

## The Impact of Tele pharmacy in Rural Healthcare

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### Abstract

In many nations, the rapid expansion of information and telecommunication technology use has a significant impact on healthcare delivery. Geographical and demographic characteristics, however, frequently make it difficult for rural areas and residents to access healthcare services. Telepharmacy, a relatively new term for pharmaceutical services, allows a qualified pharmacist to provide healthcare services, including medication reviews, patient counseling, and prescription verification, to patients who live far from a hospital, pharmacy, or healthcare facility. Economic benefits, patient satisfaction due to medication access and information in rural areas, easy access to healthcare services in remote and rural locations, effective patient counseling, and a lack of local pharmacists and pharmacy services are just a few of the well-known advantages of telepharmacy. Although telepharmacy is an excellent idea, its implementation can occasionally be difficult. There are hazards and legal issues that come with implementing these techniques that must be resolved. Significant time, money, and effort are required for the technology, software, connectivity, and operational costs associated with telepharmacy startup. One of the main obstacles to telepharmacy services for rural hospitals with fewer patients seems to be cost. Furthermore, there are still issues with the execution and uniformity of the telepharmacy law. A properly-designed system, however, has the power to transform pharmacy practice in ways that benefit rural communities as well as the hospitals or retail pharmacies that provide these services.

**Keywords:** Challenges; Clinical Benefits; Healthcare Services; Pharmacist; Telepharmacy

### 1. Introduction

The 20th century has seen a sharp increase in the use of information and communication technology. In many nations, this expansion has had a significant impact on the provision of healthcare. Because of the Internet, consumers are better informed and have higher expectations of healthcare providers. Still, a lack of medical care services and qualified medical personnel, particularly in rural and regional locations, frequently obstruct patients' access to the right care and treatment.<sup>1,2</sup>

One possible way to get around some of these barriers to patient care is through the use of technology. It seems that telemedicine, namely telepharmacy, is an enabling technology that offers a distinctive and creative approach to providing high-quality in particular, pharmacy services to rural and regional location.<sup>3</sup> Using telepharmacy, patients who live far from a hospital, pharmacy, or other healthcare facility can still receive healthcare services including prescription verification, medication reviews, and patient counseling from a licensed pharmacist. This study introduces the idea of telemedicine, concentrating specifically on telepharmacy models, how they work, the role of a pharmacist, and the advantages and difficulties they present for clinical settings. The purpose of this review is to emphasize

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pharmacists' perspectives on healthcare delivery, while acknowledging that healthcare delivery approaches vary among nations.

### **1.1. Telemedicine**

The Latin word "Meden" meaning "to heal" is the source of the word "medicine," while the Greek word "Telos" means "at a distance" is the source of the term "tele." This technology was developed to offer healthcare services to individuals with illnesses impoverished people in isolated areas of the country with the use of long-distance medical facilities.<sup>4</sup> In order to advance the health of individuals and their communities, telemedicine is defined by the World Health Organization as the delivery of healthcare services where distance is a critical factor by all healthcare professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment, and prevention of disease and injuries, research and evaluation, and for the ongoing education of healthcare providers. A wide variety of technology and applications are used in telemedicine. Telemedicine practices that involve phones, video conferences, and the Internet are the most frequently discussed.<sup>5</sup> Since telemedicine therapies appear to produce results comparable to those received through in-person care, telemedicine programs and consultations are becoming more and more popular every year. The extensive use of telemedicine has been driven by the development of lowbandwidth personal computer-based videoconferences made possible by advancements in digital communication, data compression technologies, and digitalization processes.<sup>5</sup>

### **1.2. Telepharmacy**

The term "telepharmacy," which refers to the supply of pharmaceutical services, is more contemporary and is comparable to "telemedicine". There are now multiple telepharmacy models in existence as a result of strategies to overcome the obstacles to obtaining pharmacy services. "The delivery of pharmaceutical care through the use of telecommunications and information technologies to patients at a distance" is how the National Association of Boards of Pharmacy defines "telepharmacy."<sup>6</sup>

