Exploring the Potential of Artificial Intelligence in Optimizing Medication Therapy Management: Perspectives of Pharmacists and Nurses in Saudi Arabian Hospitals

Salman Huimed Almutairi[1]
Yasser Shaman Almutairi[2]
Abdul Kareem Aiesh Alharbi[3]
Shabbab Oraimet Tail Al Solami[4]
Osama Barakah Allah Obaidallah Almuhalbidi[5]
MAHER SAAD ALLUHAIBI[6]
Fawzi Mohammed Sharaf Alsharif[7]
Riham Hussen Alsyed[8]

1. Pharmacy
2. Pharmacy
3. Pharmacy
4. Pharmacy
5. Nursing
6. Nursing
7. Nursing
8. Nursing

Abstract

Background: Artificial intelligence (AI) has shown promise in transforming healthcare delivery, including medication therapy management (MTM). However, little is known about the perspectives of pharmacists and nurses on the potential of AI in optimizing MTM in Saudi Arabian hospitals.

Objective: This study aimed to explore the views of pharmacists and nurses on the potential benefits, challenges, and future directions of AI in MTM within the Saudi Arabian hospital context.

Methods: A qualitative descriptive design was used. Semi-structured interviews were conducted with 20 pharmacists and 20 nurses purposively sampled from 4 tertiary hospitals in Riyadh, Saudi Arabia. Thematic analysis was used to analyze the data.

Results: Participants perceived several potential benefits of AI in MTM, including improved medication safety, efficiency, and personalized care. However, they also identified challenges such as data privacy concerns, lack of human touch, and the need for specialized training. Three key themes emerged regarding future directions: 1) Developing AI systems that integrate with existing workflows; 2) Ensuring transparency and explainability of AI decisions; and 3) Fostering interprofessional collaboration in AI implementation.

Conclusion: Pharmacists and nurses in Saudi Arabia recognize the potential of AI to optimize MTM but also anticipate challenges. Collaborative efforts are needed to thoughtfully design and implement AI solutions that enhance rather than disrupt patient care. Future research should pilot AI interventions for MTM and evaluate their impact on patient outcomes.

1. Introduction

The rapid advancement of artificial intelligence (AI) technologies has opened up new possibilities for transforming healthcare delivery and improving patient outcomes (Ngiam & Khor, 2019). One promising application of AI is in the domain of medication therapy management (MTM), which involves optimizing medication use and adherence, reducing adverse drug events, and improving medication-related health outcomes (Ayorinde et al., 2022). With the ability to rapidly analyze large volumes of data, identify patterns, and generate predictive insights, AI has the potential to revolutionize the way MTM is practiced (Challen et al., 2019).

In Saudi Arabia, the healthcare system has undergone significant expansion and modernization in recent years, with increasing adoption of digital health technologies (Alharbi, 2018). However, medication errors and adverse drug events remain a significant challenge, with studies suggesting that up to 23% of patients in Saudi hospitals experience medication-related problems (Al-Otaibi et al., 2018). Implementing AI solutions for MTM could help address these issues and improve the quality and safety of medication use.

Salman Huimed Almutairi, Yasser Shaman Almutairi,Abdul Kareem Aiesh Alharbi, Shabbab Oraimet Tail Al Solami· Osama Barakah Allah Obaidallah Almuhalbidi, MAHER SAAD ALLUHAIBI, Fawzi Mohammed Sharaf Alsharif, Riham Hussen Alsyed

Pharmacists and nurses play a crucial role in MTM, with pharmacists being responsible for medication review, counseling, and monitoring, and nurses often serving as the final checkpoint before medications are administered to patients (Alharthi et al., 2020). As such, the perspectives of these healthcare professionals on the potential of AI in MTM are critical for informing the design, implementation, and evaluation of AI interventions. However, there is currently a lack of research exploring the views of pharmacists and nurses on AI in MTM, particularly within the Saudi Arabian context.

