to medicine. By automating routine tasks and synthesizing vast amounts of data, AI may not only enhance the efficiency of medical workflows but also augment diagnostic accuracy, leading to earlier detection of diseases and improved treatment outcomes.

AN OMINOUS POSSIBILITY

Can AI fully replace health care providers? Issues with legal, risk, acceptance, privacy aside, that future — at least from the "can we" perspective — is closer than we might think. An early-stage experimental model created by Google called Artificial Medical Intelligence Explorer (AMIE) demonstrated

the ability to outperform primary care providers in generating differential diagnoses as well as conveying empathy to actors portraying patients in a very small clinical trial. Med-PaLM 2 is a Google-designed AI model — currently only available for research — that has demonstrated the capacity to achieve an 85% score on medical licensing exams, far exceeding the score achieved by most practicing clinicians.[2]

Watch a video of some exciting advances in AI by scanning the QR code at right or by visiting youtube.com/watch?v=3BPzqH5sF90

AI currently can and should start to replace many of the administrative and repetitive tasks in medicine, as well as potentially provide more "rules-based" decision-making, including some medical triage, for example. This could lead to significant improvements in efficiency of care delivery.

However, there remain limitations in our ability to recreate areas of advanced human intelligence including common sense, emotional intelligence, consciousness, and ethical reasoning. Although advances are being made even in those areas, an inability of these as-yet uniquely human characteristics will continue to limit AI's ability to completely replace clinicians.

DATA ➔ INFORMATION ➔ KNOWLEDGE ➔ WISDOM

In our digital world, we are drowning in medical data, constantly struggling with good information and only dabbling with knowledge, making true wisdom ever elusive. While our approach has been to "search" for information, this amounts to casting a small net into a vast sea hoping to capture a few tidbits of knowledge. That strategy has been around since the early days of the internet (e.g., the dawn of the WebCrawler search engine) and has been tried (and has failed) within our own electronic medical records.

AI has the potential to revolutionize how we find and utilize information for patient care. The conversational aspects of AI may be the most intriguing. These can help us finally leverage the vast mine of medical data and put it to work for us. Consider these potential "asks" for our new AI:

- Generate a summary for me of this patient's most pertinent issues since their last visit, from the perspective of an anesthesiologist.
- Show me a list of all my patients currently most at-risk for a coronary heart disease event.
- Create a note for today's encounter in the context of a neurology visit.
- Given the information from today's visit and history over the past five years, generate a differential diagnosis list in order of likelihood with a summary of the lowest cost diagnostic tests needed for each.
- Based on today's note, generate an appropriate billing code and potential opportunities for additional documentation.

All these examples are technically possible today, and many will start to appear soon as our AI medical applications begin to integrate the data in our charts. At this time the technology is evolving fast and the developers are struggling to keep up.

WHAT COULD POSSIBLY GO WRONG?

Health care delivery is generally very inefficient, so the potential efficiency impact will be exponential. Yet, it is critical to acknowledge the potential pitfalls that will come with this technology.

The ethical aspects of AI in health care will demand vigilant oversight, particularly regarding issues of patient-data privacy, algorithmic bias, and the potential for overreliance on computer-generated recommendations. Regulatory frameworks are being established to address concerns related to bias, transparency, and accountability. Most notably, in January 2023 the National Institute of Standards and Technology released the AI Risk Management Framework, which provides a comprehensive approach to managing AI risks throughout the AI lifecycle, including those of safety, security, fairness, and accountability.

While governmental and industry bodies have begun to issue guidance around the safe development and use of AI, the industry is evolving too rapidly to keep up. There is a particular scarcity of oversight in health care apart from Food and Drug Administration regulations for clinical tasks related to diagnosis, treatment, or interpretation; regarding AI, there are only a handful of state-based legislations. Striking the right balance between human expertise and AI assistance will be critical to ensure that the provider's role evolves without diminishing the inherent essence of compassionate care.

Finally, the fear of job displacement among physicians and caregivers will be real as AI systems increasingly excel in tasks traditionally performed by medical professionals. It will be essential for the

medical community, policymakers, and technology developers to collaborate in shaping this future.

FINAL THOUGHTS

We are at the intersection of technology and patient care, witnessing the nascent impact of AI on the medical landscape. The future of AI in health care holds the promise of transformative advancements in medical treatment and process, leading to more efficient health care delivery and improved patient outcomes. However, privacy and ethical considerations, regulatory frameworks, and the continued collaboration between technology developers and health care professionals will be important for realizing the full potential AI can offer.

AI in health care will be a powerful, disruptive force, and dismissing its potential impact would be futile. It is the proverbial "freight train" coming down the track; we need to be actively involved in shaping the future and embrace the changes to come. It is important that clinicians help steer the development and use of AI to remain effective and relevant to providing care. This may take the form of local IT development, involvement in emergency medical record focus and user groups, and vocal support and criticism through medical societies or governmental forums.

Health care professionals bring empathy, ethical judgment, and personal experience, all critical to how we care for patients. Collaboration will ensure that AI systems will complement rather than replace the human elements of health care, leading to more holistic and effective health care impacts.

REFERENCES

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JLGH Summer 2024 Recap

Q&A for Extended Learning

The Summer issue of The Journal of Lancaster General Hospital *offered articles on pharmacotherapeutic agents for the management of type 2 diabetes, urinary tract infections in women, and quality improvement and health equity, as well as a photo quiz on Henoch-Schönlein purpura and other practice recommendations. Review the questions and answers below to see how much you remember from the issue. Need a refresher? All issues of* JLGH *are available online at JLGH.org.*

Q A **Ultra-long-acting insulins are now available with similar efficacy to shorter acting formulations. What are some benefits of insulin degludec (U-100 and U-200) and insulin glargine (U-300)?**
Insulin degludec (U-100 and U-200) results in decreased rates of nocturnal hypoglycemia in clinical trials and a duration of action of up to 42 hours. Insulin glargine (U-300) allows for decreased injection volumes and a duration of action of up to 36 hours.

Q A **Henoch-Schönlein purpura (HSP) generally occurs in children and teens 3-15 years of age and presents as palpable purpura with acute abdominal pain. What is the treatment for HSP?**
Supportive care includes having patients stay well hydrated, plus using NSAIDs for joint pain and prednisone for more concerning symptoms. Frequent monitoring of kidney function is important; kidney biopsy is warranted in severe cases.

Q A **Why might we consider treating dyspareunia in women with antibiotics?**
Up to 80% of women of reproductive age with dyspareunia may have an undiagnosed urinary tract infection (UTI). While patients who are perimenopausal and postmenopausal more often have genitourinary syndrome than UTI, 94% of women with UTI-associated dyspareunia respond positively to antibiotics.

Q A **Penn Medicine economist Rachel Werner, MD, PhD, suggests four approaches to modifying health care's value-based payment program to advance health equity. What might these include?**
Create accountability for equity, account for social risk in performance management, financially support under-resourced providers, and address drivers of inequity.