Through telepharmacy, a pharmacist can dispense medication remotely and provide clinical pharmacy services without being physically present. Drug information services, patient counseling, therapeutic drug monitoring, prescription order review, dispensing, and compounding are examples of services that are typically provided by telepharmacy.<sup>7</sup>

As a result, telepharmacy makes use of cutting-edge technology to enable a licensed pharmacist in one location to oversee a pharmacy technician or assistant located at a distant location where medications are dispensed using computer links that can transmit audio and visual signals. For rural hospitals, telepharmacy presents a viable substitute for 24-hour on-site pharmacist medication review.<sup>8</sup> As an alternate approach to expanding pharmacy coverage in places where 24-hour pharmacy services are not offered, some healthcare facilities have embraced this. Pharmacists now have easier access to information to evaluate before a patient is given a dose because to the development of electronic health information systems and related technology like fax machines and electronic health records. The telepharmacy services are being advanced by these technologies, which also allow pharmacists to effectively contribute to better drug use.<sup>9</sup>

### **1.3. How does telepharmacy work?**

Small rural hospitals, pharmacies, or clinics that are located in remote areas are typically linked to a bigger urban center's widely used service model, which provides better access to pharmacist staff—often around-the-clock. Videophone systems, cutting-edge software, and automated dispensing machines make this connection possible. Depending on whether the rural location is a drugstore or a clinic, the personnel usually consists of either pharmacy technicians or nurses.<sup>10</sup> When a patient visits one of these locations, they might send the prescriptions (by fax, for example) to the central location, where a licensed pharmacist handles them. After reviewing the prescription, the central pharmacist releases the necessary supplies at the remote location (such as prepackaged medication from automated dispensing devices) and checks the label. The North Dakota<sup>1</sup> model's remote site processing and dispensing technique is shown in Figure S1.

STEP-BY-STEP PROTOCOL FOR PROCESSING NEW PRESCRIPTIONS AT REMOTE TELEPHARMACY SITE	
New Prescription is received by Pharmacy Technician from:	
<u>Patient</u> Written prescription	<u>Prescriber</u> Phone/fax/computer
[Some pharmacists prefer the prescription be faxed to the central pharmacy for entry.]	[Some pharmacists prefer calls to come to the central pharmacy.]
[In North Dakota it is permitted for the pharmacy technician to perform these functions if allowed by the pharmacist.]	
IF PATIENT IS KNOWN Verify Insurance Any new allergies	IF PATIENT IS NOT KNOWN Get demographic/Allergy info Insurance/Family history Disease status
Verify prescription has all required elements:	
Noncontrolled substance NDAC 61-04-06-02	Controlled substance 61-04-06-03
Is prescription readable and understandable? ANY Questions – contact pharmacist	
Enter prescription into the computer patient profile Pharmacist performs drug utilization review:	
No Allergies or Drug-Drug/ Drug-Disease Interactions:	Allergies Drug-Drug/ Drug-Disease Interactions: Contact pharmacist for verification
Proceed to select correct product Prepare prescription for dispensing and label proper use instructions Bill through insurance—Clear any third-party problems (early refill etc.) Final check performed by pharmacist Seat patient in consultation room Connect patient to pharmacist via audio/video link Place filled prescription on a table in front of the patient Pharmacist performs patient education counseling – Dispensing takes place here Bag/Package prescription including written product information Complete financial transaction	
Thank you/come back soon	

**Figure S 1** North Dakota telepharmacy Project – step-by-step Protocol for processing new prescriptions at remote telepharmacy site

Next, the pharmacy technician or nurse at the remote location scans the bar code to confirm that the prescription and its label match, affixes the label, and gives the medication to the patient. To make sure the correct prescriptions have been filled and dispensed, the pharmacist at the central end can visually watch the technician's or nurse's work.<sup>11</sup> At the conclusion of the procedure, the patient receives a two-way video chat from the central pharmacist to make sure they comprehend the recommended dosage and method of administration.<sup>12</sup> This takes into account any worries raised by the patients themselves and makes it possible to provide effective patient counseling from one central place.