This study aimed to address this gap by conducting in-depth interviews with pharmacists and nurses in Saudi Arabian hospitals to explore their perspectives on the potential benefits, challenges, and future directions of AI in optimizing MTM. Understanding the insights of these frontline practitioners is essential for developing AI solutions that are not only technically sound but also aligned with the needs, values, and workflows of the healthcare teams who will use them. The findings of this study can inform policymakers, healthcare leaders, and technology developers on how to successfully integrate AI into MTM practice in Saudi Arabia and beyond.

2. Literature Review

AI is a rapidly evolving field that encompasses a range of techniques, including machine learning, natural language processing, and computer vision, which enable computers to perform tasks that typically require human intelligence (Jiang et al., 2017). In healthcare, AI has shown promise in various applications such as disease diagnosis, drug discovery, personalized medicine, and clinical decision support (Ngiam & Khor, 2019). The use of AI in medication management is an emerging area of research, with studies demonstrating the potential of AI to optimize medication selection, dosing, and monitoring (Ayorinde et al., 2022).

One key application of AI in MTM is in the identification and prevention of medication errors and adverse drug events. For example, machine learning algorithms have been developed to predict the risk of adverse drug reactions based on patient characteristics and medication regimens (Caster et al., 2020). AI-powered clinical decision support systems can alert healthcare providers to potential drug-drug interactions, contraindications, and dosing errors at the point of care (Tomaselli et al., 2020). AI can also be used to monitor medication adherence through smart pill bottles or wearable devices, enabling early identification and intervention for non-adherence (Labovitz et al., 2017).

Another promising area is the use of AI for personalized medication therapy. By analyzing large datasets of patient characteristics, medication use, and clinical outcomes, AI models can generate individualized treatment recommendations tailored to each patient's unique needs and preferences (Khandelwal et al., 2022). This approach has the potential to improve the effectiveness and safety of medication therapy while also enhancing patient engagement and shared decision-making.

However, the implementation of AI in MTM also poses several challenges. One major concern is the potential for AI algorithms to perpetuate or exacerbate biases present in the training data, leading to disparities in treatment recommendations for different patient populations (Wiens et al., 2019). Ensuring the transparency, interpretability, and explainability of AI models is critical for fostering trust and acceptance among healthcare providers and patients (Ahmad et al., 2018). Data privacy and security are also key considerations, as AI systems often rely on access to sensitive patient health information (Kaisho, 2021).

Furthermore, the successful integration of AI into MTM practice requires addressing organizational and human factors. Healthcare providers may lack the necessary knowledge and skills to effectively use AI tools, highlighting the need for specialized training and education (Vural & Kaya, 2020). Workflow disruptions and increased cognitive burden are potential unintended consequences of poorly designed AI interventions (Morgado & Sanchez, 2021). Ensuring that AI systems are seamlessly integrated into existing clinical workflows and align with the needs and preferences of end-users is crucial for achieving widespread adoption and realizing the full benefits of AI in MTM (Ibrini et al., 2020).

While previous studies have explored healthcare providers' perspectives on AI in general (Laï et al., 2020; Sit et al., 2020), there is a paucity of research specifically examining the views of pharmacists and nurses on AI in MTM. Given the central role these professionals play in medication management, understanding their unique insights and concerns is essential for developing AI solutions that are fit for purpose and successfully implemented in practice. This study aims to address this research gap within the context of Saudi Arabian hospitals, where the potential of AI in MTM remains largely unexplored.

3. Methods

A qualitative descriptive design was used to gain an in-depth understanding of pharmacists' and nurses' perspectives on the potential of AI in optimizing MTM. Qualitative description is well-suited for research aimed at eliciting firsthand knowledge from practitioners to inform practice and policy (Kim et al., 2017).

3.1 Setting and Participants

The study was conducted across four tertiary hospitals in Riyadh, Saudi Arabia. Purposive sampling was used to recruit pharmacists and nurses with experience in MTM. Inclusion criteria were: 1) Licensed pharmacist or

registered nurse; 2) Minimum of 2 years of hospital practice experience; 3) Involved in direct patient care and MTM activities. A total of 20 pharmacists and 20 nurses participated in the study (see Table 1 for participant characteristics).

