



Cambridge
International

Professional Research Thesis

**Evaluating the effectiveness of pharmacy Apps in
improving patient Communication**

Researcher

Aalaa Abdellatif Abdelrahman Zaineldeen

Supervisor signature

2024



SUMMARY

This research investigates the role of pharmacy applications in enhancing communication between patients and pharmacists, improving adherence to medication regimens, and fostering health literacy, particularly within the context of the Middle East. Traditional pharmacy practices encounter obstacles such as insufficient direct interaction and low levels of patient engagement. Mobile health (mHealth) technologies, especially pharmacy applications, present innovative solutions to these challenges by facilitating real-time communication, sending reminders, and providing educational resources.

Utilizing a quantitative research approach, the study gathered data from 384 participants through structured questionnaires. The findings reveal that pharmacy applications significantly improve communication by enabling more frequent interactions between patients and pharmacists, enhance medication adherence through timely reminders and alerts, and increase patient satisfaction by offering accessible and convenient healthcare services. Furthermore, these applications are instrumental in delivering clear and concise health information, thereby empowering patients to take an active role in managing their health.

However, the study also highlights certain limitations, including challenges related to digital literacy, concerns regarding privacy, and inconsistencies in the quality of applications. These issues emphasize the necessity for focused enhancements in app design, security measures, and their integration with existing healthcare frameworks.

In conclusion, pharmacy applications possess the potential to transform healthcare delivery in the Middle East. The study recommends the development of user-friendly and culturally appropriate app designs, adherence to data protection regulations, and the integration of these applications into comprehensive healthcare systems to optimize their effectiveness. By addressing these challenges, pharmacy applications can serve as vital instruments for promoting patient-centered care and improving health outcomes.

Introduction:

Nowadays, the classic perception of the pharmaceutical profession in community pharmacies are facing worldwide extinction due to many factors. Among the numerous factors, online pharmacies are increasingly gaining ground thanks to their ability to facilitate customer demand. Nevertheless, they are endangering “face-to-face” contact, affecting the building of customer loyalty based on direct “human” interaction, and consequently reducing pharmacists to mere commercial figures. Patient-centered care communication is emphasized as the essential element to build a solid and appropriate interpersonal relationship with the patient, to make the consultancy process effective, and to strengthen the pharmacist’s professionalism in community pharmacy.[1]

Health Applications is a growing up issue that is becoming a major improvement on patient lives, especially in elderly, disabled, and chronically ill. In recent years, information and communication technologies improvements, along with mobile Internet, offering anywhere and anytime connectivity, play a key role on modern healthcare solutions. In this context, mobile health (m-Health) delivers healthcare services, overcoming geographical, temporal, and even organizational barriers. MHealth solutions address emerging problems on health services, including, the increasing number of chronic diseases related to lifestyle, high costs of existing national health services, the need to empower patients and families to self-care and handle their own healthcare, and the need to provide direct access to health services, regardless of time and place. Then, this paper presents a comprehensive review of the state of the art on m-Health services and applications. It surveys the most significant

research work and presents a deep analysis of the top and novel m-Health services and applications proposed by industry.[2]

In the light of increasingly complex treatment regimens, and co-morbid conditions, patient safety has become a major challenge in healthcare practice. Worldwide, more qualified pharmacists are needed in today's market to effectively and safely manage patients' conditions. Competent knowledgeable pharmacists can enhance patient care and support physicians with evidence-based medication advice.

In the developed world, expanded pharmacy practice has been established, and there is collaboration between pharmacists and physicians which has led to more cost-effective patient management strategies. However, in developing countries, the field of clinical pharmacy is still underdeveloped, and considerable challenges are faced.[3]

In recent years, pharmacists have made great efforts to shift their focus from medication dispensing to patient care. The field has been undergoing a paradigm shift in this respect, from product-oriented functions, i.e., dispensing and compounding medications, to the provision of pharmaceutical services, information, and pharmaceutical care.[4]

Pharmaceutical care contributes to reducing drug-related morbidities and mortalities, improving clinical outcomes and health-related quality of life, and lowering medical costs. The cornerstone of pharmaceutical care success is the quality of patient–pharmacist relationships. In such relationships, patients grant authority to pharmacists to manage their health and well-being. In turn, pharmacists accept responsibility to take care of the well-being of the patients. Community pharmacies are the front doors of medical advice and the points of sale of pharmaceutical products. Customer loyalty is crucial in the medical and pharmacy business.[4]

