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Review Article

VirtualPharm: Bridging healthcare through telepharmacy

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ABSTRACT

The word "telepharmacy" refers to a type of pharmaceutical care in which patients and pharmacists communicate by information and communication technology (ICT) even though they are not in the same location. Telepharmacy has been used to solve the scarcity of pharmacists and offer pharmaceutical services to underprivileged communities. Due to geographic and demographic constraints, however, rural inhabitants and towns frequently may not have easy access to healthcare services. A more recent term for pharmaceutical service delivery is telepharmacy, which allows patients who live far from a hospital, pharmacy, or other healthcare facility to receive healthcare services from a qualified pharmacist, including medication review, patient counseling, and prescription verification. Increased comfort with the medication-use system, patient safety, and job satisfaction were shown by nurses' survey results. Actually, after a pharmacist's intervention, there has been evidence of better control over hypertension, dyslipidemia or diabetes, successful smoking cessation, and a decrease in hospitalization among heart failure patients. Telepharmacy services are developed and offered using a range of technology, care models, and interventions, catering to a diverse range of individuals with various clinical conditions. Video conferencing is used in pharmacy for management, instruction, and training needs. The telephone has evolved from a device for dialing and speaking to a multimodal communication tool. Refill authorization, prior authorization, prescription counseling, and formulary compliance monitoring are all provided by call centers, while medical equipment are being connected to phone lines to provide remote monitoring and therapy. Telepharmacy is a useful tool for community pharmacies to improve drug dispensing safety and lessen the strain on the healthcare system.

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1. Introduction

Telemedicine is the utilization of telecommunications technology to extend healthcare services to individuals situated at a considerable distance from healthcare providers.¹ Telepharmacy, a transformative technological stride in modern pharmacy, presents substantial potential for elevating pharmaceutical care accessibility in geographically and demographically constrained rural areas.² Telepharmacy" refers to a model of pharmaceutical care where pharmacists and patients engage in interactions

without being physically present in the same location, utilizing information and communication technology (ICT) facilities for communication.³

2. Problem Statement and Significance of Telepharmacy

Embracing telemedicine proves especially invaluable in scenarios where physical proximity to healthcare facilities poses challenges, offering a solution that transcends traditional constraints and contributes to a more inclusive and efficient healthcare system.¹ Medication mistake rates have decreased in hospitals that have

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implemented telepharmacy.³ Advancements in medical telecommunication devices offer potential cost reduction and broader healthcare access across socioeconomic groups.⁴ Complicating matters is the absence of official regulations and comprehensive recommendations, presenting a challenge for stakeholders, be they private or governmental, in ensuring the proper validation and approval of emerging digital health technologies. To navigate this terrain effectively, a foundation of robust scientific research is imperative. This involves thorough investigation before any digital product is integrated into the healthcare sector, providing insights into its clinical efficacy, safety profile, and ethical considerations. This approach is essential to foster a responsible and effective deployment of digital health innovations in the evolving landscape of healthcare.⁵

2.1. Objectives of VirtualPharm

This innovation encompasses a spectrum of services, including medication management, dispensing, patient counseling, and drug information dissemination.² This innovative approach has been embraced with the aim of delivering pharmaceutical services to areas that are underserved and tackling the challenge of a shortage of pharmacists.³ The study accentuates telepharmacy as a precision instrument, offering targeted improvements in both healthcare system efficiency and medication safety protocols within the intricate landscape of community pharmacy operations.⁶ These services encompass medical consultations, educational sessions, treatment administration, continuous monitoring, and accurate diagnoses.⁷

3. Services Offered by VirtualPharm

This innovative approach facilitates medical consultations, diagnoses, and treatment delivery through various communication channels, overcoming geographical barriers to ensure remote access to quality healthcare.¹ Investigation underscores the strategic role of telepharmacy in alleviating healthcare system burdens and optimizing drug dispensing safety within community pharmacies.² For a variety of chronic conditions, clinical pharmacy services delivered by telemedicine in outpatient settings—mostly through telephone interactions—show positive results in clinical disease management, patient self-management, and adherence.⁸ This technological boom has not only reshaped industries but has also had a profound impact on how we work, communicate, and engage with the world around us.⁷

