

Embracing and Leveraging Technology: Using AI to Improve Pharmacy Operations



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Disclosures and Conflict of Interest

Catherine Gilmore declares no conflicts of interest, real or apparent, and no financial interests in any company, product, or service mentioned in this program, including grants, employment, gifts, stock holdings and honoraria.



Disclosure of AI Use

Artificial Intelligence (AI) was utilized in the development of this educational content. ChatGPT-5.5 Plus was utilized for the *generation of works cited/references* and *language editing*.



Pharmacist Objectives

At the conclusion of this program, the pharmacist will be able to:

- ▶ Define terminology related to artificial intelligence (AI) and automation
- ▶ List examples of current AI tools and automation technologies used in pharmacy settings
- ▶ Identify common challenges in adopting AI and automation in pharmacy
- ▶ Describe future directions of AI in pharmacy practice



1. Which of the following best defines artificial intelligence?

- a. A manual process of using computers to store data
- b. Technology that mimics physical human movements
- c. Software that handles only repetitive administrative tasks
- d. Use of computer systems to perform tasks requiring human cognition

Pre-Test Question



2. Which of the following best represents the current use of AI in community pharmacy operations?

- a. Pre-programmed refill calendars managed manually by pharmacy technicians for sync programs
- b. AI-driven speech pattern analysis to predict adherence risks
- c. Intelligent call routing via cloud-based telephone systems
- d. Connected text messaging system to increase communication between the pharmacy and patients

Pre-Test Question



3. How does data privacy pose a barrier to AI adoption in pharmacies?

- a. AI systems do not require any patient data
- b. Concerns over security and confidentiality of patient data
- c. Patients willingly share all their data without reservations
- d. Data privacy laws are universally standardized and clear

**Pre-Test
Question**

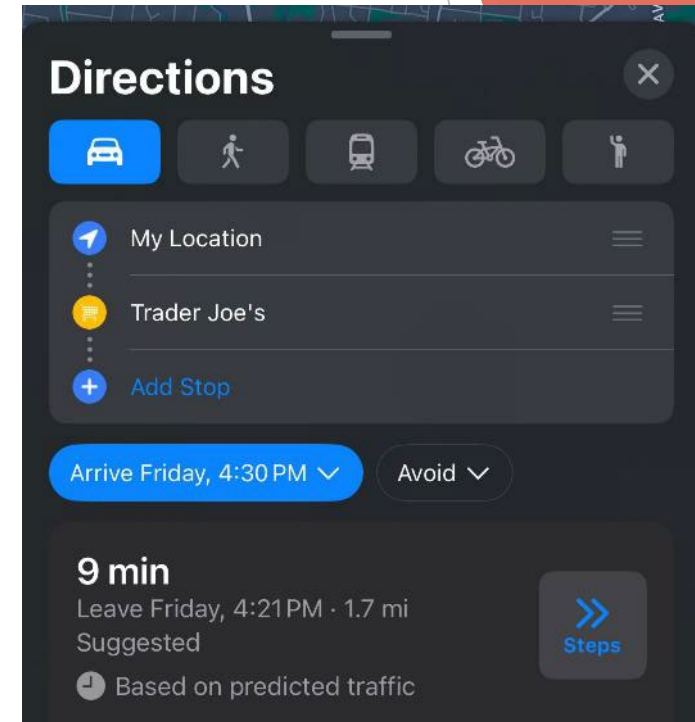
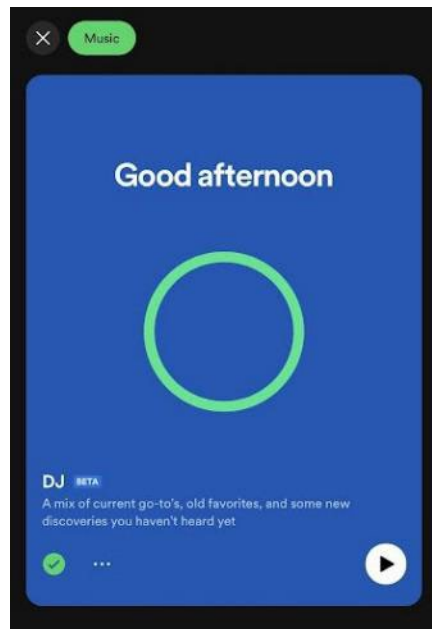


4. Which of the following is a key way AI can improve medication adherence in pharmacy operations?

- a. Automating the generation of patient copay coupons
- b. Providing educational videos at the point-of-sale
- c. Automatically switching patients to mail-order delivery
- d. Analyzing refill patterns to flag nonadherent patients for follow-up

Pre-Test Question





“We tend to overestimate the effect of a technology in the short run and underestimate the effect in the long run.”

Amara's Law



Artificial Intelligence

Artificial Intelligence (AI)

The theory and development of computer systems to perform tasks that normally would require human cognition.