3.2 Data Collection

Individual semi-structured interviews were conducted with participants. The interview guide was developed based on a review of the literature and input from an expert panel of health informatics and MTM researchers. Questions explored perspectives on the current state of MTM, potential applications and benefits of AI, anticipated challenges and concerns, and recommendations for future development and implementation of AI in MTM. Interviews were conducted in either English or Arabic based on participant preference, audio-recorded, and transcribed verbatim. Arabic transcripts were translated into English for analysis.

3.3 Data Analysis

Thematic analysis was used to analyze the interview data, following the six-step approach outlined by Braun and Clarke (2006). Two researchers independently coded the transcripts, then met to compare codes and organize them into initial themes. Themes were refined through discussion with the full research team. Strategies to ensure trustworthiness included maintaining an audit trail, peer debriefing, and member checking of themes with a subset of participants.

4. Results

Three main themes were identified regarding the potential of AI in optimizing MTM: 1) Perceived benefits; 2) Anticipated challenges; and 3) Future directions. Subthemes and representative quotes are presented below.

4.1 Perceived Benefits

Participants identified several potential benefits of AI in MTM, including improved medication safety, efficiency, and personalized care.

4.1.1 Medication Safety

Many participants felt that AI could enhance medication safety by reducing errors and adverse events. They described AI's potential to quickly identify drug interactions, contraindications, and inappropriate dosing.

"AI could be like a safety net, double-checking our work and catching mistakes before they reach the patient." (Pharmacist 3)

"With AI monitoring, we could pick up on adverse reactions much earlier and intervene before serious harm occurs." (Nurse 7)

4.1.2 Efficiency

Participants also perceived AI as a means to streamline MTM processes and reduce workload. They envisioned AI automating tasks such as medication reconciliation and optimizing medication regimens.

"AI could take over some of the tedious, time-consuming parts of medication review and free us up to focus on more complex issues." (Pharmacist 12)

"If AI could suggest the most effective and cost-efficient medication regimens, it would save a lot of time and mental energy." (Nurse 15)

4.1.3 Personalized Care

Another perceived benefit was the potential for AI to enable more personalized, precision medicine approaches to MTM. Participants described how AI could tailor medication recommendations based on individual patient factors.

"By analyzing each patient's unique genetic profile, health history, and preferences, AI could help us choose the most suitable medications and doses." (Pharmacist 9)

"AI might uncover patterns we wouldn't see on our own and help us make more targeted, individualized treatment decisions." (Nurse 20)

4.2 Anticipated Challenges

While recognizing the potential benefits, participants also foresaw various challenges in implementing AI for MTM.

4.2.1 Data Privacy and Security

Concerns about data privacy and security were common. Participants emphasized the need for robust safeguards to protect patient information in AI systems.

"We'd need to be absolutely certain that patient data is kept confidential and secure when used for AI. Any breaches would erode trust." (Pharmacist 18)

"Patients might be hesitant to have their information fed into AI algorithms without strong assurances of privacy." (Nurse 6)

4.2.2 Lack of Human Touch

Some participants worried that AI could diminish the human aspects of MTM, such as face-to-face counseling and empathetic communication. They stressed the importance of maintaining a personal touch.

Salman Huimed Almutairi, Yasser Shaman Almutairi,Abdul Kareem Aiesh Alharbi, Shabbab Oraimet Tail Al Solami· Osama Barakah Allah Obaidallah Almuhalbidi, MAHER SAAD ALLUHAIBI, Fawzi Mohammed Sharaf Alsharif, Riham Hussen Alsyed

"MTM isn't just about the technical aspects of medications. It's also about building rapport and trust with patients, which AI can't fully replace." (Pharmacist 2)

"We have to be careful not to lose the human connection and empathy in pursuit of efficiency through AI." (Nurse 11)

4.2.3 Need for Specialized Training

Participants also identified the need for specialized training to effectively use and interpret AI tools. They recognized that integrating AI would require new skills and knowledge.

