

Systematic Review

Optimizing healthcare outcomes and broadening nursing capabilities in digital era: telemedicine transformative impact

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ABSTRACT

The telemedicine concept brought about a revolution in caring and led to efficient and effective nursing practice. The aforementioned improvements in patient outcomes and the positive advancements in patient care and accessibility were catalysed by the 2020 pandemic. The advent of this patient-centred care under telemedicine has ensured patient access, reduced costs, and encouraged general patient satisfaction. More so, the innovations are felt more in underserved populations, and rural populations recorded appreciable improvement in care pathways with professional access on a hospital proximity basis. Moreover, telemedicine has helped bridge critical gaps in healthcare for so long within the underserved regions. In nursing, telemedicine has maintained workable handover and helped expand safety from viral or bacterial infection chain to mental health and sanity. For example, patient circumstances such as diabetes have seen telemedicine innovations in ways that ensure patients are being monitored in remote places and doctors or nurses update patients simultaneously using modern telemedicine platforms. However, the noted issues have been challenges integrating machine operations with existing hospital setups. The future of telemedicine promises continuous remote caring achievable with real time data entry that will improve patient outcomes and nursing practice. In conclusion, telemedicine provides efficient, effective, and accessible nursing care that centers itself with the patient.

Keywords: Continuous remote caring achievable, Accessible nursing care, Improve patient outcomes, Effective nursing practice, Telemedicine concept, Real time data entry, Telemedicine innovations, Modern medicine platform, Bridge critical gaps

INTRODUCTION

Telemedicine revolution-transformation of the delivery of healthcare thanks to the application of information and

communication technologies with the purposes of promoting patient outcomes while guaranteeing outcomes-based improvement in nursing practice. In the situation of medical service usage, we are likely to see a new era of telemedicine being one of the most defining-and the spread

of telehealth-related services due to the COVID-19 pandemic has contributed greatly to its vast spread.¹ It is probable that medical services will be unrecognizable, completely new ways of providing care to patients—a patient-and nursing-centred approach—will also change due to this event example.

SEHA-centric telehealth systems in Saudi Arabia have changed nursing quality, practice, and education radically and have led the revolution of this kind beyond primary care hospital settings example.² Telemedicine's new models have several potential advantages for underserved populations. These include increasing patient access to medical professionals, decreasing health prices, and improving patient satisfaction, all of which are critical for organizations operating in resource-restrained environments.³ For instance, “uniform nursing handover models increased patient safety by decreasing medication errors and patient falls”. As a point of fact, tele-nursing, in this instant, turned out to be very beneficial for patient assistance.⁴ Thus, tele-nursing is the application of technology into the patient education, consultation, and postoperative surgery follow up.⁵

New ways to improve telehealth safety are developed, including AI integration into patient education, which showed improved information and physical functioning. The last one is especially relevant for orthopaedic patients, limited in mobility due to disease.⁶ The outcomes of telehealth interventions among prediabetic and diabetic patients showed encouraging results in managing medication intake and overall treatment.⁷ The adaptation of nursing practice completely to telehealth competencies is required for online lifelong healthcare service usage and allowing old people with technological instruments to live on.⁹ The digital transformation of care services, accelerated by socio-economic changes and the pandemic, gives importance to the digital incorporation of professions such as nursing.⁸

Finally, telemedicine applications affecting cancer patient outcomes through health web-based interventions are essential for addressing some of the chronic diseases occurring during the past years of the pandemic.¹⁰

Review of literature

Contemplation of all those sentiments additionally illustrates the significance of the telemedicine revolution in the desire for change in nursing.¹¹ Undoubtedly, the use of telemedicine formats actively affects the health of patients and the provision of services in the medical industry.¹² Treatment becomes more accessible for societies with limited access to treatment resources.

The net visits in telehealth clinics spiked 63% and 31% in-network visits, which reduced indirect costs, including patients' drive times, significantly compared with conventional methods.

Additionally, telemedicine sustains or possibly enhances quality for people managing chronic conditions and diseases such as lupus and cancer.¹³ With lupus patients, virtual care leads to higher next disease activity scores, emphasizing the need for prudent application. For cancer care, telemedicine did not negatively affect satisfaction it improved well-being and helped overcome the anxiety and de-stress.¹⁴

In summary, telemedicine has led to more of the outcomes by increase access, maintenance of quality, and a better alternative to common visits without increasing body cost limits.²⁰ When considering patients, there are other significant benefits about telemedicine that change care delivery. First, they lower travel costs and time make care easier to reach to remote adults and facilitates are mobility impaired acutely and locally.¹³ Other accessibility is through wearables and remote monitoring for home care.²¹ Additionally, during the pandemics, telemedicine was a critical continuity to limiting COVID-19 spread since inadequate crises are crucial.²²