Machine Learning

Machine Learning (ML)

A mathematical approach to learning the unknown rules that govern a particular phenomenon by analyzing many examples of it happening.

Neural Networks

Neural Networks (NN)

Machine learning models inspired by nervous system architecture, in which complex mathematical rules are learned by composing many simple patterns

Deep Learning

Deep Learning (DL)

Neural Network models in which the composition of simple patterns occurs in greater depth, allowing for very complex rules to be learned.



Terminology (cont.)

Generative AI (GenAI)

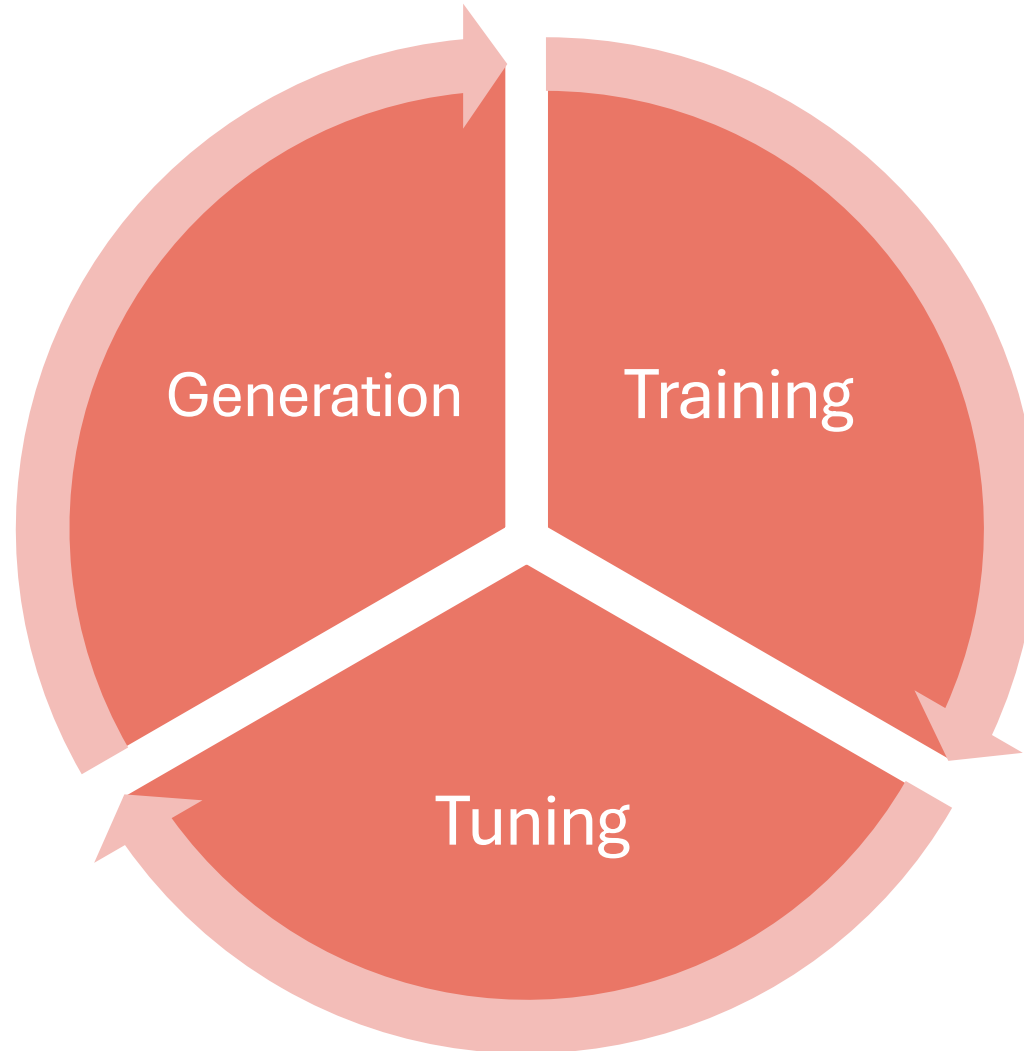
- Broad category of AI tools developed to create new content (text, images, audio, video)
- Content creation (or “output”) is influenced by patterns and information learned from the data the model was trained on

Large Language Models (LLM)

- A specialized form of GenAI that concentrates solely on tasks involving written or spoken language, such as interpreting and producing text
- Developed using extensive text-based datasets to enable comprehension and generation of language that mimics human communication



GenAI: How It Works



Promises and Pitfalls

PROS	CONS
Increased efficiency (time and cost)	Data security and privacy concerns
Automation of repetitive and tedious tasks	Propagation of bias
Enhanced creativity and content creation	Fabricated or inaccurate information (e.g., hallucinations)
Data augmentation	Lack of specificity in generated responses due to quality of input prompts
Personalization	Ethical concerns such as intellectual property rights, authenticity
Predictive analytics and simulation	Potential replacement of human creative or analytical task personnel