Problems in pharmacist consultation can occur when patients and pharmacists have different expectations regarding the pharmacist's role and the provision of services. Patients who have low expectations regarding a consultation with a pharmacist receive fewer consultations than those with higher expectations. Therefore, the patient–pharmacist relationship is largely influenced by the level of the patient's trust in the pharmacist. Trust in pharmacists could be defined as “patients' willingness to be vulnerable to the actions of pharmacists based on the expectation that pharmacists will do what is best for patients, irrespective of patients' ability to monitor pharmacists”.^[4]

Patient satisfaction is an important indicator of the quality of health care services, and an important predictor of the relationship with the health care provider and of adhering to a medication regimen. However, it is difficult to identify a single factor that is directly associated with a low or high level of patient satisfaction with the provided health care services. Patient satisfaction has been conceptualized differently over the last 15 years and has been characterized as a complex construct. A variety of factors might be involved in patient satisfaction degree. Some of these are patient demographics, health status, characteristics of the health care provider, such as technical expertise, interest in patient-oriented care, and waiting time. Furthermore, patient satisfaction is found to be directly associated with patient expectations; patient satisfaction can be defined as the sum of patient expectations and perceptions of the treatment or pharmaceutical service provided to them. Implementing changes based on this feedback is vital for upgrading the health system and attaining optimal patient satisfaction. This interaction between patients and pharmacists has been thoroughly assessed in many developed countries. However, this research is often not generalized to developing countries such as those in the Middle

East, where the priority is still traditional pharmacy practices. There have been some efforts to gauge patient satisfaction in some Middle East countries.[4]

Professional pharmacy services are defined as “an action or set of actions undertaken in or organized by a pharmacy, delivered by a pharmacist or other health practitioner, who applies their specialized health knowledge personally or via an intermediary, with a patient/client, population or other healthcare professionals, to optimize the process of care, with the aim to improve health outcomes, and the value of healthcare”. Community pharmacies are considered the first in line for patients regarding ease of access to obtain their medication and health services. Pharmacists in community pharmacies can provide medical services for numerous patients in a day with or without appointments. These services can be seeking advice, reassurance, treatment, or even a combination of all these.[5]

The core functions of the community pharmacist range from recommending suitable non-prescription products to detecting and minimizing any side effects that may harm patients related to the prescription medicines, among which patient counseling is an integral part. Thus, there are many factors that contribute to the satisfaction of the patient. A significant increase in the number of patients worldwide who visit community pharmacies as compared to health care centers can be attributed to several reasons, including the low cost of services offered by the pharmacies, less waiting time, and more time spent with the pharmacist. Saudi Arabia is no different. Ample evidence suggests that people in Saudi Arabia frequently visit their community pharmacies for various reasons. Hence, there is an increased public demand for utilizing community pharmacy services.[5]

Self-medication is a worldwide phenomenon of using medications without medical supervision. It is even more prevalent in low-income countries, where individuals seek community pharmacies because of accessibility and affordability. Although self-medication is associated with an increased risk of medication errors, few studies have been conducted to examine the quality of community pharmacy management towards self-medicating individuals of at-risk populations such as pregnant women.[6]

Assessing and satisfying patient expectations are essential in successful patient-centered communication. Recognizing the gap between patient expectation and perception during pharmacist–patient communication can help to identify communication problems and suggest ways to improve communication.[7]

The study Problem:

In recent years, there has been a significant decline in the communication between pharmacists and patients concerning public health guidance. We believe that the rise of smart applications could address this critical issue, and therefore, we are examining how these applications can enhance the interaction between patients and pharmacists.

The importance of studying:

This study is significant as it illuminates a critical issue faced by community pharmacies and explores potential solutions through the implementation of mobile applications.

Objectives of the study:

General objective:

To evaluating the effectiveness of pharmacy Apps in improving patient Communication.