However, tiny rural hospitals and clinics may not always be able to afford automated dispensing units. A different approach was created by researchers in Fargo, North Dakota, USA, in which a technician prepares medication for dispensing, repackaging, and relabeling while being supervised via videoconference by a central pharmacist located far away.<sup>13</sup> The pharmacy technician then gives the nurse these prescriptions directly or, if automated dispensing equipment is available, dispenses them. In another example, a wireless mobile technology cart has been designed for use in rural hospitals to enable doctors and nurses to have 24-hour access to the pharmacist for in-person consultation and communication in the patient care area (15)

#### 1.4. Types of telepharmacy model

##### 1.4.1. Traditional full-service pharmacy

Similar to conventional pharmacies, this online pharmacy offers services like prescription filling, medication evaluations, and patient counseling. These telepharmacy websites offer comprehensive drug inventories that contain both prescription and over-the-counter drugs, as well as other general goods and other health and beauty products.

#### 1.4.2. Remote consultation sites

At the central pharmacy, prescription drugs are made and then sent to the rural locations. Telemedicine in hospitals the ADMs Patient education and counseling are provided via computer links that combine audio and visual.

#### 1.4.3. Hospital telepharmacy

The urban medical center's hospital pharmacist examines procedures and confirms the prescriptions that are written and electronically transmitted from rural hospitals. The prepared drug is electronically released by an automated dispensing machine (ADM). The label and drug are double-checked by a nurse or pharmacy assistant at the rural end before being given to patients. The central (urban) pharmacist oversees the verification procedure and, when necessary, participates in videoconference link consultations with patients, nurses, or doctors.

#### 1.4.4. ADMs

When an electronic or faxed drug order is received, a central pharmacist verifies the patient's profile, performs an appropriate drug utilization review, and then directs the ADM to release the prescription. Patient counseling is then carried out with the aid of computer links for voice and video.

### 1.5. Involment of pharmacist

A pharmacist can actively participate in the provision of pharmacy services in any telepharmacy paradigm. In telepharmacy models, the pharmacist guarantees high-quality care.benefit the community, especially in areas like patient counseling and medication reviews. According to a 2013 study on the effects of telepharmacy services, fewer adverse drug events were reported when pharmacists reviewed medication orders remotely during hospital pharmacy closures.<sup>14,15</sup> Several thousand deaths annually are caused by medication errors and adverse drug reactions. An estimated US\$2 billion is spent each year on avoidable adverse medication events in the USA alone. Similarly, telepharmacy services may have avoided unfavorable patient outcomes, such as extended hospital stays and even death, in place of round-the-clock on-site pharmacist prescription reviews for rural hospitals, according to a 2012 US study.<sup>16</sup>

Because the number of patients with chronic illnesses is rising, pharmacists' global participation in telepharmacy models to enhance medication compliance and monitoring can reduce the risk of medication errors, adverse drug reactions, lower prescription costs, and treatment failure risk. This means that certain telepharmacy models, such as Internet pharmacies, vending machine models, mail-order pharmacies, and models that transfer the responsibilities of pharmacists to other medical professionals like doctors and nurses, should be avoided as they frequently exclude active pharmacist involvement.<sup>17</sup>