Telemedicine also offers essential contact that is vital in team understanding and respecting patient desires that are interpersonal remain pillars in successful hospital care.^{23,25} The technology also emerged to bridge professional and infrastructure gaps that outdo geographical accessibility.²⁴ Over a range of those, which include chronic, conditions patients, disabilities, and neurological, safety and outcomes have proven positive experiences, efficacy, and safety.²⁶ Heart failures exhibited diagnostic effectiveness and ability to initiate therapy and specifically rehospitalization reductions, which improve cost-effective manners.²⁷ Cardiology excelled through monitoring and management; hence the implication was telemedicine was the future technology trends caring.²⁸ Chronic lung diseases had accesses to specialized facilities, rapid follows and savings that emphasized telemedicine was enhancements to vulnerable populations.²⁹ Finally, satisfaction was non-inferior to in-person, attesting that the acceptability and a supplementary role were in the upcoming wellness delivery.³⁰

On the other hand, telemedicine “provides increased access to healthcare, reduced transportation costs and hours spent waiting in a waiting room, minimal germ spreading, and more comfort for patients and practitioners; and it enables uninterrupted rehabilitation, connects remote populations with expert healthcare providers, and can help bridge falling or lacking infrastructures gaps via patient access to remote caregivers” and furthermore, telemedicine also offers the benefits of improved patient follow-through, knowledge, and self-reliance, more accurate and candid health data, including for PTA in kidney transplantation.^{3,21,31} According to, “studies indicate improving patient outcomes due to telemedicine and increased patient satisfaction; telemedicine offers the opportunity of remote meetings and educational chances for professionals”.³² However, many barriers remain,

including lack of resource access, ethical conundrums, and technological challenges.

Aim

Aim of the study was to investigate the effects of telemedicine on patient outcomes across various healthcare contexts, to examine the implications of telemedicine for nursing practice, encompassing its impact on operational processes, patient engagement, and data protection concerns, to ascertain the extent to which telemedicine alters healthcare accessibility, particularly for populations in remote and disadvantaged areas, to scrutinize the obstacles and constraints associated with incorporating telemedicine into existing care delivery models and nursing protocols, to explore viable solutions and methodologies for overcoming barriers encountered during the implementation of telemedicine in current healthcare settings, to assess the growing application of telemedicine in managing chronic illnesses, such as diabetes, and its potential to influence long-term health outcomes. To delve into emerging advancements and innovations in telemedicine technologies, including the utilization of real-time data analytics and intelligent systems for remote patient monitoring and to formulate evidence-informed recommendations for healthcare administrators and policymakers, aimed at enhancing the

quality of patient care and nursing practice based on the research findings.

METHODS

The research adopted a mixed methodology in conducting a systematic review through the preferred reporting items for systematic reviews and meta-analyses (PRISMA) (Table 1) framework.³³ Overall, I used various qualitative and quantitative research publications. The title of this systematic literature review is telemedicine revolution: enhancing patient outcomes and transforming nursing practice. Telemedicine as a game-changer in the healthcare sector has revolutionised patient outcomes and transformed nursing practice. It is located in the space opening up for patients to access care services of their caregivers that significantly close the gap between patients and the services of caregivers.

Research questions

Based on the guidelines obtained from the university of North Carolina at Chapel Hill Libraries system, the present study developed research questions relevant by the [SPIDER (S-sample, PI-phenomenon of interest, D-design, E-evaluation, R-research type)] framework, as indicated in Table 1.⁴⁴

Table 1: Research questions framed according to SPIDER protocol.

Spider	Element	Included terms
S	Sample	Telemedicine provides rapid access to medical expertise regardless of the patient's location, enhancing the reach and efficiency of healthcare delivery.
PI	Phenomenon of interest	The focus is on telemedicine's role in enhancing patient outcomes, transforming nursing practice, and addressing healthcare accessibility.
D	Design	Designs include randomized controlled trials (RCTs), quasi-experimental studies, and narrative reviews to assess telemedicine's effectiveness.
E	Evaluation	Evaluation metrics include patient satisfaction, knowledge improvement, and physical functional outcomes, demonstrating telemedicine's positive impact.
R	Research type research questions	Clinical trials that use both qualitative and quantitative approaches. How effective is telemedicine in improving patient outcomes across various healthcare conditions? What are key challenges faced by nurses in implementing and integrating telemedicine into their daily practice? What are the potential benefits of telemedicine for nursing education and professional development?