Generative vs. Predictive AI

FEATURE	GENERATIVE AI	PREDICTIVE AI
FOCUS	Creates entirely new and original content	Analyzes historical data to forecast future events
TECHNIQUES	Learns from massive data sets of existing content	Uses statistical modeling and machine learning to identify patterns and trends in historical data
APPLICATIONS	Art and design, marketing content creation, software development	Finance, retail, manufacturing, healthcare
HUMAN EXPERTISE	May be needed for editing or refining generated content	Essential for interpreting results and making final decisions



AI in Healthcare Today



Current Uses in Healthcare Today



Efficiently synthesize and document medical information into discharge summaries and chart notes ¹



Minimize administrative burden, which leads to better allocation of cognitive and time resources towards patient care ³



Reduced risk of intradialytic hypotension for patients with ESRD, enhancing patient safety and quality of life ²



Interpreting medical imaging to provide more precise and expedited diagnoses ⁴

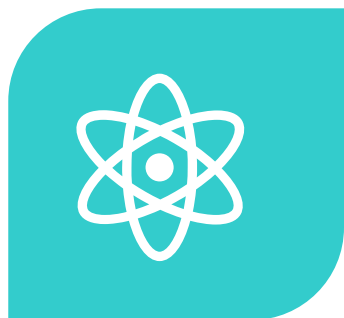


1. Betzler BK. Lancet Digit Health. 2023 Dec;5(12):e917-e924.
2. Zhang H. Nephrol Dial Transplant. 2023;38:1761-9.
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4. Gulshan V. JAMA. 2016 Dec 13;316(22):2402-2410.

Current Uses in Healthcare Research



GenAI constructs molecules, proteins, and nucleic acid sequences to expedite drug discovery ¹



Improving current molecules to have better binding properties than existing drugs for treatment of cancers ²



Reproducing reliable estimates of survival and treatment efficacies of blood cancers ³



1. Vert JP. Nat Biotechnol. 2023 Jun;41(6):750-751.
2. de Raffele D. Chem Commun (Camb). 2024 Jan 16;60(6):632-645.
3. D'Amico S. JCO Clin Cancer Inform. 2023 Jun;7:e2300021.

Current Uses in Pharmacy Practice



Perpetual
inventory
management



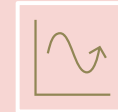
Interactive
voice response
(IVR) systems



IV compounding
robot to
minimize errors
in hospital ¹



Training current
electronic medical
records (EMR) to enable
intelligent filtering of
medication alerts to
minimize alert fatigue ²



Remote patient
monitoring



1. Siwicki B. Healthcare IT News. Published July 28, 2022. <https://www.healthcareitnews.com/news/allegheeny-general-hospital-saves-12-million-iv-robotics>
2. Bryant AD. *BMJ Qual Saf.* 2022 Mar;31(3):160-168.

Current Uses in Pharmacy Practice

Detects drug diversion with 96% accuracy ¹

OpenEvidence: AI-powered medical search engine ²

Complex medication dosing support, such as vancomycin and aminoglycosides ³

Central fill and mail order support ⁴

1. Knight T. Am J Health Syst Pharm. 2022 Aug 5;79(16):1345-1354.
2. Philip S. J Med Libr Assoc. 2026 Jan 1;114(1):86-87.
3. Barrett JS. J Pediatr Pharmacol Ther. 2024 Aug;29(4):434-440.
4. Augusta Hitech. *Prescribing the future: How AI is transforming the Central Fill Mail Order (CFMO) pharmacy.*
https://www.augustahitech.com/blog/AI_is_Transforming_the_Central_Fill_Mail_Order



The Possibilities are Limitless!

Perpetual
Inventory

EMR/PMS
integration

Data entry &
claims
adjudication

Staffing

Clinical
support

Automated
Dispensing
System

Analyze
local
health
trends

Reminder
messages

Marketing

Operational
support



Practical Tips for Implementing AI in Practice

Ask	Know	Understand	Start	Maintain
Ask “what problem will AI help me solve?”	Know the legal and ethical considerations • HIPAA-compliance? • Is data secure?	Understand your AI platform • What data does it train on?	Start small, test, and learn	Maintain constant human interaction • Keep a close eye on its guardrails



Final Tips & Take Home Points

- ▶ AI tools, like interactive voice response, perpetual inventory, and robotics are currently used in pharmacy practice.
- ▶ Data privacy, bias, and hallucinations remain as challenges to use AI in healthcare.
- ▶ Various emerging applications of AI in pharmacy include improved operational workflow and clinical support.
- ▶ Ongoing training and digital literacy are essential for pharmacists to effectively integrate and supervise technologies in practice.



Questions?



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Post-Test Question



Resources and References

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Thank you

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