"Most of us don't have a background in AI or informatics. We would need significant training to feel comfortable relying on these systems." (Pharmacist 15)

"It's not enough to just give us AI tools. We need to deeply understand how they work, their limitations, and how to apply them safely in practice." (Nurse 4)

4.3 Future Directions

When asked about future directions for AI in MTM, three key themes emerged.

4.3.1 Workflow Integration

Participants emphasized the importance of developing AI systems that seamlessly integrate with existing MTM workflows. They desired tools that would enhance rather than disrupt current practices.

"The AI solutions need to fit naturally into our daily work and information systems. They should make our jobs easier, not add extra steps." (Pharmacist 5)

"Interoperability is key. AI needs to pull from and feed back into our electronic health records and other software we already use." (Nurse 17)

4.3.2 Transparency and Explainability

Participants also prioritized transparency and explainability in future AI systems. They wanted to understand the reasoning behind AI recommendations and have the ability to override them when necessary.

"AI can't be a black box. We need to know what data it's using and how it's arriving at conclusions, especially if we're going to trust it for high-stakes decisions." (Pharmacist 14)

"There should be clear explanations in layman's terms for how the AI generated each recommendation. And we should still have the final say." (Nurse 9)

4.3.3 Interprofessional Collaboration

Finally, participants emphasized the need for interprofessional collaboration in the design, implementation, and evaluation of AI solutions for MTM. They believed that diverse perspectives were crucial for success.

"Pharmacists, nurses, physicians, informaticists, and patients should all have a voice in shaping these AI tools. We each bring different expertise and insights." (Pharmacist 20)

"Collaboration will be essential for making sure the AI truly meets the needs of everyone involved in the medication use process." (Nurse 12)

See Table 2 for additional supporting quotes.

5. Discussion

This study provides novel insights into pharmacists' and nurses' perspectives on the potential of AI to optimize MTM in Saudi Arabian hospitals. Consistent with previous literature, participants recognized several promising applications of AI, such as enhancing medication safety, streamlining workflows, and enabling personalized care (Challen et al., 2019; Khandelwal et al., 2022). At the same time, they anticipated challenges related to data privacy, the need for human interaction, and the requirement for specialized training, echoing concerns raised in prior studies (Kaisho, 2021; Morgado & Sanchez, 2021).

Perhaps most importantly, this study highlights key considerations for the future development and implementation of AI in MTM. Participants' emphasis on the need for workflow integration aligns with research demonstrating the importance of human-centered design in health information technology (Luna et al., 2020). Their call for transparency and explainability in AI systems reflects growing recognition of the need for interpretable and accountable AI in healthcare (Ahmad et al., 2018). Finally, their focus on interprofessional collaboration underscores the importance of engaging diverse stakeholders in the co-design of AI solutions (Berry et al., 2019).

These findings have important implications for policymakers, healthcare leaders, and technology developers seeking to harness the potential of AI to improve MTM. They suggest that successfully integrating AI into practice will require not only advanced technical capabilities but also careful attention to the human and organizational factors that influence adoption and acceptance. Collaborative, interdisciplinary approaches that engage end-users throughout the development and implementation process are needed to ensure that AI solutions are safe, effective, and aligned with the values and needs of pharmacists, nurses, and patients.

5.1 Limitations

The qualitative design and relatively small sample size limit the generalizability of findings. The study was conducted in tertiary care settings in a single region of Saudi Arabia; perspectives may differ in other contexts. Social desirability bias may have influenced participants' responses, although the use of individual interviews aimed to minimize this risk. Future research should explore perspectives on AI in MTM across a broader range of settings and stakeholders.

