

RxAI: How AI is Reshaping the Pharmacy Landscape

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Conflict of Interest

- The speaker has no conflicts of interest with ineligible companies to disclose.



Learning Objectives

1. Describe the current applications of AI used in pharmacy settings
2. Define challenges with use of AI in pharmacy practice
3. Discuss the potential future roles and responsibilities of pharmacists and pharmacy technicians in an AI-integrated healthcare system



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Introduction

Artificial intelligence (AI): improves productivity when applied to a field

☰ Classifications

Narrow or Weak AI
(machine learning)

General or Strong AI
(deep learning)

📦 Pharmacy Applications

- ✔ Field of pharmacy uses AI but not at its full potential
- ✔ Robotics = fill, scan, package medication
- ✔ AI can learn from data, recognize patterns, identify problems

👤 Healthcare Context

Augmented intelligence:
emphasizing its assistive
role

Jessica H, et al. Res Social Adm Pharm.2025. 21(3):134-141
<https://nabp.pharmacy/news/blog/ai-in-pharmacy-how-artificial-intelligence-is-transforming-patient-care/>
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Today's Applications of AI in Pharmacy Practice



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Clinical Decision Making



Clinical pharmacist conducting medication review for 80-year-old patient with renal failure, and wants to check dosing for drug X.

Q TRADITIONAL SEARCH

keyword search in large
content repository

✂ AI-POWERED SEARCH

directly inputting natural query “drug X dosing for 80 yo patient with rf’ into AI-powered search within same database

- quickly delivering relevant information tailored for patient’s demographic
- saving time that can be spent on patient care



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<https://www.merative.com/blog/ai-in-clinical-decision-support>

Automating Routine Pharmacy Tasks



common administrative tasks

- sorting incoming faxes, reading invoices, identifying billing opportunities



assessing and maintaining stock in automated dispensing cabinets

- tracking movement, expiration dates, volumes
- moving product that's about to expire to another unit where it is used more
- improving efficiency, reducing stress on pharmacy staff

<https://news.ashp.org/News/ashp-news/2025/04/08/ai-helps-pharmacists-streamline-routine-tasks>



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Personalized Medicine



analyzing genetic markers of tumor

- identify therapies most likely effective for a patient
- reducing trial-and-error approach



processing large amounts of patient data

- identifying patterns useful for diagnosis and treatment



analyzing medical images

- identifying early signs of diabetic retinopathy from eye scans



enhancing pharmacogenomics

- predicting response to treatments based on individual's data



integration with wearable devices to continuously monitor patient health

- cardiac monitors can detect arrhythmias early



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<https://www.estenda.com/blog/the-growing-impact-of-ai-on-personalized-medicine-whats-next>

Patient Communication



24/7 Support

AI-powered conversational tools

- available 24/7
- individualized educational materials
- keeping in touch with patient between visits



Speed & Access

prescription refill program

launched in Utah earlier this year

- Skip doctor's office
- refill their prescriptions online by AI chatbot

<https://infermedica.com/blog/articles/the-future-of-patient-engagement-how-ai-is-transforming-healthcare-interactions>
<https://apnews.com/article/ai-prescription-refill-utah-doctronic-fda-technology-cf94ce370c05f686e8792be8671a2ef0>



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Studied AI Models with Potential Use in Pharmacy Practice



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Dispensing



Prescription Oversight

identifying common prescription errors

- re-routing incorrect prescriptions back to prescribers



Inventory & Supply

predicting drug shortages

- optimization of inventory management at national level



Patient Outcome Monitoring

monitoring patient use of medications

- detecting potential issues (e.g. development of opioid use disorder)

Wong A, et al. J Am Coll Clin Pharm. 2025; 8(4): 302-310.



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Administration



Dosage Calculations

assisting with dosage calculations



Automated Insulin Delivery

delivering subcutaneous insulin with fewer patient interventions



Self-Administration Feedback

providing real-time feedback to patients on their administration technique



Patient communication

e.g. ChatGPT to address patient queries

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Chronic Disease Management & Antibiotic Stewardship



individualized hypertension treatment

- recommended class of antihypertensive based on patient characteristics
- predicted their future SBP => reduced SBP, ~70% larger reduction vs. standard of care



voice-based conversational AI

- helping patients with type 2 diabetes titrate basal insulin at home
- improved time to optimal insulin dose, insulin adherence, glycemic control vs. standard of care



predicting efficacy of empiric antibiotics in women with recurrent UTIs



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Wong A, et al. J Am Coll Clin Pharm. 2025; 8(4): 302-310.
Hu Y, et al. BMC Med Inform Decis Mak. 2023 Mar 1;23(1):44.
Nayak A, et al. JAMA Netw Open. 2023 Dec 1;6(12):e2340232.