Several US states as well as Australia have found success with telepharmacy models that involve pharmacists playing an active role, despite the variations in healthcare systems between the two nations. In a 2005 Australian survey, about half of Home medication review (HMR) will be conducted by pharmacists in distant and rural Australian communities who expressed interest in utilizing telepharmacy methods. HMR onward It would often take a visiting pharmacist to perform this review, but telepharmacy has the potential to provide a considerable service to rural and isolated areas. Pharmacists continue to serve as the key healthcare provider when it comes to providing pharmaceutical services under telepharmacy models in the US, particularly in North Dakota<sup>18</sup> While other telepharmacy models may not involve pharmacists, they frequently lack this value-added quality assurance element, which means that patient counseling and formal drug usage reviews are not provided. According to an American study, the use of pharmacists in telepharmacy models has improved and tracked the rates of pharmaceutical errors. At places where pharmacy inputs were previously nonexistent, the models proved to be an invaluable resource. They also indicated a trend toward better prescription documentation, lower drug risk, and a realistic minimum standard of pharmaceutical review.<sup>19</sup> The number of orders that a remote pharmacist evaluated, changed, terminated, or canceled, as well as the time and money saved during order processing, further demonstrated the impact of pharmacist engagement.<sup>20</sup>

### 1.6. Objective of pharmacy

- To provide a good standard of living for the impoverished population: A large portion of India's population lives in rural areas, and they are The telepharmacy will improve access to regular healthcare for those who live far away and are geographically separated.<sup>21</sup> It will also increase the availability of a wider range of medical treatments and clinical healthcare services.
- Reducing the amount of time that patients and medical professionals spend traveling from one site to another.

- Case monitoring, home care, and remote critical care: in these cases, the expenses associated with the treatment include travel expenses and food that must be provided for the relatives, which ultimately adds to the treatment's overall cost.<sup>22</sup>
- Survey and track disease: Telemedicine can improve the community's ability to efficiently manage diseases by aiding in the better survey and tracking of endemics and epidemics. Additionally supporting the disaster management initiatives.

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## 2. Clinical benefits and challenges of telepharmacy

### 2.1. Advantages

#### 2.1.1. Access to healthcare services

The ease of access to healthcare services in isolated and rural areas is the main benefit of telepharmacy. Regular availability of prescription drugs and pharmacists are acknowledged as essential components of providing patient-centered treatment in rural and remote areas. In isolated places where access to healthcare services has been lost or is soon to be lost, pharmacists can offer top-notch pharmaceutical care services. Ninety percent of the 410 small rural hospitals in the United States stated that nurses were in charge of distributing and administering medications, and around half of the hospitals reported having a pharmacist on staff (<5 hours per week).<sup>23</sup> This situation was handled by the development of many telepharmacy models, which allowed for full-service operations including active the function of central and remote pharmacists, drug utilization reviews, patient education at the remote location using a variety of technological means, and patient counseling.

#### 2.1.2. Economic benefits

Economic benefits of telepharmacy are numerous. Establishing a new pharmacy is reportedly far more expensive than hiring a pharmacy technician for telepharmacy and purchasing the necessary equipment.<sup>24</sup> A single, knowledgeable pharmacist can service several locations. Therefore, expenses are kept to a minimum when taking into account the growing salary scale for pharmacists and the increased costs associated with hiring more pharmacists for rural locations. Over > 60% of patients would not have been able to pay their prescription drugs if there had been no telepharmacy model, according to research on low-income patients. Fourteen According to a study by Garrelts et al. (2023), there is a net estimated annual savings of US\$1,132,144 using telepharmacy in a multihospital health system.

Conversely, telepharmacy reduces travel time and cost, which are significant obstacles for injured veterans and the elderly living in remote areas.<sup>25</sup> A telepharmacy program that focuses on pharmaceutical therapy management services for 96 senior patients achieved success in saving about US\$300,000.<sup>15</sup> in Connecticut, USA. Telepharmacy is seen by healthcare practitioners as the perfect substitute for treatment delays in situations where pharmacists are not present on the spot. Travel duration and other expenses related to the trip when patients are not directed to alternative places, are avoided.<sup>26</sup>