5.2 Implications for Research and Practice

The study findings highlight several priority areas for future research and practice efforts to support the successful integration of AI into MTM. Educational programs for pharmacists and nurses should incorporate training on AI literacy, equipping them with the knowledge and skills needed to critically evaluate and effectively use AI tools. Participatory design methods that engage pharmacists, nurses, and patients as active partners in the development process can help ensure that AI solutions are user-friendly, culturally appropriate, and meet real-world needs.

Implementation research is needed to identify effective strategies for integrating AI into MTM workflows and to evaluate the impact of AI interventions on medication safety, efficiency, and patient outcomes. Governance frameworks and ethical guidelines must be established to ensure the responsible and equitable use of AI in MTM, addressing issues such as data privacy, algorithmic bias, and liability. Collaborative learning networks that bring together diverse stakeholders can foster knowledge sharing and dissemination of best practices for AI in MTM.

At a policy level, investments in data infrastructure, interoperability standards, and workforce development are needed to create an enabling environment for AI in healthcare. Regulatory frameworks must evolve to keep pace with the rapid advancements in AI technology while ensuring patient safety and public trust. Professional organizations and accrediting bodies should develop standards and competencies for the use of AI in MTM to guide education, practice, and research.

6. Conclusion

This study provides valuable insights into pharmacists' and nurses' perspectives on the potential of AI to optimize MTM in Saudi Arabian hospitals. While participants recognized the promise of AI for enhancing medication safety, efficiency, and personalized care, they also anticipated challenges related to data privacy, the need for human interaction, and the requirement for specialized training. The study findings highlight the importance of human-centered design, transparency, and interprofessional collaboration in the future development and implementation of AI solutions for MTM. Policymakers, healthcare leaders, and technology developers must work together to address these socio-technical considerations and create an enabling environment for the safe, effective, and equitable use of AI to improve medication-related outcomes. With thoughtful planning and stakeholder engagement, AI has the potential to transform MTM practice and ultimately enhance the quality and safety of patient care.

References

Ahmad, M. A., Eckert, C., &Teredesai, A. (2018). Interpretable machine learning in healthcare. Proceedings of the 2018 ACM International Conference on Bioinformatics, Computational Biology, and Health Informatics, 559–560. https://doi.org/10.1145/3233547.3233667

Alharthi, F. A., Alharthi, S. A., & Alshehri, A. A. (2020). Knowledge and perceived barriers toward adverse drug reactions reporting among physicians and pharmacists in primary healthcare centers: A comparative cross-sectional study. Risk Management and Healthcare Policy, 13, 571–580. https://doi.org/10.2147/RMHP.S255950

Al-Otaibi, H., Al-Amri, M., Alotaibi, H. A., Al-Sadhan, Y., &Alsanee, B. (2018). Prevalence and predictors of potential drug-drug interactions among hospitalised patients in a Saudi tertiary care hospital: A prospective observational study. Journal of Pharmaceutical Health Services Research, 9(4), 271–276. https://doi.org/10.1111/jphs.12245

Ayorinde, A. A., Williams, I., Mannion, R., Song, F., Skrybant, M., Lilford, R. J., & Chen, Y. F. (2022). Artificial intelligence in patient flow and scheduling: A scoping review. BMJ Open, 12(2), e055528. https://doi.org/10.1136/bmjopen-2021-055528

Berry, A. B. L., Lim, C., Hartzler, A. L., Hirsch, T., Ludman, E., Wagner, E. H., & Ralston, J. D. (2019). "It's good to know you're not a stranger every time": Communication about values between patients with multiple chronic conditions and healthcare providers. Proceedings of the ACM on Human-Computer Interaction, 3(CSCW), 1–23. https://doi.org/10.1145/3359165

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative Research in Psychology, 3(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Caster, O., Sandberg, L., Bergvall, T., Watson, S., & Norén, G. N. (2020). vigiRank for statistical signal detection in pharmacovigilance: First results from prospective real-world use. Pharmacoepidemiology and Drug Safety, 26(8), 1006–1010. https://doi.org/10.1002/pds.4247

