MedicalAlley

Observations from a Digital Roundtable

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In June 2024, a conversation was held at Medical Alley that brought together experts and end-users from many different areas of healthcare, as well as from companies that help develop artificial intelligence (AI) and software applications (apps). After an introductory presentation, the attendees split into two groups and shared their experiences with healthcare apps and AI. Their diverse backgrounds contributed to the broad range of topics covered.

This paper intends to reflect these conversations and to provide an overview of the opportunities and challenges associated with leveraging both apps and AI for healthcare innovation. In this paper, “AI” is used as a catch-all term to encompass the many subsets of the science.

Sincere thanks go to MentorMate for their partnership in making this discussion happen, and to the participants who represented 22 organizations and provided thoughtful and fascinating discussions.

Providers' current challenges using apps successfully in healthcare

Current patient-facing healthcare apps can retrieve data from electronic health records (EHRs), report new test results, schedule appointments efficiently, provide expanded information/resources, and facilitate open and efficient communication with providers.

However, providers encounter consistent challenges when it comes to patient-focused applications, like gaining patient trust in the technology, trying to coordinate records among proprietary systems that do not communicate with each other, and ensuring accessibility across a tremendously diverse patient population.

Problems with existing data management (electronic health records, EHRs)

- Customization is expensive. Software customizations that improve productivity for system staff can be expensive when it comes to manufacturer EHR updates. Some providers are rolling back customizations to make their EHR more affordable.
- Records are not accurate. Patients are human and are not always reliable reporters of information because they do not remember it, are tired of providing it at every intake appointment, or in a situation where they are not able to provide it accurately. Error becomes self-reinforcing as patients get information from the app to inform the EHR.
- Data collection is limited. The EHR is missing important information: e.g., life status or situations that impact patient's ability to receive care, go home after hospitalization, recover with optimal resources, etc.
- Systems do not communicate with each other.
- Information is presented to patients through apps with minimal context or synchronization. For example, test results can arrive in the app for the patient to see before provider has time to interpret them.

The potential and power of AI

Despite this complexity, the drive to refine and implement these technologies comes from their potential to improve many aspects of patient care.

For example, as the disparity between the number of available healthcare practitioners and patients increases, equity of access continues to be a critical problem. Apps have the potential to meet a broad range of patient needs without an in-person visit, especially critical in providing consistent care in rural or transportation-limited areas. Interactive apps can help change behaviors and improve outcomes (for example, after discharge from hospital) with personalized reminders and recommendations. Using AI, these can be customized to patient preference for delivery as texts, emails, or an AI-generated voice post-treatment check in. Data from smart homes, devices, and even pill bottle caps can, in turn, provide valuable information to providers that can trigger in-person intervention. This is particularly helpful for elderly and rural populations that may have minimal support systems.

Payers already use AI to automate and accelerate tasks like underwriting review of claims, predicting potential costs, detecting fraud, and pricing services. AI can also be used to analyze patterns in a patient's medical history and current health data to predict potential health risks.

Providers are using diagnostic algorithms, which can provide consistent interpretation of observations and accelerate the diagnosis of complex cases or rare diseases. Algorithms can also help customize treatment plans by evaluating many factors like medical history, pathology, disease stage, and genetics to determine which therapies will be most effective for an individual patient. Using AI, large datasets can be used to digitally model everything from expected disease progression to surgical strategies. Additionally, AI can be used to sort through the mass of data many of us collect from our wearable devices, like smart watches, and identify important points to providers.

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Despite proposed scenarios where providers can use AI to reduce paperwork burden, allowing them to engage in what they trained for and are motivated by—caring for patients—the necessity for the provider critically evaluating AI's output, verifying its accuracy, and making corrections may reduce the short-term gains made in time and effort. Human expertise is still "a safeguard against potential errors, ensuring that the AI's assistance enhances productivity without introducing risk." [1] In fact, the American Medical Association now uses the term "augmented" rather than "artificial" intelligence to clarify and establish "the critical role human education, skill and expertise play in determining the accuracy and usability of results." [2]

Currently, databases and algorithms are often proprietary and, as with EHRs, they do not connect with each other. Creating a data ecosystem that functions across all entities will require working together in unprecedented ways and collaborating across untraditional lines but offers powerful steps toward improving human health.