Design

Using the PRISMA 2020 flow diagram, the present study could interpret enough relevant papers, followed by evaluating each research project's quality according to Long and Godfrey criteria and concluding by writing up a narrative overview of what had been found.^{43,45}

Inclusion criteria

On the other hand, articles to be considered should be published concerning telemedicine/ telehealth technologies, services/interventions regardless of structure and affirmed within a certain period, for example, between 2015 and 2023. Peer-reviewed publication should be written in English or otherwise specified language to enable full-text retrieval and assure publication quality.

The articles should relate to geographic scope, considering context of use or population to whom they are applicable and domain studied. It is necessary to review articles evaluating various telemedicine interventions, including teleconsultation, telemonitoring, telepsychiatry, telepharmacy, and other telehealth services. Articles must feature relevant outcome measures, such as patient health, healthcare utilization, nursing practice, and other appropriate domains. It is relevant to evaluate articles in terms of the study setting, taking into account the use of the assessed telemedicine intervention area.

Exclusion criteria

The article establishes guidelines to the assessment of irrelevance in telemedicine research: focused on the irrelevant studies, irrelevant publication data, non-English

sources, sources without peer approval, and a lack of access restriction, a focus on non-research articles, limitations of research data on the basis for study designs, non-human studies, and restrictions to geography, population, or study and evaluation content. In the case of the article, it explains that the user needs to confirm that the articles they use have content that is relevant to current developments in telemedicine. The user must also confirm that the studies of which they use in their research are applicable to their study on the basis of the methods through which research was conducted on the user Bibliography through the regions or systems of study. It also explains that the user must also be able to disqualify their research studies and evaluable sources on the basis of the populations of studies and disallow use on irrelevant patient groups. The article deems it true that the factors must also bear considerations. The user bibliography must hold a clear parallel with their research questions and the restrictions of telemedicine interventions or the technologies.

Selection criteria

Based on Figure 1, procedures to search, select, and evaluate the articles that were used to write the literature review can be generalized. The search was performed in numerous databases including Scopus, PsycINFO, Google

Scholar, PubMed/MEDLINE, and CINAHL. This literature review provides evidence that the telemedicine revolution influences patient outcomes and how nursing is practiced. The publications range from 2015 to 2023. Both database search and reference search were conducted in English. English search terms were as follows: telemedicine or telehealth or remote healthcare or virtual care or digital health or teleconsultation or telemonitoring or tele-triage or telepsychiatry or tele-pharmacy or nursing practice or nursing care or nursing informatics or nursing telehealth or nurse-led telemedicine or nursing role in telehealth or nursing workflow in telemedicine or nurse-patient communication in telehealth or patient outcomes or clinical outcomes or health outcomes or patient satisfaction or patient experience or healthcare access or healthcare disparities or rural healthcare or underserved populations or chronic disease management or acute care or primary care or home healthcare or care coordination or patient education or adherence to treatment or health technology or remote monitoring devices or telemedicine platforms or mobile health apps or wearable technology or artificial intelligence in healthcare or telehealth policy or regulatory landscape or licensure requirements or reimbursement models or healthcare legislation or privacy and security or ethical considerations or technological barriers or interoperability challenges or training and education.