Reducing Dispensing Errors



identification of drug images for tablets, capsules, blister packs
reducing medication errors due to look-alike medications



classified medication images captured by medication dispensing robot
predicted NDC of medications inside prescription bottle
AI precision of 98.5-99.1% vs. unaided pharmacist's accuracy rates of 95.7–99.7%



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Wong A, et al. J Am Coll Clin Pharm. 2025; 8(4): 302-310.
Lester CA, et al. NPJ Digit Med. 2021 Jul 27;4(1):118.

Reducing Impact of Drug Shortages



PREDICTIVE CAPABILITY

predicted 59% of most impactful
shortages
one month in advance



ACTIONABLE IMPACT

allowing pharmacy professionals to
optimize their orders and inventories



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Wong A, et al. J Am Coll Clin Pharm. 2025; 8(4): 302-310.
Pall R, et al. Health Care Manag Sci. 2023 Sep;26(3):395-411.

Reducing Pharmacist Non-clinical Duties

CLINICAL QUESTION ROUTING

routing only clinical questions to pharmacists

reduction in time pharmacists spend answering questions related to logistics

AI-BASED INTERNET PHARMACY

reviewed prescriptions

dispensing machine dispensed medications at offline pharmacy by scanning QR code

provided medication consultation outside business hours

Wong A, et al. J Am Coll Clin Pharm. 2025; 8(4): 302-310.
Bu F, et al. Front Pharmacol. 2022 Nov 9;13:1027808.



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Medication Self Administration

EVALUATING TECHNIQUE & ERROR DETECTION

evaluating patient's administration technique with inhalers & insulin pens
analyzing wireless signals in patient's home, without physical contact
detecting medication self-administration errors

AI WIRELESS SENSOR MECHANISM

wireless sensor is mounted on wall, analyzing surrounding radio signals using AI
sends reminders to patient if fails to take medication on time
healthcare providers can access records



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Zhao M, et al. Nat Med. 2021 Apr;27(4):727-735.
Salgado García FI, et al. Pain. 2022 Feb 1;163(2):e357-e367.

Medication Self Administration



CLINICAL PURPOSE

wearable technology for opioid use monitoring



DETECTION

wearable sensor (wristband) to detect self-administration of opioids

collects physiological data heart rate & electrodermal activity

signals after each opioid administration show decreased values after opioid use



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Zhao M, et al. Nat Med. 2021 Apr;27(4):727-735.
Salgado García FI, et al. Pain. 2022 Feb 1;163(2):e357-e367.

Drug Interactions



CLINICAL APPLICATION

identification of drug-drug and drug-food/beverage/supplement interactions
using patient's medication and health Record

Wong A, et al. J Am Coll Clin Pharm. 2025; 8(4): 302-310.



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Medication Reconciliation



OBJECTIVE

predicting drugs patient could be taking but are missing from their medication list



EHR PATTERN ANALYSIS

if many patients in EHR who were prescribed drug A were also prescribed drug B

occurrence of drug A in a patient's list suggests that drug B may also be present but not recorded



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Wong A, et al. J Am Coll Clin Pharm. 2025; 8(4): 302-310.
Hasan S, et al. J Am Med Inform Assoc. 2011 Jul-Aug;18(4):449-58.

Remote Patient Monitoring



DAILY PEF & SYMPTOM MONITORING

detecting asthma exacerbations occurring same day or up to 3 days in future
using daily monitoring of peak expiratory flow (PEF) and symptoms



CLINICAL RATIONALE & INTERVENTION WINDOW

significant changes in PEF and asthma symptoms start to occur 3 days prior to exacerbations
anti-inflammatory actions of inhaled and oral corticosteroids start within that time frame
intervention within this time frame has positive impact

Wong A, et al. J Am Coll Clin Pharm. 2025; 8(4): 302-310.
Zhang O, et al. J Asthma. 2021 Nov;58(11):1518-1527.
Levy-Loboda T, et al. J Biomed Inform. 2022 Aug;132:104129.



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Remote Patient Monitoring



SYSTEM VULNERABILITY

insulin pumps are connected wirelessly
vulnerable to cyber-attacks



DETECTION & MONITORING MECHANISM

detection of cyberattacks on insulin pump systems
using logs of real insulin pumps and continuous glucose monitors

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Question 1

Could you share an example of AI application currently used in your institution or your peers' practice settings?