3.1. Online medication ordering and delivery

The use of electronic information and communications technology to deliver and assist medical care when participants are separated by distance is known as

telemedicine.⁹ The significance of telemedicine lies in its ability to empower healthcare professionals to vigilantly oversee patients' health status while allowing individuals to seamlessly maintain their regular lifestyle, fostering a more accessible and patient-centric healthcare experience.⁷ Additionally, there's a pressing need to address the reliability and safety of these digital health innovations, requiring meticulous testing and the conduct of clinical studies that adhere to rigorous ethical principles.⁵

3.2. Teleconsultations with pharmacists

These involve establishing connections between clinical specialists and members of the healthcare team to facilitate consultations in settings where specialty services are not readily available, such as community pharmacies.¹⁰ This innovative approach leverages internet services and telecommunications to facilitate the remote exchange of critical medical information and the delivery of various healthcare services.⁷ These digital health platforms become increasingly prevalent, a host of essential questions must be addressed before their widespread implementation. A primary concern revolves around the clinical effectiveness and validation of these novel technologies. It's crucial to ascertain their real-world impact on patient outcomes and healthcare delivery.⁵

3.3. Medication adherence support

The integration of telemedicine services into healthcare delivery models has presented novel approaches to the management of cardiovascular patients.¹⁰ Reflecting on historical precedents, the likelihood of unforeseen consequences underscores the exigency for a rigorous examination of telemedicine's effects and efficacy. This emphasizes the imperative for meticulous research, to establish a rational policy framework.¹ By employing technology to facilitate these virtual interactions, telepharmacy not only enhances accessibility to pharmaceutical care but also addresses workforce challenges in the healthcare sector.³ The statistical significance of reduced medication dispensing errors (MDEs), particularly in the domain of prescription-related errors (5.38% vs. 10.08%, $p < 0.05$), substantiates the efficacy of telepharmacy in enhancing dispensing precision. However, the observed higher likelihood of wrong patient errors (AOR=5.38, $p < 0.05$) emphasizes the need for a meticulous risk-benefit assessment in telepharmacy implementation.⁶ The program is designed to enhance efficiency by allowing technicians to simultaneously observe and interact with multiple Emergency Departments (EDs) through videoconferencing capabilities. This not only streamlines the medication history-taking process but also offers the flexibility of remote operations.¹¹

4. Technological Infrastructure

Telemedicine can involve various forms of communication, including real-time video consultations, phone calls, secure messaging, and even the transmission of medical images and data.¹ A pivotal aspect within the realm of interconnected healthcare is telemedicine.⁽⁷⁾ Healthcare professionals are increasingly tuned into these challenges associated with the integration of telehealth technology and the nuanced considerations required for its effective use in diverse healthcare settings.¹² One notable limitation is the scarcity of randomized control trials, which are considered a gold standard in research design for establishing causal relationships. The absence of such trials in many studies on telemedicine introduces uncertainties in attributing observed outcomes solely to the intervention. Additionally, a reliance on small sample sizes in some studies may compromise the generalizability of findings to broader populations.¹³ The process of obtaining medication histories has been revolutionized through the utilization of mobile carts equipped with advanced videoconferencing technology. This sophisticated system enables pharmacy technicians to conduct their work from a centralized location, providing a range of benefits to the healthcare workflow.¹¹

4.1. User-friendly mobile application and web platform

This paradigm shift in healthcare delivery leverages real-time video consultations, telephone calls, secure messaging, and the seamless transmission of medical data, enhancing accessibility and convenience for patients.¹ Systems for telepharmacy work well for tasks that need accuracy, including preparing anti-neoplastic drugs. Examples that have been reviewed include prescription analysis, medication delivery, dispensing, and error detection.³ Over the past few decades, an unprecedented surge in technological innovation has led to the emergence of a diverse array of virtual technologies. Among these groundbreaking advancements are artificial intelligence (AI), a field dedicated to creating systems that mimic human intelligence and decision-making. Quantum computing has also entered the scene, harnessing the principles of quantum mechanics to revolutionize computation capabilities.⁷ economic evaluations often grapple with the absence of high-quality data and the use of appropriate measures to assess the true impact of telemedicine on costs and outcomes. Incomplete or inadequate data may hinder researchers from drawing robust conclusions about the economic efficiency of telehealth interventions.¹³