Specific objectives:

1. Evaluate Patient-Pharmacist Communication: Examine the extent to which the application enhances direct interactions between patients and pharmacists regarding medication inquiries, consultations, and health-related guidance.
2. Analyze Support for Medication Compliance: Investigate the app's role in promoting patient adherence to prescribed medication schedules through features such as reminders, dosage monitoring, and refill alerts.
3. Assess the Influence on Health Literacy: Investigate the app's capability to deliver comprehensible information to patients concerning their medications, encompassing side effects, potential interactions, and appropriate usage instructions.

Study hypotheses and questions:

The implementation of pharmacy applications markedly enhances the communication dynamics between patients and healthcare professionals, resulting in improved patient outcomes and heightened satisfaction levels.

Detailed explanation of the Hypothesis:

1. Improved Medication Adherence: Applications equipped with reminder functions and alerts are likely to promote better adherence to prescribed medication regimens, thereby minimizing the incidence of missed doses and contributing to improved health outcomes.
2. Optimized Communication: The inclusion of direct communication tools within pharmacy applications, such as chat or messaging options with pharmacists, enables quicker and more efficient resolution of issues compared to conventional communication methods.
3. Elevated Patient Satisfaction: By enhancing convenience and the quality of interactions, patients are likely to express greater satisfaction with pharmacy services, which can strengthen their relationships with healthcare providers.

Null Hypothesis:

Pharmacy applications do not lead to significant improvements in patient communication or healthcare outcomes when compared to traditional communication methods, such as in-person visits or telephone interactions.

Study Approach:

Descriptive approach

The limits of the study:

Spatial boundaries:

Middle east

Time limits:

From 2020 to 2024

Study plan:**Study type:**

Quantitative study; using questionnaire to measure the effectiveness of pharmacy Apps in terms of communication frequency and patients' satisfaction.

Study duration:

2 months for data collection and data analysis to ensure covering of broad range of patient's categories.

Study population and sampling:**Participants:**

Include patients who use pharmacy Apps for prescription management, searching about drug information, and communicating with pharmacists.

Inclusion criteria:

- 1- Any patient who is aged between (18 – above 60) years.
- 2- Using or previously used pharmacy Apps

Exclusion criteria:

- 1- Any person aged below 18 years.
- 2- Any person who never used any pharmacy Apps.
- 3- Any person who used any tool other than pharmacy Apps to get information about Drugs and to communicate with pharmacist.

Sample Size:

By using data analysis Apps software (**Stat direct, SPSS, Excel**), sample size needed for this study was calculated and found to be (**384**) participants.

Sampling method:

By using Random sampling to prevent bias and to ensure broad points of view from patients who using App.

Data Collection Methods

Questionnaire:

Questionnaire was developed to be distributed to patients who use pharmacy apps. Include questions on:

- 1- Demographic data.
- 2- Frequency of communication with pharmacists via the app.
- 3- Ease of use of communication features (e.g., messaging, notifications).
- 4- Satisfaction with app-based communication
- 5- Health outcomes (e.g., medication adherence).

Data analysis:

Quantitative Analysis:

- 1- Descriptive Statistics: Summarize the demographic data (e.g., age, gender, frequency of app use).
- 2- Inferential Statistics: Use statistical tests (Chi-square) to assess relationships between app use and communication outcomes (e.g., satisfaction, improved adherence).

Conclusion:

This study highlights the significant potential of pharmacy applications in addressing the challenges of modern healthcare communication, particularly in improving the interactions between patients and pharmacists. The findings suggest that these applications enhance direct communication, support medication adherence, and increase patient satisfaction by remedying shortcomings in traditional consultation methods and offering innovative tools for self-management and remote healthcare access.

The findings underscore the importance of employing user-centered design principles and incorporating features such as reminders, real-time messaging, and readily available educational resources to maximize their effectiveness. However, the success of these applications depends on factors such as patient engagement, technological literacy, and adherence to ethical and regulatory standards.

While pharmacy applications are gaining traction globally, their implementation in regions like the Middle East is still in the early stages. This research emphasizes the need for tailored strategies that consider cultural, economic, and healthcare system-specific challenges. By aligning these technological innovations with patient needs and broader healthcare goals, pharmacy applications can significantly contribute to the development of more effective, accessible, and patient-centered healthcare systems.