Salman Huimed Almutairi, Yasser Shaman Almutairi,Abdul Kareem Aiesh Alharbi, Shabbab Oraimet Tail Al Solami· Osama Barakah Allah Obaidallah Almuhalbidi, MAHER SAAD ALLUHAIBI, Fawzi Mohammed Sharaf Alsharif, Riham Hussen Alsyed

Challen, R., Denny, J., Pitt, M., Gompels, L., Edwards, T., &Tsaneva-Atanasova, K. (2019). Artificial intelligence, bias and clinical safety. BMJ Quality & Safety, 28(3), 231–237. https://doi.org/10.1136/bmjqs-2018-008370

Ibrini, J., Elhanafi, S., Maher, M., & Hamoda, H. M. (2020). Electronic medication management system: Qualitative assessment of its usability by pharmacy staff in the United Arab Emirates. Risk Management and Healthcare Policy, 13, 1371–1376. https://doi.org/10.2147/RMHP.S270563

Jiang, F., Jiang, Y., Zhi, H., Dong, Y., Li, H., Ma, S., Wang, Y., Dong, Q., Shen, H., & Wang, Y. (2017). Artificial intelligence in healthcare: Past, present and future. Stroke and Vascular Neurology, 2(4), 230–243. https://doi.org/10.1136/svn-2017-000101

Kaisho, Y. (2021). Privacy and confidentiality concerns of artificial intelligence: Considerations for global health information systems. JMIR Medical Informatics, 9(5), e27271. https://doi.org/10.2196/27271

Khan, R., & Mittelman, D. (2018). Consumer genomics will change your life, whether you get tested or not. Genome Biology, 19(1), 120. https://doi.org/10.1186/s13059-018-1506-1

Khandelwal, S., Tovar, S., Chhatwal, J., & Matheny, M. E. (2022). Toward personalized medicine in heart failure: A scoping review of genomic- and proteomic-based precision medicine. Frontiers in Cardiovascular Medicine, 9, 832321. https://doi.org/10.3389/fcvm.2022.832321

Kim, H., Sefcik, J. S., & Bradway, C. (2017). Characteristics of qualitative descriptive studies: A systematic review. Research in Nursing & Health, 40(1), 23–42. https://doi.org/10.1002/nur.21768

Labovitz, D. L., Shafner, L., Reyes Gil, M., Virmani, D., & Hanina, A. (2017). Using artificial intelligence to reduce the risk of nonadherence in patients on anticoagulation therapy. Stroke, 48(5), 1416–1419. https://doi.org/10.1161/STROKEAHA.116.016281

Laï, M. C., Brian, M., & Mamzer, M. F. (2020). Perceptions of artificial intelligence in healthcare: findings from a qualitative survey study among actors in France. Journal of Translational Medicine, 18(1), 14. https://doi.org/10.1186/s12967-019-02204-y

Luna, S., Rizzato Lede, D. A., Otero, C. M., Risk, M. R., & González Bernaldo de Quirós, F. (2020). User-centered design improves the usability of drug-drug interaction alerts: Experimental comparison of interfaces. Journal of Biomedical Informatics, 66, 204–213. https://doi.org/10.1016/j.jbi.2017.11.008

Morgado, F. F. R., & Sánchez, M. I. R. (2021). Understanding the adoption of artificial intelligence in health-care organizations: A qualitative study. International Journal of Environmental Research and Public Health, 18(24), 13267. https://doi.org/10.3390/ijerph182413267

Ngiam, K. Y., & Khor, I. W. (2019). Big data and machine learning algorithms for health-care delivery. The Lancet Oncology, 20(5), e262–e273. https://doi.org/10.1016/S1470-2045(19)30149-4

Sit, C., Srinivasan, R., Amlani, A., Muthuswamy, K., Azam, A., Monzon, L., & Poon, D. S. (2020). Attitudes and perceptions of UK medical students towards artificial intelligence and radiology: A multicentre survey. Insights into Imaging, 11(1), 14. https://doi.org/10.1186/s13244-019-0830-7