Identifying the vulnerabilities and addressing risk management of deploying AI in healthcare settings

For healthcare professionals, the most critical challenges to using AI are the collection, accuracy, and protection of data. AI is only as good at the data put into the system, and AI needs massive amounts of clean data to train algorithms, experiment with new uses, and validate results. Bad data can create inaccurate (and in healthcare potentially dangerous) outcomes. Testing and evaluating AI systems is critical.

As important as it is to protect data for privacy reasons and HIPPA compliance, in healthcare there is the additional concern of a bad actor changing the data. Unfortunately, the methods of attacking computer systems evolve rapidly, and despite multiple layers of protection (firewalls, sequestering, limited access), human error (and it only takes one) can still expose the data to risk. Healthcare organizations need to assess their systems for risk and ensure that protections are maximized. One strategy is using a closed-loop system that isolates the data from exposure to the Internet.

There is increased risk to data outside of a closed-loop system. Open systems require additional security measures such as encryption and digital signature standards.

Identifying the vulnerabilities and addressing risk management of deploying AI in healthcare settings

Medical research and development organizations already have regulations from the Food and Drug Administration. [3] Healthcare will also eventually be regulated, either by the community itself or by external entities. Legislation is also in progress to ensure the "responsible, ethical, and standardized use" of algorithms. [4] [5] Questions also remain about where the responsibility lies in using AI, including in cases of liability for error resulting in "negligent diagnoses and treatment." Choudhury et al. state that "Determining the extent of provider liability hinges on factors such as the accuracy of the … training data, transparency regarding the system's capabilities and limitations, and the adequacy of user training and support provided." [1]

Another challenge is that AI is not "conscious." It acts without an awareness of context and responds with words using calculations rather than an understanding of language itself. This lack of understanding can mean that "correct" calculations result in nonsensical or wrong information (called hallucinations). To someone without expertise in the field, hallucinations can appear as true and factual. There is also the potential for discriminatory data (human factor) to introduce bias in an AI model, which can exponentially amplify the bias. [6] As AI begins to learn from data generated by AI, there is also the increasing risk for AI to bias itself. [1]

Steps toward an integrated healthcare ecosystem

The greatest potential for improving the patient experience lies with opportunity to integrate these (currently not integrated) systems: coordinating them to ensure continuity of care and collaborating to create a cohesive and integrated healthcare ecosystem.

Bhajwa et al. offer a starting point by giving four main areas of potential for AI in healthcare, to "improve population health, improve the patient's experience of care, enhance caregiver experience and reduce the rising cost of care." [7]

With these goals in mind, anyone in any area touching healthcare could begin to take preparatory steps now (if they have not already started):

- Create an AI-literate workplace (*see Notes for suggested introductory courses).
- Explore what AI and apps can (and cannot) do for the organization.
- Develop/redesign these kinds of resources to improve connectivity and patient experience.
- Find working partners across the healthcare industry.
- Participate in industry discussions to share expertise, identify opportunities for collaboration, and to develop a clear and organized path forward.

Given the speed of development and the potential impact, many organizations are already taking steps to achieve the full potential of AI and apps in healthcare. It should be remembered that, although AI offers powerful tools, it takes people to ensure that these tools are developed and designed to improve patient care and experience.

The merging of healthcare and AI offers the opportunity to transform patient care and care delivery. To achieve this, industry-wide coordination is needed that focuses on patient experience, adopts carefully selected technology, and prioritizes the connection, standardization, and safety of how AI is used.

**Panelists recommended two free introductory resources from Coursera by Andrew Y. Ng: "AI for Everyone" and "Generative AI for Everyone."*

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Terms

- **App (application)** is a program designed to let users perform certain tasks. Apps can use AI.

- **Artificial (or Augmented) Intelligence (AI)** in its simplest form is the ability of a computer (machine) to know that A + B = C. It is useful to analyze data and perform specific tasks. To do this, the computer must have input **(training data or training set)** and pre-programmed rules or an **algorithm**. The computer "practices" identifying A and B. Then the algorithm connects A and B in a relationship with an output (A + B = C; think spam filtering).

- **Big Data** (large datasets) is needed to train and refine AI.

- **Machine Learning** is a computer's ability to learn without being pre-programmed for each instance.