4.2. Secure online payment gateway

Amidst growing investments in the E-pharmacy sector and varying pharmacist-to-patient ratios across states, the establishment of E-pharmacy emerges as a vital initiative

in India. This venture aims to enhance the accessibility and efficiency of medication delivery while simultaneously curbing costs. Notably, medicines constitute a substantial 70% of healthcare expenses in India. (14) A major problem that leads to negative consequences and large financial costs for readmission is patient noncompliance.³ These apprehensions not only shape how the benefits are perceived but also significantly impact the overall acceptance and successful integration of virtual care services.¹² In essence, the complexities and nuances in the design and execution of economic evaluations contribute to the varying conclusions on the cost-effectiveness of telemedicine. These challenges underscore the need for more rigorous research methodologies, larger sample sizes, and improved data quality to provide a clearer understanding of the economic implications of implementing telemedicine systems.¹³

4.3. Integration with electronic health records (EHRs if applicable)

Following the clinical review, the pharmacist identifies the suitable medication for dispensing from the Critical Access Hospital's (CAH) formulary. In cases where the medication order is not generated through the Computerized Physician Order Entry (CPOE) system, the order is scanned into a document and transmitted via email to remote pharmacists. Subsequently, the pharmacist inputs the required information into both the Electronic Health Record (EHR) and the pharmacy information system. The medication order review process thereafter mirrors that of medications initiated via CPOE. The newly entered medication order is integrated into the EHR, allowing the CAH nurse to proceed with fulfilling the order.¹⁴ ASHP advocates increased research for telepharmacy implementation best practices.⁴ Virtual reality (VR) stands out as a technology that immerses users in simulated environments, providing an interactive and immersive experience. This technological boom has not only reshaped industries but has also had a profound impact on how we work, communicate, and engage with the world around us.⁷ Technicians are able to conduct interviews with patients via videoconferencing, facilitating a thorough understanding of their medication history. Moreover, the collected information is promptly documented in the electronic medical record (EMR), ensuring accuracy and accessibility for healthcare providers.¹¹

5. Benefits of VirtualPharm

It provides a way for patients to access healthcare services without the need for in-person visits, making healthcare more accessible and convenient. Additionally, telemedicine can be particularly beneficial for routine check-ups, follow-up appointments, and managing chronic conditions.¹ telepharmacy serves as a strategic solution

to overcome the scarcity of pharmacists by enabling them to remotely provide their expertise and services to a broader population.³ The dynamic landscape of technological advancement is reshaping the landscape of the pharmaceutical field, presenting unprecedented opportunities to revolutionize the development and delivery of medicines. This transformative potential is underscored by the commitment to fostering a highly streamlined, exceptionally effective, and innovative approach to pharmaceutical processes.¹⁵ Despite the widely acknowledged benefits of telehealth as a valuable resource for delivering high-quality healthcare services, persistent concerns about data privacy and security act as substantial barriers.¹²

5.1. Improved access to medications for patients in remote areas or with mobility limitations

Telepharmacy has significantly enhanced pharmaceutical service access in rural locales, mitigating issues of pharmacist understaffing, especially during off-hours and vacations. This approach not only reduces medication errors but also addresses challenges related to the recruitment and retention of pharmacists in these remote areas.¹⁶ a transformative paradigm with intricate implications. The nuanced interplay of rapid technological progression and the dynamic healthcare milieu precludes definitive prognostication.¹ The PILL program has shown promise in addressing this issue by lowering the need for acute care 30 days after discharge.³ The pivotal determinant for successful implementation lies in the meticulous development of a system, poised to induce paradigmatic shifts in pharmacy practices, ultimately benefiting underserved rural populations and the healthcare establishments facilitating.² This model is particularly valuable in areas where access to pharmacy services is limited, ensuring that individuals in underserved regions have a means to obtain essential pharmaceutical care.³ Recognizing the intricate nature of these challenges, the American Telemedicine Association, a prominent influencer in telehealth policy, advocates for the meticulous development of telehealth and virtual care technologies. Their emphasis lies in establishing a robust foundation that prioritizes the protection of patient privacy, the secure management of patient data, and the effective reduction of cybersecurity risks.¹² To encapsulate, the ongoing digital revolution has not only impacted but also fundamentally reshaped healthcare systems on a global scale. This transformation extends beyond developed Western nations, reaching into developing countries, and brings about improvements in healthcare accessibility, quality, and flexibility through the integration of innovative digital technologies. One notable example is the application of telemedicine, which proves invaluable in offering high-quality medical consultations, diagnostics, and treatment to individuals residing in remote