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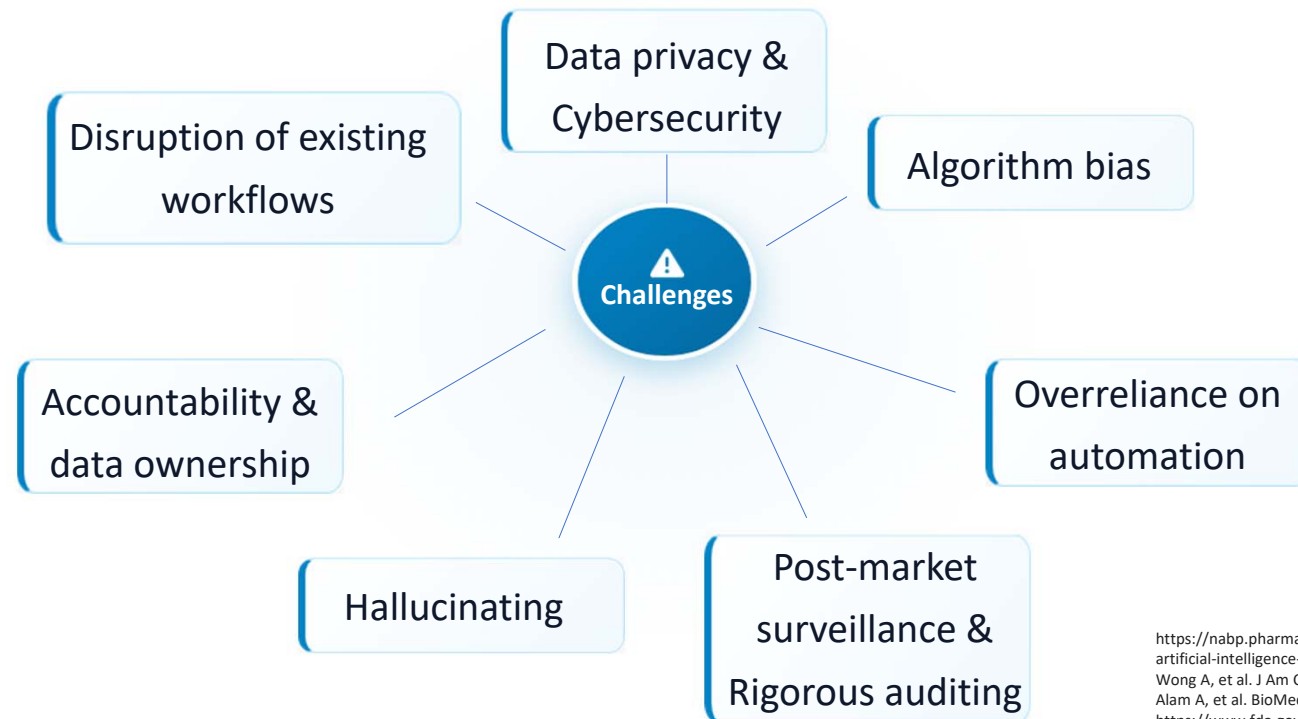
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Challenges of using AI in Pharmacy Practice



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Challenges of using AI in Pharmacy



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Alam A, et al. BioMedInformatics 2025, 5, 65.
<https://www.fda.gov/medical-devices/software-medical-device-samd/artificial-intelligence-software-medical-device>



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Question 2

What is one of the challenges in use of AI in the pharmacy practice setting?

- a) Algorithmic bias and patient data privacy
- b) Elimination of legal requirement for human oversight
- c) Higher administrative workload for pharmacy professionals
- d) Extra time spent on administrative tasks by pharmacy professionals



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Future Role of Pharmacy Professionals



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Future Role of Pharmacy Professionals



Verifying accuracy of AI-generated information

AI expands access to evidence-based information
supports more informed decision-making



Focusing on clinical responsibilities and putting human touch to patient care

AI enhances workflow by completing administrative tasks
integration of AI in wearable and remote monitoring devices
allows pharmacists to track patient health, e.g. HR, BG
more proactive & personalized care



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ACCP Ambulatory Care PRN Newsletter Spring 2026
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Wong A, et al. J Am Coll Clin Pharm. 2025; 8(4): 302-310.
Nelson SD. Am J Health Syst Pharm. 2024 Feb 8;81(4):83-84.

Future Role of Pharmacy Professionals



Enrolling in training programs to develop skills and knowledge needed for using AI effectively



Developing educational materials, training and continuing education content



Getting involved in institution's deployment of AI and its ongoing validation



Drafting comprehensive AI guidelines and actively engage in policymaking, AI governance, data stewardship

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Future Role of Pharmacy Professionals



Providing human oversight for both AI and its users



Accepting new roles in healthcare



Medical Information Consultant



AI ethics and bias editors

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Question 3

How do you think institutions should prepare pharmacists and pharmacy technicians for future roles in an AI-integrated practice setting?



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