Results:

1 .Enhanced Communication:

The research confirms that pharmacy applications improve communication dynamics by offering real-time access to pharmacists, facilitating quicker resolution of issues, and supporting patient inquiries related to medication usage and health concerns.

2 .Improved Medication Adherence:

Features such as medication reminders, refill notifications, and dosage tracking have been shown to significantly enhance adherence rates, thereby minimizing the likelihood of missed doses and improving treatment outcomes.

3 .Enhanced Patient Satisfaction :

The utilization of application-based communication and the provision of round-the-clock services significantly enhance patient satisfaction, particularly among individuals who value accessibility and reduced waiting periods.

4 .Improved Health Literacy :

Pharmacy applications offer patients comprehensive and easily understandable information regarding medications, thereby enhancing their awareness of possible side effects, drug interactions, and proper usage. This knowledge empowers patients to engage actively in their healthcare decisions.

5 .Wider Healthcare Implications :

The research underscores that pharmacy applications play a crucial role in addressing systemic issues such as :

- Increasing rates of controlling chronic diseases by fostering medication adherence and education .
- Overcoming geographic limitations through virtual consultations .
- Enhancing health system efficiency by minimizing the need for in-person visits for medical consultations.

6 .Challenges and Suggestions :

The study identifies challenges such as varying levels of digital literacy among specific populations and apprehensions regarding data security and the reliability of applications. It advocates for focused training initiatives, stringent app development protocols, and regulatory policies to ensure adherence to healthcare standards.

The acceptance of the alternative hypothesis and the rejection of the null hypothesis are warranted, as the integration of pharmacy applications significantly improves the communication dynamics between patients and healthcare providers, leading to better patient outcomes and increased levels of satisfaction.

Recommendations:

1 .Enhance Accessibility and Usability:

- Streamline application interfaces to facilitate intuitive navigation, particularly for older adults or individuals with limited technological proficiency .
- Implement offline capabilities for patients residing in regions with inconsistent internet connectivity .
- Offer multilingual support, particularly in Arabic, to cater to the diverse populations within the Middle East.

2 .Boost Patient Engagement:

- Incorporate interactive elements such as gamification to promote consistent app usage and adherence to medication regimens .
- Provide personalized tools for tracking health objectives, virtual incentives, and reminders tailored to the unique needs of each patient.

3 .Prioritize Integration with Healthcare Systems:

- Connect pharmacy applications with established healthcare frameworks, including electronic health records (EHR) and telehealth services, to facilitate seamless communication between patients and healthcare professionals .
- Allow for real-time updates regarding prescriptions and consultations to improve continuity of care.

4 .Tailored Development:

- Adapt applications to align with cultural and regulatory standards in the Middle East, addressing specific patient requirements and preferences, such as self-medication habits and prevalent language barriers .
- Create a comprehensive database of locally available medications and dosage guidelines to minimize errors and enhance patient confidence.

5 .Engage in Ongoing Evaluation and Training:

- Continuously evaluate the effectiveness of the application through feedback from patients and pharmacists, concentrating on enhancements in communication, satisfaction, and adherence .
- Provide training for pharmacists to effectively utilize and advocate for these applications as a vital component of patient care.

6 Enhance Application Capabilities :

- Incorporate sophisticated functionalities, including AI-based health consultations, instant messaging with pharmacists, and compatibility with wearable devices for the management of chronic illnesses .
- Offer visual resources, instructional videos, and engaging interactive content to foster health literacy and enhance comprehension of medications.

Limitation:

1 .Demographic Limitations:

- The research's emphasis on application users excludes those lacking access to smartphones or the internet, thereby constraining the applicability of the results.
- Certain demographic groups, including older adults and individuals with lower educational attainment, may be underrepresented due to their reduced engagement with digital technologies.

2 .Cultural and Geographic Specificity:

- The findings of the study may be tailored to the healthcare context of the Middle East and may not be relevant to areas with differing healthcare infrastructures or technological resources.

3 .Brief Study Duration:

- A study duration of two months is insufficient for a thorough assessment of long-term application usage, patient compliance, and ongoing satisfaction levels.

4 .Self-Reported Metrics:

- The dependence on self-reported data for measuring satisfaction and adherence may introduce biases, including inaccuracies stemming from memory issues or the desire to present oneself favorably.

