

ASHP Statement on the Use of Artificial Intelligence in Pharmacy

Am J Health-Syst Pharm. 2020;77:2015-2018

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Keywords: algorithm, artificial intelligence, informatics, model

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DOI 10.1093/ajhp/zxaa249

Position

Pharmacists are responsible for determining which aspects of medication use and management are best handled by pharmacists, by artificial intelligence (AI), or by pharmacists

who receive advice from AI-based systems. Pharmacists should use scientific approaches to determine the degree to which AI is used to automate specific medication-use tasks. Full automation using AI should be reserved for algorithmic tasks for which it is demonstrated that AI performs as well or better than pharmacists. AI of proven value should be adopted and used so that pharmacists can make better decisions and focus their expertise on solving new and confounding problems for patients, families, and organizations.

Pharmacists are uniquely positioned to be key contributors and domain experts in the advancement of AI in healthcare. Pharmacists should lead the design, implementation, and ongoing evaluation of AI-related applications and technologies that affect medication-use processes and tasks. Pharmacists should define appropriate medication-related use cases for AI-enabled technology and provide foresight for anticipated future applications. It is also important for pharmacists to assist in validating AI for clinical use. At a minimum, AI should be evaluated for accuracy and interpretability. In addition, pharmacists should be prepared to adapt to AI through education and continued engagement.

Background

The US healthcare landscape is rapidly evolving, driven by rising costs, an aging population, and an increased emphasis on personalized medicine. As healthcare becomes increasingly digitized, unprecedented amounts of data offer valuable opportunities to better understand and thus improve patient care and pharmacy practice. The increasing digitization of healthcare data further accelerates the need for increased automation and

scalability. Pharmacy must be prepared to embrace and lead efforts in making efficient use of advanced technologies to address all aspects of the quadruple aim (improving access, reducing costs, improving outcomes, and optimizing clinician satisfaction).¹

AI is the theory and development of computer systems to perform tasks normally requiring human intelligence, such as visual perception, language processing, learning, and problem solving.² AI, when deployed optimally, has the ability to “augment human intelligence and improve decision-making and operational processes.”³ As the ASHP Commission on Goals noted at its 2019 meeting, AI capabilities are rapidly evolving within healthcare, with both clinical and operational implications for pharmacy.⁴ This technology allows for automation of routine and manual tasks and provides a higher level of clinical decision support for the clinician across every aspect of medication management, including procurement, storage, ordering, verifying, dispensing, administering, and monitoring. As this technology advances, its deployment in the healthcare system has the potential to create new roles for pharmacists and alter the scope of pharmacist care.⁵

ASHP has developed this statement to define the role and position of pharmacists and pharmacy technicians in the advancement of AI in the care of patients. This statement was developed not simply to consider potential applications of AI within the current practice of pharmacy but also to plan for how this technology will need to be developed and implemented in coming years. Although this position is similar to the positions of other health-professional organizations contemplating how AI will drive change in their practices, it is uniquely focused on identifying opportunities specific to the

practice of pharmacy. This statement is based on consensus opinion and professional judgment among experts on AI in pharmacy. Pharmacy practice settings impacted by this policy include informatics, acute care, ambulatory, community, education, public health, policy, industry, research, and development.

Responsibilities of pharmacists in AI

For AI implementation, pharmacists should actively seek to address the following 3 key questions:

1. Which medication- or therapy-related tasks are appropriate for AI to address?
2. How should AI models be evaluated?
3. For each type of use case, which AI learning approach(es) is(are) most appropriate?

As AI methodology and techniques evolve, pharmacists should define appropriate medication-related clinical-use cases for AI-enabled technology based on AI's current capabilities, providing foresight for anticipated future applications. Every health system should include an AI-integration road map as an important part of strategic planning.⁴ Any clinical AI platform implemented in the health system related to medication use or monitoring should be validated by a pharmacist prior to implementation and receive continual evaluation by a pharmacist for its contextual accuracy and interpretability. As new techniques and methodologies come into practice, establishing best practices for clinical validation and bias reduction will be a critical component in AI optimization. Pharmacists should develop and maintain clinical validation standards for AI at the local and national levels, outlining the varying levels of required evidence for safety and efficacy before deploying AI-enabled technology.⁴ Clinical validation standards should

- take into account the level of risk involved in the AI activity and its level of autonomy,

- balance stringency with the need for rapid innovation, and
- include definitions and requirements for interpretability for any model used in the medication-use process.

Impact on pharmacy. As AI automates routine, manual, and repeatable tasks, pharmacists' time and focus can shift to complex clinical tasks that provide direct, empathetic patient care in a high-touch and humanistic way.^{6,7} AI systems have the potential to off-load time-consuming tasks, such as routine monitoring, patient and medication safety surveillance, and data processing. AI technology can run in the background to provide information in a visually digestible and easily interpretable way, at the appropriate time to aid the pharmacist in patient-care decisions.