#### 2.1.3. Patient satisfaction

Patient satisfaction is improved when telemedicine is used to provide medication access and information in remote places. When the elderly patients in the clinic missed their appointments, one of the main obstacles was that they desire to leave their houses. Pharmacists may now evaluate patients' prescription regimens without needing to travel thanks to remote technology. Patients now trust the service more and are happier with it as a result. According to a US study that looked at community-specific factors or the mode of healthcare delivery when determining patient satisfaction, patients in rural areas prefer being able to receive local pharmacy services via telepharmacy services rather than having to travel outside of their community.<sup>27</sup> A comparable study conducted in the USA with the goal of assessing the telepharmacy program revealed that more than 75% of the patients research expressed satisfaction with the videoconference service and interactions with the pharmacist.<sup>14</sup> According to a Queensland, Australia study on patient surveys, patients are quite happy with the telepharmacy services they received.<sup>28</sup>

#### 2.1.4. Effective patient counselling

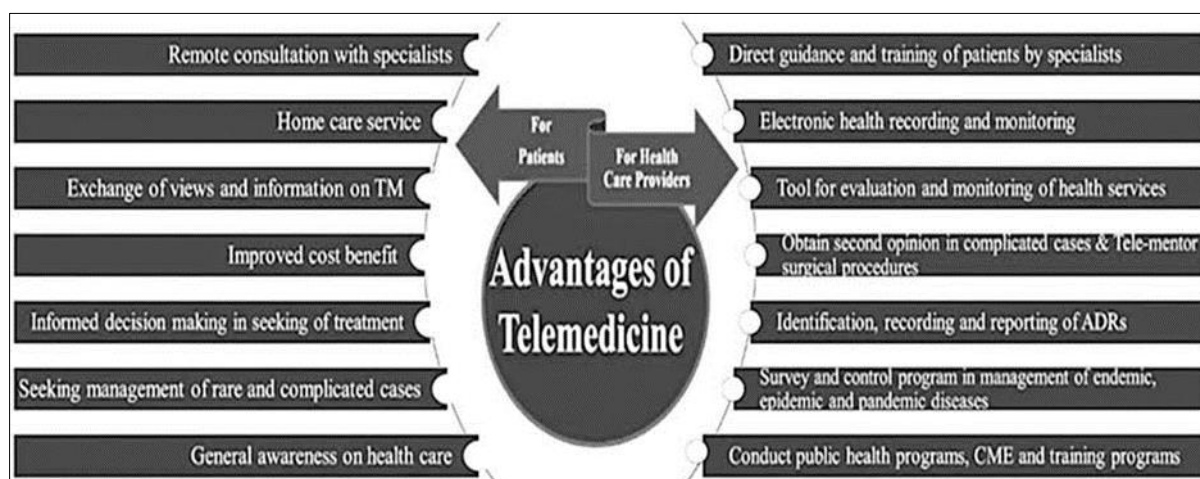
When it comes to pharmacist advice and the amount of the needed to get medication, telepharmacy guarantees that consumers are more satisfied. Fourteen Webcam-enabled telepharmacy services are recommended by pharmacists, according to a study on telepharmacy-related services and outcomes conducted in the United States. for the longer session duration and improved privacy they offer<sup>29</sup> Another study that used compressed video instead of typical package insert instructions to explain metered-dose inhaler procedures demonstrated the effectiveness of

telepharmacy counseling.<sup>30</sup> Skoy et al. investigated the efficacy of students' telepharmacy-based patient consultation skills and looked for any variations between the students' telepharmacy-based and in-person patient counseling. They said showed even without any prior experience using telepharmacy technology, students are capable of providing patient consultations.<sup>31</sup> Nevertheless, the study also showed that students did better in the in-person consultation, indicating the need for further instruction and telepharmacy consultation procedures.