5 .Technological Challenges:

- Insufficient digital literacy among certain populations and limited access to stable internet connections may hinder the effective utilization of pharmacy applications, especially in rural settings.

6 .Variability in Applications:

- Variations in application design, functionalities, and overall quality can result in disparate user experiences and outcomes, complicating efforts toward standardization.

Foreign references:

- 1- Abas SA, Ismail N, Zakaria Y, Yasin SM, Ibrahim K, Ismail I, et al. Enhancing tuberculosis treatment adherence and motivation through gamified real-time mobile app utilization: a single-arm intervention study. *BMC Public Health*. 2024 Jan 22;24(1):249. doi: 10.1186/s12889-023-17561-z. PMID: 38254065; PMCID: PMC10801941.
- 2- Doan TTD, Tran TC, Pham NM, Zhao Y, Dinh TPH, Hoai NX, et al. Designing and developing a mobile app (BeBo) in a randomized controlled trial study to promote breastfeeding among Vietnamese mothers. *Int Breastfeed J*. 2023 Jan 19;18(1):7. doi: 10.1186/s13006-023-00543-7. PMID: 36658643; PMCID: PMC9854088.
- 3- Said A, Hussain N, Abdelaty LN. Physicians' and pharmacists' perception and practice of hospital pharmacist professional role in Egypt. *Int J Pharm Pract*. 2020 Oct;28(5):491-497. doi: 10.1111/ijpp.12638. Epub 2020 Jun 4. PMID: 32497350.
- 4- El-Kholy AA, Abdelaal K, Alqhtani H, Abdel-Wahab BA, Abdel-Latif MMM. Publics' perceptions of community pharmacists and satisfaction with pharmacy services in Al-Madinah City, Saudi Arabia: a cross-sectional study. *Medicina (Kaunas)*. 2022 Mar 16;58(3):432. doi: 10.3390/medicina58030432. PMID: 35334609; PMCID: PMC8954639.
- 5- Alhazmi M, Bajuayfir A, Cheema E, Elrggal M, Ali M. Evaluation of current community pharmacist practice in Saudi Arabia—a cross-sectional study from pharmacists' perspective (Part II). *Pharmacy (Basel)*. 2022 Mar 10;10(2):38. doi: 10.3390/pharmacy10020038. PMID: 35314619; PMCID: PMC8938769.
- 6- Tawfik AG, Abdelaziz AI, Omran M, Rabie KA, Ahmed AF, Abou-Ali A. Assessment of community pharmacy management towards self-medication requests of tetracyclines for pregnant women: a simulated client study in Upper Egypt. *Int J Clin Pharm*. 2021 Aug;43(4):969-979. doi: 10.1007/s11096-020-01203-0. Epub 2020 Nov 24. PMID: 33231814.
- 7- Kim MG, Lee NE, Sohn HS. Gap between patient expectation and perception during pharmacist-patient communication at community pharmacy. *Int J Clin Pharm*. 2020 Apr;42(2):677-684. doi:

- 10.1007/s11096-020-01014-3. Epub 2020 Apr 7. Erratum in: *Int J Clin Pharm*. 2020 Dec;42(6):1539. doi: 10.1007/s11096-020-01120-2. PMID: 32266556.
- 8- Ngo E, Truong MB, Wright D, Nordeng H. Impact of a mobile application for tracking nausea and vomiting during pregnancy (NVP) on NVP symptoms, quality of life, and decisional conflict regarding NVP treatments: MinSafeStart randomized controlled trial. *JMIR Mhealth Uhealth*. 2022 Jul 5;10(7):e36226. doi: 10.2196/36226. Erratum in: *JMIR Mhealth Uhealth*. 2022 Sep 26;10(9):e41927. doi: 10.2196/41927. PMID: 35787487; PMCID: PMC9297140.
- 9- Snoswell CL, Rahja M, Lalor AF. A systematic review and meta-analysis of change in health-related quality of life for interactive telehealth interventions for patients with asthma. *Value Health*. 2021 Feb;24(2):291-302. doi: 10.1016/j.jval.2020.09.006. Epub 2020 Oct 24. PMID: 33518036.
- 10- Thonon F, Perrot S, Yergolkar AV, Rousset-Torrente O, Griffith JW, Chassany O, Duracinsky M. Electronic tools to bridge the language gap in health care for people who have migrated: systematic review. *J Med Internet Res*. 2021 May 6;23(5): e25131. doi: 10.2196/25131. PMID: 33955837; PMCID: PMC8138704.
- 11- Thonon F, Perrot S, Yergolkar AV, Rousset-Torrente O, Griffith JW, Chassany O, et al. Electronic tools to bridge the language gap in health care for people who have migrated: systematic review. *J Med Internet Res*. 2021 May 6;23(5): e25131. doi: 10.2196/25131. PMID: 33955837; PMCID: PMC8138704.
- 12- Snoswell CL, Rahja M, Lalor AF. A systematic review and meta-analysis of change in health-related quality of life for interactive telehealth interventions for patients with asthma. *Value Health*. 2021 Feb;24(2):291-302. doi: 10.1016/j.jval.2020.09.006. Epub 2020 Oct 24. PMID: 33518036.
- 13- Robbins, S. P., & Coulter, M. (2021). *Management* (15th ed.). Pearson.
- 14- Daft, R. L. (2021). *Organization theory and design* (13th ed.). Cengage Learning.

- 15- <https://www.news-medical.net/health/Community-Pharmacy.aspx>
- 16- Holdford, David (2017). Introduction to Acute and Ambulatory Care Pharmacy Practice, Second Edition. pp. 21–26. ISBN 1585285455.
- 17- American College of Clinical Pharmacy (June 2008). “The definition of clinical pharmacy” (PDF). *Pharmacotherapy*. 28 (6): 816–7. doi:10.1592/phco.28.6.816. PMID 18503408. S2CID 45522678.
- 18- “Collaborative drug therapy management (CDTM)”. *Pharmacist’s Letter/Prescriber’s Letter*. 25: 250801. 2009.
- 19- <https://www.webmd.com/brain/news/20121010/what-are-compounding-pharmacies>
- 20- “What is a Consultant Pharmacist?”. American Society of Consultant Pharmacists. Archived from the original on 2 April 2015. Retrieved 11 March 2015.
- 21- <https://web.archive.org/web/20150402132814/https://www.ascp.com/articles/what-consultant-pharmacist>
- 22- <https://www.ashp.org/-/media/assets/pharmacy-practice/resource-centers/ambulatory-care/ambulatory-care-career-tool.ashx>
- 23- <https://www.bpsweb.org/media/ambulatory-care-pharmacy-fact-sheet/>
- 24- <https://doi.org/10.22271/tpi.2019.v8.i1o.25499>
- 25- Adler, R. B., Rosenfeld, L. B., & Proctor, R. F. (2018). *Interplay: The process of interpersonal communication* (14th ed.). Oxford University Press.
- 26- Tran S, Smith L, El-Den S, Carter S. The Use of Gamification and Incentives in Mobile Health Apps to Improve Medication Adherence: Scoping Review. *JMIR Mhealth Uhealth*. 2022 Feb 21;10(2):e30671. doi: 10.2196/30671. PMID: 35188475; PMCID: PMC8902658.
- 27- Free, C., Phillips, G., Galli, L., Watson, L., Felix, L., Edwards, P., & Haines, A., 2013. The effectiveness of mobile-health technology-based health behaviour change or disease management