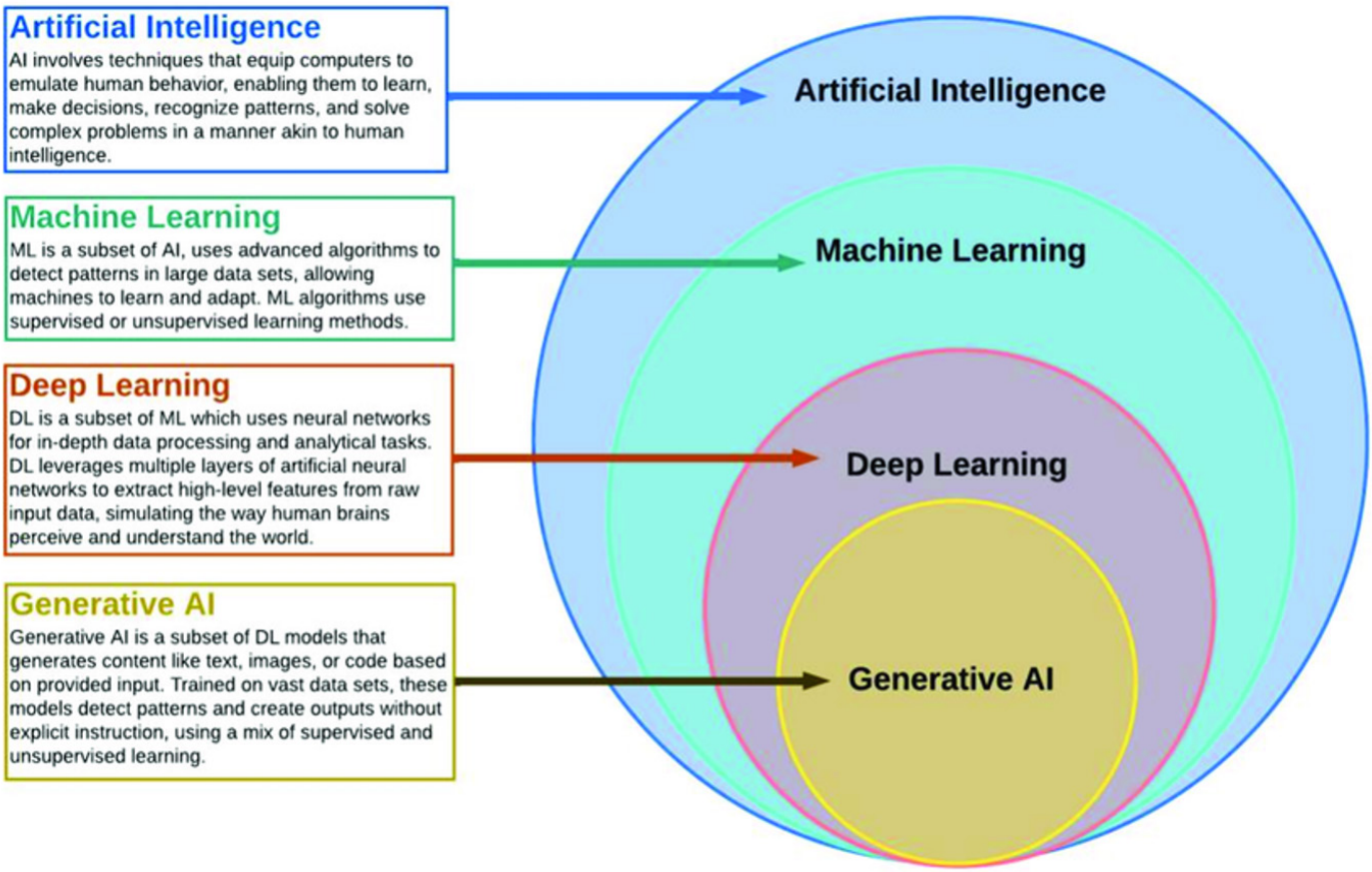
- **Data Science** is extracting knowledge and insight from data to make decisions.

- **Deep Learning (neural networks or neuronets)** is a subset of machine learning that takes AI to a more complex level by creating networks inspired by how biological neural networks in human brains are structured and function. They are made up of nodes (artificial neurons) that are connected like synapses in the brain (edges).

- **Generative AI** uses machine learning and deep learning to create new content (think ChatGPT) like text, images, or music. This is based on a prompt provided by human input (commands, guidelines, or parameters).

- **Synthetic Data** is data generated by AI. It looks real but is artificial.

- Figure from paper by L. Zhuhadar and M. Lytras [8] **showing comparative view of AI, machine learning, deep learning, and generative AI.**



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