

Artificial intelligence tools in community pharmacy: a literature review.

Francisco Castro¹, Gonçalo Pires¹, Isabel Pinto¹, José Cunha¹, Luís Nascimento¹, Xavier Costa¹

¹Polytechnic Institute of Bragança, Portugal. Corresponding Author: Xavier Costa - isabel.pinto@ipb.pt

BACKGROUND

Community pharmacies play a vital role in public health, serving as the first point of contact for many patients.

With the increasing workload and complexity of care, artificial intelligence (AI) is being explored as a way to enhance pharmaceutical services. [1][2][3]

In community pharmacy, AI is designed to complement the pharmacy professional's clinical judgement, robotization of procedures and dispensing, and enhance patient outcomes [4].

OBJECTIVE

This literature review aims to explore the current AI-based hardware and software technologies applied in community pharmacy, the barriers to their implementation, and their impact on pharmaceutical care.

METHODS

A literature review was conducted using PubMed, focusing on articles from 2020 to 2025. Keywords included "artificial intelligence", "community pharmacy", "hardware", "software" and "robots". Inclusion criteria prioritized full-text studies of scoping reviews, systematic reviews or narrative reviews, about AI applications in community pharmacy.

REFERENCES

- Jessica, H., et al. (2025). Applications of artificial intelligence in current pharmacy practice: A scoping review. *Research in Social and Administrative Pharmacy*, 21(3), 134–141.
- Ranchon, F., et al. (2023). Development of artificial intelligence powered apps and tools for clinical pharmacy services: A systematic review. *International Journal of Medical Informatics*, 172, 104983.
- Corey, L., et al. (2025). Effect of Uncertainty-Aware AI Models on Pharmacists' Reaction Time and Decision-Making in a Web-Based Mock Medication Verification Task: Randomized Controlled Trial. *JMIR Med Inform*, 13, e64902.
- Nelson, S. D., Walsh, C. G., Olsen, C. A., McLaughlin, A. J., LeGrand, J. R., Schutz, N., & Lasko, T. A. (2020). Demystifying artificial intelligence in pharmacy: American journal of health-system pharmacy - AJHP - official journal of the American Society of Health-System Pharmacists, 77(19), 1556–1570. <https://doi.org/10.1093/ajhp/zxaa218>
- Lester Corey and Rowell, B. and Z. Y. and C. Z. and M. V. and K. J. Y. and C. Q. and K. R. and Y. X. J. (2025). Effect of Uncertainty-Aware AI Models on Pharmacists' Reaction Time and Decision-Making in a Web-Based Mock Medication Verification Task: Randomized Controlled Trial. *JMIR Med Inform*, 13, e64902. <https://doi.org/10.2196/64902>
- Roosan, D., Padua, P., Khan, R., Khan, H., Verzosa, C., & Wu, Y. (2024). Effectiveness of ChatGPT in clinical pharmacy and the role of artificial intelligence in medication therapy management. *Journal of the American Pharmacists Association*, 64(2), 422-428.e8. <https://doi.org/10.1016/j.japh.2023.11.023>
- Raza, M. A., Aziz, S., Nooren, M., Saedd, A., Anjum, T., Ahmed, M., & Raza, S. M. (2022). Artificial Intelligence (AI) in Pharmacy: An Overview of Innovations. *INNOVATIONS in pharmacy*, 13(2), 13. <https://doi.org/10.24926/ijp.v13i2.4839>
- Simpson, M. D., & Qasim, H. S. (2025). Clinical and Operational Applications of Artificial Intelligence and Machine Learning in Pharmacy: A Narrative Review of RealWorld Applications. *Pharmacy*, 13(2), 41. <https://doi.org/10.3390/pharmacy13020041>
- Jarab, A. S., Al-Qerem, W., Alzoubi, K. H., Obaidat, H., Abu Heshmeih, S., Mukattash, T. L., Naser, Y. A., & Al-Azayzih, A. (2023). Artificial intelligence in pharmacy practice: Attitude and willingness of the community pharmacists and the barriers for its implementation. *Saudi Pharmaceutical Journal*, 31(8). <https://doi.org/10.1016/j.jsps.2023.101700>
- Hasan, H. E., Jaber, D., Tabbah, S. A., Al-Lawand, N., Habib, H. A., & Farahat, N. M. (2024). Knowledge, attitude and practice among pharmacy students and faculty members towards artificial intelligence in pharmacy practice: A multinational cross-sectional study. *PLoS ONE*, 19(3 March). <https://doi.org/10.1371/journal.pone.0296884>
- Sendeckie, A. K., Linneth, L. W., Abate, B. B., Chanig, G. S., Kassaw, A. T., Tamene, F. B., Geto, K. Y., & Dagne, E. M. (2024). Artificial intelligence in community pharmacy practice: Pharmacists' perceptions, willingness to utilize, and barriers to implementation. *Exploratory Research in Clinical and Social Pharmacy*. <https://doi.org/10.1016/j.rcsop.2024.100542>

RESULTS

In review of the literature were identified applications and evidence of the improvement in the community pharmacy.

Applying **AI in hardware**, picture 1, we found autonomous robotic dispensing systems, mobile verification devices and smart medical equipment. These devices are associated with a 75% reduction in medication errors [1][5].



Picture 1 - AI hardware robotic dispensing for community Pharmacy

AI in the software, picture 2, enables more accurate: encompasses clinical decision support tools, with natural language models (Chatbox's) demonstrating near 100% accuracy in Medication Therapy Management scenarios [6], and predictive inventory management systems with 90% forecast accuracy [7].



Picture 2 - AI Software for community Pharmacy

The use of AI on community Pharmacy shows advantages and disadvantages, picture 3. Although it brings great benefits, the main challenges for use are the lack of user training, high costs in some cases, ethical issues, and a still inefficient technological landscape with limited AI availability [6][9][11].



Picture 3 - AI impact and barriers on community Pharmacy

CONCLUSION

AI holds transformative potential for community pharmacy, optimizing patient safety and process efficiency. Its successful integration requires a strategic investment in digital infrastructure, professional training, and robust regulatory frameworks to ensure an ethical and effective implementation.