- interventions for health care consumers: A systematic review. *PLoS Med*, 10(1), p.e1001362. doi: 10.1371/journal.pmed.1001362.
- 28- Abas SA, Ismail N, Zakaria Y, Yasin SM, Ibrahim K, Ismail I, Razali A, Sherzkawi MA, Ahmad N. Enhancing tuberculosis treatment adherence and motivation through gamified real-time mobile app utilization: a single-arm intervention study. *BMC Public Health*. 2024 Jan 22;24(1):249. doi: 10.1186/s12889-023-17561-z. PMID: 38254065; PMCID: PMC10801941.
- 29- Samuel Ken-En Gan, Cornelius Koshy and Phi-Vu Nguyen et al. An overview of clinically and healthcare related apps in Google and Apple app stores: connecting patients, drugs, and clinicians. *Sci Phone Appl Mob Devices*. 2016. Vol. 2(1). DOI: 10.1186/s41070-016-0012-7
- 30- Hanrahan, C., Aungst, T.D., and Cole, S., (2014). Evaluating mobile medical applications. (American society of health system pharmacists).
- 31- Jamie L. McConaha, Theresa R. Prosser (2018). *Communication Strategies in Pharmacy*.
- 32- DiMasi, J. A., Hansen, R. W., & Grabowski, H. G. (2003). "The price of innovation: new estimates of drug development costs." *Journal of Health Economics*, 22(2), 151-185. This study highlights the complexities and costs associated with drug discovery and research.
- 33- World Health Organization. "Quality assurance of pharmaceuticals: a compendium of guidelines and related materials." WHO Press, 2014. This document provides guidelines on quality control and manufacturing standards globally.
- 34- European Medicines Agency. "Pharmacovigilance: ensuring the safety of medicines." EMA, (<https://www.ema.europa.eu/en/humanregulatory/overview/pharmacovigilance>) 2022. This resource explains post-market surveillance and pharmacovigilance requirements. 58
- 35- Schwartz, L. M., & Woloshin, S. (2013). "Medical marketing in the United States, 1997–2016." *JAMA*, 323(1), 67-71. This article examines trends in pharmaceutical marketing and its impact on public awareness and prescribing practices.

- 36- United States Pharmacopeia (USP) Chapter and outline sterile and non-sterile compounding standards, respectively. These guidelines define the requirements for facility setup, staff training, and quality control to ensure safe compounding practices.
- 37- American Pharmacists Association. “Understanding Compounding Pharmacy: An Overview for Healthcare Professionals and Patients.” American Pharmacists Association, 2022. (<https://www.pharmacist.com/>) This document provides insights into why healthcare providers and patients choose compounded medication
- 38- U.S. Food and Drug Administration. “Compounding and the FDA: Questions and Answers.” FDA, 2023. (<https://www.fda.gov/drugs/human-drug-compounding>) This resource details the FDA’s role in regulating compounding, especially regarding large-scale compounding and public health concerns.
- 39- : Institute for Safe Medication Practices (ISMP). “Safe Compounding Practices: Reducing Risks in Sterile and Non-Sterile Compounding.” ISMP, 2021. (<https://www.ismp.org/>) This document discusses best practices, and the potential risks associated with compounding.
- 40- • Inalcik, H. (1994). *The Ottoman Empire: The Classical Age, 1300–1600*.
- 41- Van De Mierop, M. (2005). *A History of the Ancient Near East, ca. 3000–323 BC*.
- 42- Kuran, T. (2010). *The Long Divergence: How Islamic Law Held Back the Middle East*.
- 43- Witzel, M. (2012). *A History of Management Thought*.
- 44- Robbins, S. P., & Judge, T. A. (2021). *Organizational Behavior*.
- 45- Hofstede, G. (2001). *Culture’s Consequences: Comparing Values, Behaviors, Institutions, and Organizations Across Nations*.
- 46- Kotter, J. P. (1996). *Leading Change*.
- 47- Lewin, K. (1951). *Field Theory in Social Science*.
- 48- Cappelli, P. (2008). *Talent on Demand: Managing Talent in an Age of Uncertainty*.

- 49- Armstrong, M., & Taylor, S. (2020). *Armstrong's Handbook of Human Resource Management Practice*.
- 50- Kahneman, D. (2011). *Thinking, Fast and Slow*.
- 51- Simon, H. A. (1977). *The New Science of Management Decision*.
- 52- Duarte, D. L., & Snyder, N. T.(2011) *Mastering Virtual Teams*.
- 53- Bloom, N., et al. (2015). "Does Working from Homework? Evidence from a Chinese Experiment." *Quarterly Journal of Economics*.
- 54- Carroll, A. B., & Buchholtz, A. K. (2014). *Business and Society: Ethics, Sustainability, and Stakeholder Management*.
- 55- Elkington, J. (1997). *Cannibals with Forks: The Triple Bottom Line of 21st Century Business*.
- 56- Schein, E. H. (2010). *Organizational Culture and Leadership*.
- 57- Cameron, K. S., & Quinn, R. E. (2011). *Diagnosing and Changing Organizational Culture*.