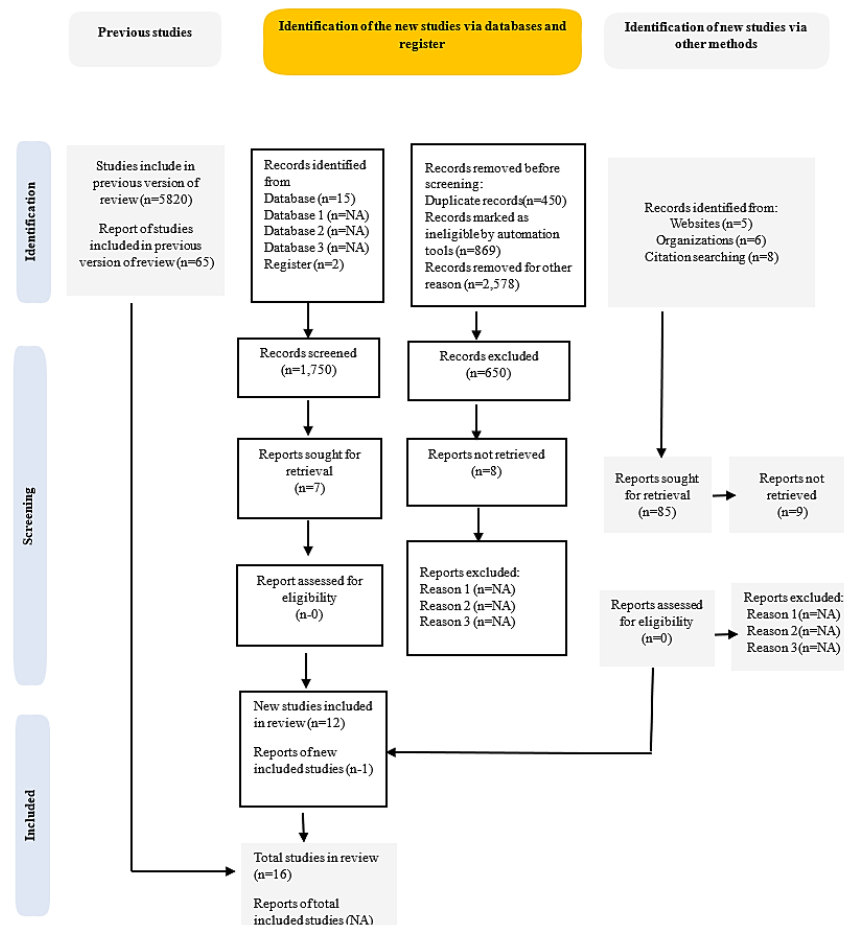


Figure 1: Flowchart: documentation of study selection process.

Table 2: Individual article assessment rating based on Long and Godfrey, 2004 tool evaluation of included study.

Bibliography details	Purpose	Key findings	Evaluative summary	Quality assessment
Julia et al ⁴⁸	1+	1+	3+	5+
Forti et al ⁵⁰	1+	1+	2+	4+
Luz et al ²⁰	1+	1+	2+	4+
Tamás et al ¹²	1+	1+	2+	4+
Jinping et al ²⁵	1+	1+	3+	5+
César et al ¹⁶	1+	1+	3+	5+
Ana et al ¹⁹	1+	1+	3+	5+
Lindsay et al ²¹	1+	1+	3+	5+
Katherine et al ²³	1+	1+	3+	5+
Safa et al ²⁶	1+	1+	3+	5+
Clemens et al ²⁹	1+	1+	3+	5+
Johanna et al ⁴⁰	1+	1+	3+	5+
Kathleen et al ⁴¹	1+	1+	3+	5+
Stephanie et al ⁴⁴	1+	1+	3+	5+
Olivia et al ⁴⁵	1+	1+	2+	4+
Bishav et al ⁴⁹	1+	1+	2+	4+

Quality assessment of included studies

Given that most of the articles were in a qualitative form of writing, the author of this research applied Long and Godfrey individual assessment instrument because it suits qualitative assessment better than quantitative. The other article is supported by “sociodemographic” features, such as percentages and frequencies. The article is called using telemedicine to revolutionize nursing practice and improve patient outcomes. Ratings in Table 2 appear from 5+: very excellent quality to 4+: adequate quality. We have 8 studies of adequate quality out of 16 and 13 studies of good quality. High quality is distinguished by a sample methodology, theoretical framework, and practical results.

Selection process and data extraction

The PRISMA guidelines provide a comprehensive approach to performing meta-analyses and systematic reviews. As a nursing student, you can apply PRISMA to the process of selecting and harvesting data for the literature review on “the telemedicine revolution: enhancing patient outcomes and transforming nursing practice.” A selection process involves data sources, such as databases and search engines that are scanned for relevant publications after eliminating duplicates. Titles and abstracts as well as full texts are then screened for eligibility. The specific data is extracted by two independent reviewers in a standardized manner using a data extraction form.⁴⁶ The final step, called synthesis, includes the writing itself and the prepared presentation in the proper format and is pivotal in structuring the obtained data, dividing it by the most relevant and urgent topics, treatments, or outcomes, and presenting the data.

Data synthesis

We can get valuable perspectives from multiple-author systematic reviews of research subjects. This method for

synthesising data is systematic and rigorous, making it the most objective, informs evidence-based practice, and points the way for future research questions. At the same time, collaborating among authors with differing expertise can shore up any weaknesses in the manuscript's argument and presentation. In other words, this landmark piece's sheer weight of expertise should serve as a powerful lever for advancing nursing practice. Multiple authors' collaborative work ensures that readers have a broad and rigorous supply of material to draw upon in their studies of the integration of telemedicine into nursing.