AI also has the potential to synthesize and become a new source of evidence-based data with which pharmacists will need to be actively engaged. As AI capacity develops further into the diagnostic space, it has the potential to shift healthcare paradigms, with some diagnoses being confirmed independently through AI-enabled devices and applications.^{8,9} Eventually, patients may receive continuous diagnostic surveillance. Pharmacy leadership should focus on improving access to care through scalable models centered on AI-enabled diagnostic surveillance and pharmacy medication management, especially for underserved patient populations. Given the novelty of this technology, systems should be designed with a functional level of autonomy that corresponds to the level of trust users can confidently place in the system.¹⁰

In addition to its impact on care-delivery models, AI is expanding the medication armamentarium. Advances in AI capabilities are enabling the emergence of software platforms designed for patients with chronic disease states to be used with, or in place of, medication therapy.¹¹ Given the anticipated trend of increasing development and use of digital therapeutics and a blend between chemical, biological, and

digital therapies, pharmacists should be involved in the design of AI-enabled digital therapeutics.^{12,13} Pharmacists should have access to the summarized data from AI-enabled digital therapeutics for safety and efficacy monitoring. Pharmacy organizations should seek out opportunities to collaborate with other healthcare organizations to be involved in creating guidance and standards on how to incorporate AI-enabled digital therapeutics into patient care.

Informatics

Pursuant to the rigor applied to clinical trial design and the practice of evidence-based medicine, AI models need to be trained, evaluated, corrected, and applied to data that match clinical practice. AI models that run on poorly sourced data, data with disproportionate representation, or correlated data assumed to be causal could unintentionally magnify systemic bias or discrimination.¹⁴⁻¹⁶ In addition, AI models require maintenance and monitoring as clinical practice and data inputs or data distributions change over time. With their background in experimental design, research methodology, and problem solving, pharmacists (especially pharmacists specialized in informatics) have ideal baseline skill sets for AI development and implementation.¹⁷ Pharmacists can further specialize in AI and data science, or develop partnerships with data scientists to develop, test, and validate new AI models related to medication management, and should promote development of interdisciplinary teams or dedicated positions for integrating AI solutions within the health system.

Clinical applications

Pharmacists should be open and willing to make changes to traditional clinical workflows by leveraging AI and AI-enabled clinical-decision support systems to improve patient care.¹⁸ AI applications are expanding from diagnostics to therapy recommendations. Because medications are a central focus of therapy recommendation

models, pharmacists should take a central role in leading the research, development, implementation, and quality improvement of these models. Pharmacy departments should work with healthcare systems to leverage pharmacists and future emerging AI-enabled diagnostic tools and decision support tools to evaluate models, improve care, lower costs, and provide comprehensive medication management for patients.

Pharmacy operations

From an operational standpoint, AI platforms can be used to tighten inventory management,¹⁹ facilitate product verification, and help pharmacists perform at the top of their skill set. As AI becomes more reliable, standard pharmacy operations will become increasingly automated, allowing pharmacists to focus more on high-value patient-care activities. Rather than merely adopting AI, it is important that pharmacy executives lead the effort to define the future of pharmacy and the role of the pharmacist in an environment where AI is pervasive. As pharmacy departmental leadership looks at operational AI systems to develop and deploy, they should prioritize systems and applications that promote personalized, continuous, and preventive care.²⁰

Education and engagement

Education about and exposure to AI is necessary throughout all domains of pharmacy practice.⁴ Pharmacy students should be introduced to the essentials of data science and fundamentals of AI through a health informatics curriculum during their PharmD education. Pharmacists must also be given the opportunity to develop an understanding of AI through continuing education. Data science courses or pharmacy residencies with a focus on AI topics should be made available for pharmacists seeking more hands-on involvement in AI development, governance, and use. As these technologies rapidly evolve, the pharmacy education system must remain agile to ensure our profession

is equipped to steward these transformations of care.

Conclusion

Advances in technology through AI stand to substantially change how care is delivered to patients. In all aspects of the medication-use process, there are opportunities to refine and augment existing pharmacy workflows to improve both safety and efficiency. Pharmacists will be necessary in leading innovation on how AI models and technologies are developed, validated, and activated to enact change. Further, pharmacists must be poised to capitalize on the operational gains and enhanced clinical guidance made possible by AI technology to enhance patient care. To carry this out, pharmacy needs to continue to build on education that will enable current and future generations of pharmacists and pharmacy technicians to shape the evolution of AI technology. The scope and impact of changes to come will cross into all aspects of pharmacy practice, requiring continued engagement by all in the field.

Acknowledgments

ASHP gratefully acknowledges the following individuals for reviewing the current version of the statement: Allen Flynn, PharmD, PhD; Amey C. Hugg, BSPHarm, CPHIMS, FKSHIP; Beth Prier, PharmD, MS, CPHIMS; Chris Urbanski, BSPHarm, MS, FASHP; Dennis Tribble, Pharm, FASHP; Eric Maroyka, PharmD, BCPS; Jay Dorris, PharmD; Jessica Hill, PharmD, BCPS, BCACP; Katayoon Kathy Ghomeshi, PharmD, MBA, BCPS, CPPS; Kerry Goldrosen, PharmD, BCPS; Maritza Lew, PharmD, CPHIMS, PMP; Seth Hartman, PharmD, MB; and Sylvia Belford, PharmD, MS, CPHIMS, FASHP.

Disclosures

The authors have declared no potential conflicts of interest.

Additional information

Approved by the ASHP Board of Directors on November 19, 2019, and by the ASHP House of Delegates on May 20, 2020. Developed through the ASHP Section of Pharmacy Informatics and Technology.

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