AI in Rural Health

Artificial Intelligence (AI) is both a buzzword and a transformational technology. How can individuals and organizations engaged in digital health know where to begin with recognizing, understanding, and interacting with Artificial Intelligence enhanced technologies?

Who should care about this overview?

This guide is designed as a starting point for:
- Rural Clinics investigating AI tools and applications
- Rural providers who are looking at AI to enhance patient care
- Anyone asking: What is AI in rural health and why should I care?

What is AI?

Starting with a definition is typically a great way to approach any new technology. However, definitions of artificial intelligence are numerous and vary depending on the specific technologies in use and the priorities of the defining organization.

- The **United States federal government** has issued a key Executive Order to provide oversight of various AI systems, including in health care. Different Federal Agencies use varied definitions of AI, including the Food and Drug Administration (FDA), the U.S. Department of Health and Human Services' Office of Civil Rights (OCR), and the Assistant Secretary of Health Technology.
- **States** are in the process of writing, modifying, and passing legislation that defines the roles and risks of AI.
- **Provider Organizations:** The American Medical Association's Common Procedural Technology (CPT) Panel provides definitions for levels of autonomy.

For the purposes of this document, we have used the following definition of Artificial Intelligence in Healthcare:

> *"**Artificial Intelligence in healthcare** refers to the **utilization of computer algorithms and models** to simulate human intelligence processes, such as learning, reasoning, and decision-making, **with the aim of improving healthcare delivery**, **patient outcomes**, and **administrative efficiency**."*

General Purpose vs Healthcare AI

When looking at AI solutions a key distinction to consider is whether the technology is trained specifically for use in healthcare, or if it is a more general solution being used in the healthcare space.

Key Distinctions:
- Chatbots and Generative AI: Many chatbot and generative AI solutions are built around general AI solutions and may be more prone to provide content that may be irrelevant or erroneous when used for clinical applications.
- Diagnostic and Healthcare Specific Apps: These apps are often trained on healthcare specific data and are generally useful for providing insight within their scope of reference.

How AI interacts with people…

An important way to differentiate between AI solutions is in the way they interact with users. By breaking down the audience potential interactions an AI solution may have we can better understand the potential for impact and risk within the solution. Below is a useful classification guide from the American Medical Association that may help with thinking through and implementing AI solutions.

The American Medical Association breaks AI Applications into **Three Classifications Categories for AI Applications**:

- Assistive classification:
  - "The work performed by the machine for the physician or other QHP is assistive when the machine **detects** clinically relevant data without analysis or generated conclusions. Requires physician or other QHP interpretation and report."
    - Automating simple processes and tasks freeing user to focus on more in-depth tasks
    - Requires continuing human interactions
    - Defined inputs and outputs

- Augmentative classification:
  - "The work performed by the machine for the physician or other QHP is augmentative when the machine **analyzes** and/or **quantifies** data to yield clinically meaningful output. Requires physician or other QHP interpretation and report."
    - Move beyond what a human can normally do
    - Intermittent human interactions

- Autonomous
  - "The work performed by the machine for the physician or other QHP is autonomous when the machine automatically interprets data and independently generates clinically meaningful conclusions without concurrent physician or other QHP involvement. Autonomous medical services and procedures include interrogating and analyzing data. The work of the algorithm may or may not include acquisition, preparation, and/or transmission of data. The clinically meaningful conclusion may be a characterization of data (e.g., likelihood of pathophysiology) to be used to establish a diagnosis or to implement a therapeutic intervention. There are three levels of autonomous AI medical services and procedures with varying physician or other QHP professional involvement:"
    - Three levels of AI autonomy:
      - Level I—The autonomous AI draws conclusions and offers diagnosis and/or management options, which are contestable and require physician or other QHP action to implement.

- Level II— The autonomous AI draws conclusions and initiates diagnosis and/or management options with alert/opportunity for override, which may require physician or other QHP action to implement.
- Level III— The autonomous AI draws conclusions and initiates management, which require physician or other QHP initiative to contest.
- Potential to work independently of human intervention/oversight
- Ability to process new situations and data

Why does AI matter now?

For a useful discussion of AI in healthcare we need to consider what makes this topic a timely one for discussion and what the impacts of AI use in healthcare might be. It is worth mentioning, that at the time of writing there remain many uncertainties around the future capabilities and impacts of this technology.

Three reasons why the AI in healthcare discussion is important NOW:

- AI Tools are already being used in and around healthcare, often, without clear indication that AI is involved.
- The responsibilities and risks of using AI might not be obvious to patients and healthcare providers.
- AI has the potential to provide great benefit to patients, providers, and organizations.

How can Artificial Intelligence impact Rural Healthcare?

Let's look at some keyways AI solutions can help rural health providers and systems manage and improve patient care?

- AI can help to mitigate provider shortages by enhancing provider capabilities.
  - AI Tools can be used to collect symptom and general information from the patient
    - Routing them to the most appropriate level of care
    - Eliminating the need to collect insurance or demographic information multiple times
- AI tools are used to assist providers with the collection and documentation of visit data:

- AI solutions can record what was said (Scribing) and place that information into a standard medical note format (Charting) for provider review and approval.
    - AI can quickly review and summarize key elements of a patient's medical record to help providers prepare for patient visits
    - Decision Support Tools- AI can provide recommendations for treatment based on outcome data, best practice documentation, and medical reference documentation
- AI can enhance the diagnostic capability of rural health sites through improved:
    - Radiology and Lab Services: AI can enhance the ability for technicians to capture and process diagnostic services like labs, x-ray, and other imaging
    - Ophthalmology Screenings: AI can be used to analyze retinal images to detect signs of diabetic retinopathy, glaucoma, and other eye diseases.
    - Dermatology: AI algorithms can be trained to identify skin cancers and other skin conditions with high accuracy using existing camera hardware (like smartphones)
- AI can allow patients to receive care in their community and closer to home.
    - AI can improve the ability of Remote Patient Monitoring (RPM) devices like glucometers, Blood Pressure Monitors, Scales, and blood oxygen monitors by:
        - Providing better with better analysis of trend data
        - Creating insightful visualizations of those trends for patients and providers
        - Allowing more efficient flagging and triage of urgent results for provider review
- AI enhanced symptom checkers can help allow patients to find the right type and level of care provider, speeding up access to care and eliminating unnecessary travel.
- AI can help healthcare organizations to remain financially viable by
    - Automating financial and administrative functions
    - Improving success rate for billing and reimbursement processes
    - Processing growing amounts of Patient Generated Health Data

Key Considerations and Resources

To safely get the most out of Artificial Intelligent solutions there is a lot users should consider. We have listed a few key consideration topics broken into Hazards and Considerations. A resource page linked below can provide you with more information and learnings to help navigate this evolving space. While not an exhaustive list, this summation should be a good starting point in your AI research.

Hazards of AI

The dangers associated with AI need to be understood in order to make the most of the advantages it can provide. Below we list a few key hazards AI can introduce into your organization or practice.

- Bias- AI training data implicitly contain biases which can lead to inaccurate or discriminatory AI system output, particularly when the AI is applied to populations that are not part of its training data set.
- Liability for AI errors and bad outcomes- Determining liability for AI output may be complex: manufacturers may be liable for AI system defects; providers may be liable for incorrect or out of scope uses; or employers may be liable for their employees' actions in their uses of AI. Liability also may be shared amongst various parties.
- Malicious use of AI:
    - Healthcare AI systems may have broad access to patient data held by healthcare organizations. Bad actors may target these systems with malicious intent for purposes such as financial gain and system disruption.
    - AI can be attacked to negatively impact its performance / output.
    - AI tools can be used to steal patient information or create highly believable Spam or Phishing attacks
- Over-reliance on AI- Healthcare providers may, over time, come to rely more and more on AI in their clinical decisions and in turn become less practiced at studying and analyzing complex clinical data sets. This may lead to unintended medical errors.
- Providers decision making skills may suffer if AI tools become too ubiquitous
- Under-reliance on AI- As clinical AI systems are developed and refined; they may become superior at certain diagnostic skills necessitating changes in associated standards of care to include AI.

- Access and Equity- Care needs to be taken so that the benefits of AI are widely available and improve the experience of as many patients as possible
  - Clinical AI systems have the potential to increase the "digital divide", creating gaps between quality of care provided to patients who have access to technology vs those who don't. Barriers to access and equity may arise due to factors rooted in social determinants of health, geographic location, algorithmic bias, regulations and more.
  - Rural health organizations may lack the infrastructure, funding, and staffing to effectively deploy AI tools.
  - The underlying algorithms may not accurately reflect the unique patient populations being cared for, creating inaccuracies or errors.

Considerations for AI use In Healthcare

These considerations are key ideas and questions organizations and providers should consider as they evaluate and implement AI for Healthcare.

Not all AI is the same: The term AI is widespread and can be used to describe a variety of systems, services, and technologies.

Consider:
- Importance of Models and Training Data
  The quality of the training data may vary depending on how and when it was collected
  - Training data needs to reflect care population
  - Rural locations may have different demographics and needs that may not be reflected in urban models
- Types of Underlying AI Technologies-
  - Classification Systems- Classification systems use images or other inputs and compare them using algorithms based on large training data sets. These systems are often used in:
    - Diabetic retinopathy screening AI
    - Lab and Radiology applications

- ECG arrhythmia detection

- Optical Character Recognition (OCR)- These systems are trained to identify letters, words, and combined with other tools can quickly read and summarize documents.

- Generative AI- Used to create images, videos, and text using large language models trained on massive amounts of data these systems are able to simulate human creativity, speech, and skills- but may be prone to error or hallucination.

- Expert Systems- These systems are trained on specific data sets related to their specific scope of "expertise". Decision making for these systems is limited to this scope and is less general in its output.

Applications of AI- The risks involved in deploying AI will vary depending on a variety of factors. Key among these is the nature of the jobs we allow AI to do. For example: interacting with patients is inherently risky, processing paperwork less so.

How do I find a responsible AI vendor? Here are a few helpful tips for finding a reputable AI vendor:

- Seek vendors established in the healthcare space

- Reputable vendors will describe the limitations of their systems

- Solutions embedded into existing systems (electronic health records, enterprise resource planning systems) may offer a way to integrate AI tools within a vetted platform.

What should my organization do to prepare?

- Legal and risk review- Prior to implementing any new AI solution a thorough legal and risk review should be completed by a legal representative.

- Data Governance- Establishing Data Governance practices and controls is key to mitigating your data related risks. See resource page:

- Data Security/Privacy- Related to Data Governance a review of your security and privacy practices can help you manage day to day data concerns. The NIST framework: Link is a great starting point!

- Ensure adequate Organizational Support- beyond administrative, legal, and data governance support it is important to consider day to day support for AI applications.

  - IT Infrastructure- Is your IT staff able to support intended applications, are there contingencies for troubleshooting these tools?

  - AI ready workforce and training- AI is a new space for most health care staff, ensuring adequate training will help you make sure your providers and staff are comfortable and safe in using AI tools.

Resources-

For additional resources and to learn more, please visit our resources page at [The National Consortium of Telehealth Resource Centers](#)