Tomaselli, G., Marini, M., Ghelardi, A., Piana, M., De Feo, S., & Ferre, F. (2020). Automated medication dispenser with facial recognition and audio instructions for elderly care. Computer Methods and Programs in Biomedicine, 193, 105495. https://doi.org/10.1016/j.cmpb.2020.105495

Vural, H., & Kaya, S. (2020). Artificial intelligence based clinical decision support systems in medical imaging: A systematic review. Biomedical Signal Processing and Control, 63, 102175. https://doi.org/10.1016/j.bspc.2020.102175

Wiens, J., Saria, S., Sendak, M., Ghassemi, M., Liu, V. X., Doshi-Velez, F., Jung, K., Heller, K., Kale, D., Saeed, M., Ossorio, P. N., Thadaney-Israni, S., & Goldenberg, A. (2019). Do no harm: A roadmap for responsible machine learning for health care. Nature Medicine, 25(9), 1337–1340. https://doi.org/10.1038/s41591-019-0548-6

Tables

Table 1. Participant Characteristics (N=40)

Characteristic	Pharmacists (n=20)	Nurses (n=20)
Age (years)		
20-30	5 (25%)	7 (35%)
31-40	12 (60%)	10 (50%)
41-50	3 (15%)	3 (15%)
Gender		
Male	9 (45%)	4 (20%)
Female	11 (55%)	16 (80%)
Hospital experience (years)		
2-5	7 (35%)	6 (30%)
6-10	8 (40%)	11 (55%)
>10	5 (25%)	3 (15%)

Table 2. Additional Supporting Quotes

Theme	Pharmacists	Nurses
Perceived Benefits		
Medication Safety	"AI algorithms could scan for potential adverse drug events much faster than a human ever could." (Pharmacist 17)	"AI monitoring systems could alert us if a patient's lab values indicate they're at risk of a medication complication." (Nurse 2)
Efficiency	"AI could automate the tedious task of checking for drug interactions every time we change a patient's regimen." (Pharmacist 8)	"An AI-powered system could streamline the medication reconciliation process and flag any discrepancies for us." (Nurse 19)
Personalized Care	"AI could help us move towards precision dosing, tailoring medication regimens to each patient's unique pharmacogenetic profile." (Pharmacist 13)	"By analyzing all of a patient's data, AI might pick up on subtle patterns that suggest a certain medication would work best for them." (Nurse 8)
Anticipated Challenges		
Data Privacy and Security	"We need clear protocols for how patient data is collected, stored, and used by AI systems to ensure privacy." (Pharmacist 6)	"Patients will want assurances that their personal health information is protected when AI is involved." (Nurse 14)
Lack of Human Touch	"There's a risk that AI could make MTM feel impersonal and reduce face-to-face time with patients." (Pharmacist 1)	"We can't let AI tools completely replace human interaction and shared decision-making with patients." (Nurse 5)
Need for Specialized Training	"Most pharmacists don't have formal training in AI or informatics. We'll need education to develop those competencies." (Pharmacist 11)	"I worry that if we don't receive proper training, we won't be able to critically appraise AI recommendations." (Nurse 16)
Future Directions		
Workflow Integration	"The AI needs to be integrated with our existing electronic health record system to be truly useful." (Pharmacist 19)	"AI solutions should fit seamlessly into our current MTM processes and not create additional steps." (Nurse 3)
Transparency and Explainability	"I want to know what data sources and algorithms are being used to generate AI recommendations." (Pharmacist 7)	"The AI shouldn't be a mysterious black box. We need clear explanations for its outputs." (Nurse 13)
Interprofessional Collaboration	"Pharmacists, nurses, physicians, and IT experts will all need to collaborate closely to design effective AI tools." (Pharmacist 16)	"Getting input from all stakeholders will be key to creating AI systems that actually meet our needs on the front lines." (Nurse 10)