RESULTS

Healthcare systems revolutionize telemedicine, creating opportunities for cooperation and information sharing. The cost-effectiveness, acceptability, and efficacy of 50 studies demonstrate that virtual medical consultations may be used for long-term ulcers, either to supplement or in place of in-person visits with superior results and decreased costs. It may promote opportunities to treat paediatric diabetes better by providing a greater number of favourable options. Integration of telemedicine with regular clinical treatment results in cost and patient satisfaction savings. The healthcare sector has an influentially advanced way of telemedicine due to increased telemedicine importance as a health regulation. More than 90% of Island health nurses recommend telehealth to their patients, and 79% want to engage in remote consultations. Post-intervention treatments resulted in greater patient satisfaction in a number of treatment dimensions, with a lower degree of disparity between patient treatments. Nurse-led digital health care technologies are making great strides in terms of patient cleanliness and effectiveness, with the majority of virtual nursing initiatives focusing on patient protection and clean delivery. Telemedicine and eHealth are revolutionizing healthcare systems around the world, and existing options for cooperation and information are growing. Telehealth

network for patients removes physical barriers and provides continuous care. Telehealth may also help meet the void left by medical professionals. Nursing students have an awareness of the social pressures and subconscious mind through telemedicine work. The nurse feels that telemedicine improves long-term patient treatment and considers the efficacy and treatment quality delivered through telehealth as favorable. Telemedicine has changed the professional identity of many nurses with a technological mediator, which may lead to an expansion of telehealth technology through tele-nursing. Technology is on the move, and the healthcare sector is growing, digitalizing, and becoming more advanced with the use of telemedicine to bridge the distance in places where medical attention is lacking. Tele-psychiatrists perform similar to conventional forms according to research, outlining that more research is needed to incorporate telemedicine technology to get to appointed medical ideals.

Telemedicine in improving patient outcomes across various healthcare conditions

In different healthcare settings, telemedicine has had a positive effect on the quality of care delivered to patients. According to different studies, the method helps improve patients' access to medical services, reduce the costs of care delivery, and increase the level of patient satisfaction.³ Telemedicine is highly effective with a variety of services, delivering positive results in the fields of physical and mental health, medical engagement, behaviour changes, quality of life, self-efficacy, and social support. Moreover, the method is widely used to cut the costs of different aspects of care delivery.⁴⁷ Telemedicine was instrumental in maintaining the quality of care for adults with chronic conditions and managing their utilization, particularly at periods when in-person care provision was more difficult and risky (Table-3).⁴⁸ Finally, the rapid development of telehealth services enabled by the COVID-19 pandemic has demonstrated its convenience and potential, turning it into a widely supported part of care delivery and increasing the reliance on patient safety and quality of care.^{49,50}

Telemedicine improve access to healthcare for chronic conditions

Telehealth plays a pivotal role in boosting access to healthcare by overcoming geographical barriers and heightening patient convenience.⁷ Implementing telehealth centres staffed by mid-level practitioners can substantially amplify access, as evidenced by a 31% increase overall in network visits within 10 km of a novel centre, with 62% attributed to fresh patients.³⁵ Furthermore, utilization of tablet technology in telehealth programs, such as the tele-neurology network at Vanderbilt university medical centre, has exhibited towering satisfaction levels among both doctors and patients, facilitating care for a broad assortment of neurological diagnoses.⁸ Researchers have determined that e-consultations through incorporated medical records, which

improve care access for patients living at a remove from referral hospitals, swell demand, lessen delays in cardiology appointments, and ultimately augment healthcare accessibility.⁹

Main advantages of using telemedicine

Telemedicine has a lot of advantages. It is characterized by increased access, cost effectiveness, and decreased harm to the environment.⁶ Telemedicine has become effectively used in a remote dermatology service that shortens the time of estimating late reactions to the patch tests and reduces the necessity of participating in several face-to-face assessments.⁴¹ It leads to a considered continuity of diabetes management. The HbA1c of those with type 1 or type 2 diabetes donors stayed relatively stable.¹¹ Digital health tools also reduce the barrier to access by perinatal specialist with increased participation of the patients and their relatives in the decision-making process. Furthermore, reform will minimize the chances of resource competition.³ From a psychological perspective, the assessment of the reform has led to a shorter length of stay, more accurate diagnosis, cost savings, staff satisfaction, and compliance (Table 4).

Nurses overcome resistance to telemedicine adoption

Highlighting its benefits, providing sufficient training, ensuring technical support or positive working relations can help nurses overcome the resistance surrounding the adoption of telemedicine. Other studies have indicated that the acceptance of frontline staff is critical to successful telehealth implementation, as cited in.^{20,21} It is also noted that the determining factors between nurses and non-nurses for utilizing acute telemedicine differ, but perceived usefulness and ease of use appear to be confirmed predictors.¹ Furthermore, it was indicated that the perceived barriers due to staff resistance and scepticism can be best overcome using reliable technology, ample resources, and early achievement of successes that will facilitate track progress. Other facilitators include having local champions, such as a telehealth coordinator, clear systems for ordering and receiving installation and support, or user-friendly equipment.^{25,27} Nurses can successfully navigate and overcome these objections (Table 5).