and rural areas.⁵

5.2. Enhanced medication adherence through reminders and support

This nuanced approach underscores the role of telepharmacy as a transformative solution in optimizing healthcare delivery and improving patient outcomes, especially in areas facing geographical or personnel-related limitations.³ The emergence of COVID-19 hastened the improvements that would eventually make telepharmacy a viable choice.^{17,18} Prominent models with beneficial effects include a planned or continuous care approach that includes regular monitoring and prompt treatments. These telephone treatments highlight the effectiveness of telemedicine in outpatient care and improve patient outcomes.⁸ Within the realm of telemedicine, tele-pharmacy stands out as a significant subset, exemplifying the integration of advanced telecommunication technology into pharmaceutical services. This approach extends beyond traditional pharmacy practices, leveraging technology to provide comprehensive and personalized patient care.¹⁵ However, the implementation of telehealth services during the pandemic has brought to light a multitude of complex issues, particularly concerning healthcare disparities. The widespread adoption of telehealth and virtual care has ushered in a plethora of new services, concurrently widening the spectrum of risks associated with these technologies. These risks now extend beyond traditional concerns to encompass potential threats in cyber and technology-related data security and privacy.¹² obtaining medication histories, these technicians play a vital role in transcribing preoperative (pre-op) medication lists for patients scheduled for surgical admissions. This comprehensive approach not only addresses the immediate needs of emergency cases but also contributes to the overall continuity of care for individuals undergoing surgical procedures.¹¹

5.3. Increased convenience and time savings for patients

Proactive and comprehensive studies become imperative for navigating the intricate interdependencies of telemedicine within the evolving healthcare landscape, serving as a foundational step for informed policymaking aligned with the dynamic nature of healthcare systems.¹ In essence, telepharmacy leverages modern ICT tools to bridge the geographical gap between pharmacists and patients, allowing for remote consultations and dispensing of medications.³ Pilot projects are crucial for evidence gathering on optimal telepharmacy deployment for patient outcomes and safety improvement.⁴ This nuanced shift towards tele-pharmacy is emblematic of a broader transformation in the healthcare landscape. It signifies the

industry's proactive embrace of technological solutions to optimize pharmaceutical processes, enhance patient care, and ultimately contribute to a more efficient and patient-centric healthcare system.¹⁵ Adding complexity to this landscape is the patients' hesitancy and limited familiarity with using telehealth technology, which further intensifies their concerns regarding the privacy and security of their personal health information.¹² In essence, the integration of mobile carts and videoconferencing technology in medication history processes represents a significant leap forward in healthcare operations. It promotes remote collaboration, efficient information gathering, and accurate documentation, ultimately enhancing the quality of patient care in Emergency Departments.¹¹

5.4. Potential cost savings through medication price comparisons and promotions

Increased pharmacist interventions have been reported in another study, resulting in an estimated \$783,328 in cost savings for three hospitals annually.³ Health Insurance Portability and Accountability Act (HIPAA) rules were loosened in the United States, enabling pharmacies to use low-cost teleconferencing services like Zoom or Skype that would not have complied with privacy standards otherwise. Furthermore, regardless of state rules, emergency legislation permitted pharmacists to conduct COVID-19-related services such as COVID-19 testing, immunizations, and telepharmacy.¹⁷ Blockchain, another transformative technology, offers a decentralized and secure way of managing digital transactions and information.⁷ Over the past decade, the ascent of telemedicine has been both remarkable and consistent. This growth can be attributed to the continuous evolution of telecommunication technology, which has not only become more sophisticated but has also seen a simultaneous reduction in associated costs. As a result, telemedicine has emerged as a cornerstone in modern healthcare practices.¹⁵ The current body of literature on e-health and m-health systems includes a limited number of cost-utility and cost-effectiveness studies. While certain investigations suggest that telemedicine has the capacity to reduce costs, it is crucial to note that not all studies align with this perspective. A major challenge in conducting economic evaluations of telemedicine systems lies in the limitations inherent in the available research methodologies.¹³

6. Conclusion

In conclusion, telepharmacy, utilizing telemedicine, offers a transformative solution for rural healthcare. Real-time consultations and secure messaging reduce medication errors and enhance pharmaceutical service access. The diverse benefits, including improved medication adherence and potential cost savings, highlight its dynamic impact. However, careful implementation is crucial, requiring

a thorough risk-benefit assessment to address patient identification challenges. Proactive studies, exemplified by successful pilot programs like the PILL initiative, inform policymaking for effective telepharmacy deployment. As this technology evolves, developing robust systems is imperative for resilient healthcare ecosystems and substantial benefits for underserved rural populations.

7. Source of Funding

None.

8. Conflict of Interest

None.

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