### 2.1.5. Minimal scarcity of pharmacists

There are now not enough local pharmacy services available to many hospitals, clinics, and medical institutions in remote areas, which means that pharmaceuticals are delivered without the pharmacist's role.<sup>32</sup> When pharmacists are few in rural and isolated regions, the majority of pharmacy services are provided by nurses, doctors, and other healthcare professionals who may lack the necessary training in appropriate prescription administration. This situation may have led to the creation of an unsatisfactory system that deviates from official government directives regarding the provision of high-quality pharmaceutical services to all residents.<sup>33</sup> These problems might be solved via telepharmacy. The future of the pharmacy industry is to play a leading role in telepharmacy trials. One practical way to cover this is via a remote telepharmacy service. These changes in the pharmacy field to alternative careers. Telepharmacy thus solves the lack of pharmacists in remote locations and enhances patient access to medications and pharmacy services.

An Australian study conducted in 2010 in Queensland found that telepharmacy models may be successfully implemented to provide pharmacists with drugs. review for hospital patients in remote areas. Later in 2013, clinical pharmacy services could be provided in rural and isolated areas of Queensland thanks to government financing. Hospital telepharmacy networks offer a cost-effective, practical, and adaptable solution for tiny rural hospitals that need pharmacist staffing. Telepharmacy facilitates staff coverage for after-hours, weekends, vacations, and emergencies. It also eases problematic scheduling periods when pharmacist replacements and relief help may not be readily available.



**Figure 2** Advantages of telemedicine

## 2.2. Disadvantages

### 2.2.1. Operational Difficulties

Telepharmacy is unquestionably a fantastic idea, but putting it into practice can be challenging since it requires large, complex equipment that operates quickly digital connection and it is also dealing with the problems caused by scarce resources, which are common in rural areas.<sup>32</sup> Establishing telepharmacy can be a significant factor in breaking down barriers and ensuring its continued presence in the contemporary era. Telepharmacy is slowly but steadily making improvements to the current workflow in isolated and rural hospitals, but it also faces major obstacles when implementing the necessary changes.<sup>8</sup>

### 2.2.2. Security

The internet is used to transmit health care information in telepharmacies. Maintaining the security of the data under data control is crucial.

### 2.2.3. Reluctance to use Technology

The incapacity of older people to use technology, or their lack of technological literacy, is another disadvantage of telepharmacies.<sup>14</sup> when it is not possible to interact face-to-face Because the patient's condition might not be fully seen, the pharmacists might not be able to administer the prescription in an acceptable manner.

### 2.2.4. Continuity of care

When a patient cannot interact face-to-face with the pharmacist, the pharmacist should still offer ethical assistance by providing guidelines for the appropriate use of medications<sup>7</sup> Maintaining Uniformity in distant pharmacies, the level of care and adherence to appropriate dispensing practices increases. It is exceedingly difficult to regulate the negative consequences of drugs dispensed by unprofessional individuals without a valid prescription.

### 2.2.5. Current Status of Tele Medicine in India

The infrastructure for health care in India was created appropriately, but it was unable to fulfill patient expectations due to a lack of funding, doctors, staff, and equipment scarcity in their application. In India, 92% of people reside in secondary and tertiary care facilities located in metropolitan areas, while 68% of people live in rural areas. Telemedicine is a way for medical professionals who are unable to establish their practice in remote areas to still provide care.

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## 3. Challenges for Implementation of Tele Medicine in India

### 3.1. The Government

In particular, as well as society, patients, family physicians, and administrators, have all accepted this system. The patients in this system could experience emotional sentiments to the specialists and clinicians, and in addition, inexperienced doctors may find it challenging to persuade patients about their issues and may worry that the information they provide would not be secure.

### 3.2. Lack of financial resources

This technology is too expensive for those without sufficient financial resources to employ, therefore many hospitals and organizations find it to be cost-effective to establish a telepharmacy.

### 3.3. Language variety and the literacy rate

Just 65% of Indians are educated, meaning that a large portion of the country's population lacks formal education.<sup>34</sup> The ignorant It is challenging for people to comprehend modern communication technology. As a result, it hinders the application of cutting-edge technologies.