Nurses adapt telemedicine for elderly patients

Nurses adapt telemedicine for elderly patients by developing competencies for video telemedicine skills specific to the frail older people.¹⁹ This adaptation allows for remote clinical services using smart devices with embedded sensors, for example, accelerometers, facilitating human activity recognition originated from sensory data fusion.³⁵ Also, telemedicine visits for ophthalmologic care in elderly have proved effective in clinical care and visual acuity and especially isolated and dependent living in housing individuals.⁴¹ Moreover, current research studies aim to leverage telemedicine to

reduce time required for diagnosing and treating arrhythmias among the elderly to have them gain self-efficacy and understanding of their conditions.^{1,2} In general, telemedicine technologies enable geriatric care professionals to deliver integrated frail older people care and their career and family, although some barriers and facilitators need to be accounted for successful implementation.²⁰

The potential benefits of telemedicine for nursing education and professional development

Nursing education and professional development can be significantly enhanced by telemedicine.⁴¹ Using this approach, nurses from remote areas and those who cannot visit traditional healthcare centres can provide their interventions. For example, teleconsultation by nurses has been found beneficial for the older patients who have dementia.²³ The same approach is often used to educate patients on virtual healthcare delivery.⁵⁰ In turn, the use of telehealth is of great importance for the education of advanced practice nurses, which is done by developing standardized competencies that coincide with the four P's telehealth.⁵⁴ In addition, using telemedicine systems at the nursing homes helps connect nurses with healthcare providers and reduces unnecessary hospitalizations while improving the decision making of these professionals. Thus, telemedicine assists nursing education by providing opportunities for remote teaching and developing new skills in healthcare provision, contributing to the continued professional development of nurses.

Telemedicine enhances nursing curriculum delivery

By integrating telehealth into nurse education programs, telemedicine may play a role in renew psychology. In response to the Four People, policies, practices, and patterns (P's) Telehealth framework, nursing students would have the foundation for their own practice as well as an understanding of the tools enabling telehealth to be

realized.¹⁵ In addition, a recent study recommended that lectures and simulation experiences be used for graduate family nurse practitioner (FNP) students who take evidence-based telehealth curriculum currently being developed.²⁶ Furthermore, the formulation of new pilot curricula for pediatric residents--including slide lectures as well as direct observation exercises--brought about significant improvements in residents' self-assessed abilities to conduct telemedicine encounters.

This addressed accreditation council for graduate medical education (ACGME) competencies and offered a handbook for becoming engaged in telemedicine. These methods illustrate the necessity of structured telehealth education for nursing students and residents to prepare them for meaningful telemedicine practice surely deserve consideration

Telemedicine plays in practical nursing training

It enhances patient-doctor interactions, promotes quality care, and helps nurses develop digital skills among nurses. This is why telemedicine plays a critical part in practical nursing training.^{36,40} It enables telenursing to be integrated into clinical practice and education, resulting in benefits for patient care, family support, medical services. With the use of telemedicine in nursing-training comes the development competencies that align with the four P's telehealth framework.⁸ That is to say, nurses must be able to plan, prepare and establish networks as they provide services; then follow up on this activity by evaluating whether their work objectives have been realized.³⁶ Especially during the COVID-19 pandemic, nurses using telemedicine will be expected to show leadership, good interpersonal skills, adaptability and the professionalism. Through incorporating telemedicine into nursing curriculum, the students will be able to the improve their understanding of the online tools and the learn communication skills same as those required for high-tech medical work (Table 5).

Table 3: Application of telemedicine in healthcare areas.

Healthcare sector	Implication of telemedicine in healthcare
Telehealth	Technological advancements and healthcare innovations have significantly expanded their applicability. With the implementation of this technology in healthcare, clinicians, researchers, laboratory personnel, and physicians may utilize the concept of telehealth. It is now imperative for hospital systems, medical groups, and suppliers to incorporate telemedicine into their medical services. Furthermore, numerous organizations seek to collaborate with telemedicine providers to facilitate the process and deployment. Telemedicine is conducted using a telemedicine device, which comprises a computer and handheld medical equipment. Physicians also employ high-resolution imaging cameras to provide accurate diagnostic images to specialists. ^{7,15,16}
Facilitate service to disabled patients	Telemedicine facilitates access to healthcare services for patients with disabilities. It also enhances accessibility for other populations, including the elderly, culturally isolated individuals, and incarcerated persons. Telemedicine can be utilized in the management of various medical conditions. Its efficacy is demonstrated when an individual receives medical attention from a competent healthcare provider who obtains comprehensive information about their symptoms. According to some reports, patients who utilize telemedicine experience reduced hospital stays, resulting in cost savings. Furthermore, decreased travel time may lead to a reduction in secondary expenses such as fuel costs. ^{5,19,39}

Continued.

Healthcare sector	Implication of telemedicine in healthcare
Remote treatment	Remote treatment can be conducted virtually, which has been demonstrated to be an effective method for reducing hospital admissions. Patients seeking consultation with healthcare providers possessing specialized expertise in specific conditions can do so without the necessity of long-distance travel through video consultations. This approach allows for optimal utilization of each specialist's knowledge and skills. Healthcare delivery can, at times, be characterized as a collaborative effort, with primary care physicians and specialists working in concert to achieve optimal patient outcomes. Telemedicine facilitates this process by enabling all clinicians to communicate with the patient and each other through a secure remote connection.^{20,25}
Treatments of school-going children	Telemedicine can play an essential role in the treatment of our rapidly aging population. When a child becomes ill at school, they can consult a school nurse or be transported by their parents to an urgent care facility, which is often inconvenient and potentially unnecessary. Progressive schools can establish partnerships with physicians to conduct video consultations from the classroom. The healthcare provider may determine the appropriate course of action and provide parents with guidance or reassurance. Research has demonstrated that having physicians available on-call during nights and weekends can contribute to reducing hospital admissions for patients residing in assisted living facilities.^{19,20,22}
Effective for disorders not requiring lab examination	Telemedicine is efficacious for disorders that do not necessitate laboratory examinations or physical assessments. This technology also facilitates ongoing treatment, such as psychotherapy. During the COVID-19 pandemic, patients residing at considerable distances from primary care centers can achieve improved medical management. For patients with limited mobility, healthcare providers can expand the range of conditions they are willing to address. For instance, a physician may utilize telemedicine to prescribe antibiotics for a suspected infection.^{30,31,35}
Doctor's appointment virtually	In the current era of social distancing, a significant number of individuals anticipate virtual medical consultations. Telemedicine has demonstrated improvements in medication management, patient quality of life, and healthcare cost reduction. The development of telemedicine applications has become a primary objective for healthcare providers seeking to deliver remote healthcare services to patients. This technology facilitates the creation of appropriate telemedicine applications for medical professionals and patients. Furthermore, patients perceive these applications as reliable and user-friendly when minimal specifications are integrated with a robust authentication mechanism.^{40,41}
Enhance overall healthcare system performance	Telehealth encompasses a broad spectrum of technologies and facilities utilized to deliver patient care and enhance the overall efficacy of the healthcare system. Telemedicine comprises a more extensive range of online healthcare services. In addition to direct patient care, it is applied to remote non-clinical services such as provider recruitment, administrative meetings, and continuing medical education. Telemedicine employs mobile messaging and assistive tools to deliver healthcare to individuals who are unable to physically consult a physician. This technology is also applicable for follow-up appointments, management of chronic illnesses, expert consultation, medication management, and various other health resources that can be accessed remotely through secure video and audio connections.^{18,29}
Improve patient coordination	Telemedicine has the potential to enhance patient coordination and improve healthcare services. Fragmented care may result in treatment shortages, overutilization of medical care, inappropriate medication use, and redundant or unnecessary care. Patients can efficiently remit nominal fees for telehealth services. This modality can be delivered to patients in a comfortable manner, thereby improving patient-physician coordination. Patients derive benefits from reduced work absenteeism, decreased travel expenses and time, minimized conflicts with child or elder care responsibilities, enhanced privacy, and reduced exposure to potentially infectious individuals.^{29,30,31}
Minimise travelling of patients	Telehealth has the potential to significantly reduce the time required for medical appointments. Patients will no longer need to expend hours traveling to or waiting in a hospital. Instead, they will be able to schedule appointments online and access their consultations through a dedicated application. Moreover, healthcare can become more cost-effective than ever before. Patients can consult with physicians from the comfort of their own residences. This approach may also benefit individuals requiring urgent medical attention. Physicians who can access on-demand information necessitate the utilization of an internal database with pre-programmed queries. Rapid and efficient access can also be facilitated by various application programming interfaces and facilities.^{25,38,40}

Continued.