### 3.4. Government assistance

Since telemedicine is still in its infancy in India, the government must provide funding and encourage its use. since it has the potential to advance society's healthcare system.

Programs for professional, patient, and user education and training should be offered continuously to facilitate the use of telemedicine.

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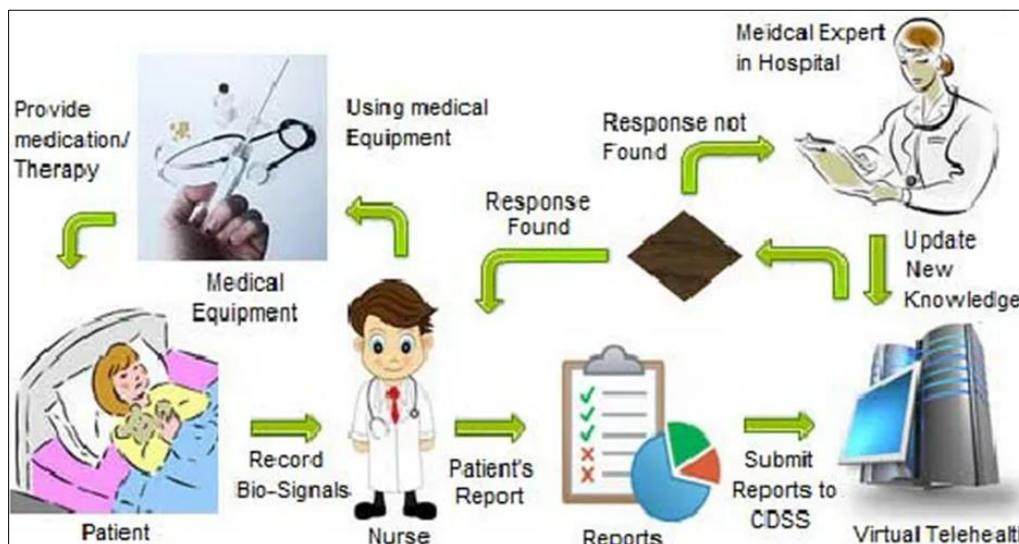
## 4. Tele Medicine Applications

- Patient medication and monitoring
- Equipment management
- Drug management
- Work flow management
- Emergency handling etc

Telemedicine is applicable to a wide range of situations and situations, including emergency rooms, intensive care units, diabetic care, cardiovascular care, trauma centers, pediatric clinics, and stroke care.<sup>35</sup> A significant number of patients have cardiac difficulties, specifically congestive heart failure. They receive emergency therapy via telemedicine to minimize fluid retention, return the patient to normalcy, and shorten their hospital stay. The professionals who are



trained in the tele medicine can easily reduce the hospital stay of the patient there by reduce the hospitalization cost of the patient. Application of tele medicine was mainly focused on the diabetes in rural areas.



**Figure 3** Telemedicine Application

## 5. Research Involving Telepharmacy

In general, patients were pleased with the telepharmacy services, and those who were in rural regions expressed higher levels of satisfaction. It was stated that the majority of the For their medicines, residents of rural areas must travel more than 40 kilometers. Through the telepharmacy system, patients can view the pharmacists thanks to this system.

## 6. Conclusion

Due to a variety of demographic and geographic variables, rural communities and people frequently lack simple access to healthcare services. Telepharmacy presents great potential as a technological advancement to enhance pharmaceutical care accessibility for those residing in isolated and rural areas. Telemedicine is swiftly taking on a crucial role in contemporary pharmacy practice with the ability to offer high-quality pharmaceutical services, including patient counseling, prescription information, medication management, and dispensing. Adoption of these approaches entails risks and legal issues that must be resolved. Nonetheless, a well-designed system can alter pharmacy practices in a way that benefits rural areas as well as the hospitals or retail pharmacies that provide these services.

## Compliance with ethical standards

### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

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