Healthcare sector	Implication of telemedicine in healthcare
Teledentistry	This technology enhances dental care, enabling practitioners to obtain photographic evidence of teeth, dentures, and other dental structures for evaluation and subsequent transfer to another practitioner for examination. The primary advantage of telemedicine in dentistry is the facilitation of record exchange among dental professionals and specialists to determine the necessity of specific treatments. Specialists may also assist dentists in identifying areas of concern and recommending preventive measures to patients to avert costly and complex procedures. Similar to other telemedicine applications, this collaborative approach benefits individuals in remote or underserved areas who may not typically have access to specialized dental care. ^{41,45,49}
Better service for clinician and patient	Telemedicine demonstrates rapid growth, offering numerous advantages to both clinicians and patients. The primary objective for any healthcare provider is to enhance patient services, which telemedicine systems can achieve while simultaneously enabling physicians to refine and improve their private practice. Consequently, the development of medical video conferencing applications in healthcare institutions is crucial for advancing medical care. The gap barrier is a recognized challenge in the healthcare sector's utilization of telemedicine technology. This is attributed to the global shortage of skilled healthcare providers. This deficiency of medical professionals can potentially be addressed through the implementation of this technology. ^{14,19,21}
Digital health monitoring	Telemedicine systems incorporating digital health monitoring capabilities, in conjunction with AI and machine learning, have potential to enhance diagnostic accuracy and treatment recommendations. Utilization of video conferencing tools and machine learning technologies in combination with individual patient case data, may facilitate refinement of algorithms to improve diagnostic precision for each patient. Telemedicine is defined as method of connecting physicians in 1 location with patients in another through use of networking devices. Applications for appointment scheduling, review processes, and photographic documentation offer an alternative to in-person consultations. This approach enables healthcare providers and patients to maintain safety during pandemics and expand medical services through digital means. ^{39,45}
Skincare	Patients can communicate with their dermatologist through telemedicine utilizing a smartphone, tablet, or computer. Dermatologists may evaluate patients presenting with psoriasis, decubitus ulcers, eczema, and other dermatological conditions using high-resolution photographs and video recordings. This modality is particularly beneficial for patients who are homebound. Dermatologists can effectively and reliably diagnose and treat cutaneous disorders using telemedicine technologies. Moreover, it not only eliminates the necessity for a patient to physically visit a healthcare facility but also allows them to maintain their privacy. Telemedicine facilitates more efficient communication between the physician and patient. Numerous healthcare providers have implemented electronic patient management systems. ^{18,29}
Track patient for medication	Telemedicine technology enables healthcare providers and personnel to monitor patients' medication adherence remotely. Physicians can now assess their patients' well-being over long distances utilizing advanced medical equipment. This technology facilitates the transmission of data, including pulse rhythm, blood pressure, glucose levels, and other vital signs, from one system to another. Given that older adults are more prone to medication non-adherence, telemedicine may offer a potential solution to address this issue. ^{27,30}
Secure patient from infectious disease	Telemedicine contributes to the enhancement of public health safety. For instance, patients experiencing influenza or upper respiratory infections can consult their healthcare providers without potentially transmitting pathogens in public spaces. When offering medical guidance and monitoring patient outcomes, healthcare professionals are effectively protected from exposure to infectious agents. This comprehensive solution incorporates robust network security measures and managed access rights protocols. Such measures can safeguard patient information transmitted via telemedicine platforms. Additionally, it serves as a mechanism to reduce the frequency of emergency department utilization. ^{17,28}
Cost-effective	Telemedicine represents a more cost-effective approach compared to conventional methods of healthcare administration. This assertion is supported by the fact that physicians and patients do not need to travel for each consultation. Moreover, video consultations are generally less expensive than in-person consultations, resulting in reduced expenditure on travel and hospital infrastructure. Additionally, the integration of online booking and video conferencing into healthcare solutions contributes to cost reduction. This approach is particularly beneficial in regions where patients may encounter difficulties accessing hospital-based medical care. ⁴⁰ Furthermore, telemedicine is expanding the boundaries of the medical industry. The field's research, scientific advancements, and growth are now more accessible. Through the utilization of video conferencing technology, the education and training of medical students have become more practical and realistic. ^{39,46}

Continued.

Healthcare sector	Implication of telemedicine in healthcare
Reduce face to face meeting	Telemedicine has several functional applications. In certain situations, face-to-face consultations are essential, which can be effectively facilitated through this technology. This offers distinct advantages that enhance the hospital's overall operational efficiency. Furthermore, telemedicine enables healthcare providers to monitor multiple patients simultaneously without leaving the hospital premises. Telemedicine facilitates remote appointments and supervision, which helps alleviate congestion in emergency departments and allows for the care of patients in more critical conditions. Hospitals can exchange medical information to provide care more expeditiously with the aid of telemedicine. Ultimately, it provides treatment for patients requiring supervision, contributing to a reduction in overall health risks. ^{41,47,48}

Table 4: Impact of telemedicine on patient outcomes.

Healthcare area	Telemedicine interventions	Observed outcomes	Supporting evidence
Stroke care	Telestroke consultations, remote imaging	Reduced time to thrombolysis, improved survival	AHA/ASA guidelines, clinical trials
Chronic disease care	Remote monitoring, teleconsultations	Better disease management, fewer hospitalizations	Systematic reviews, RCTS
Mental health	Telepsychiatry, counseling sessions	Improved access to care, reduced psychiatric symptoms	Clinical studies, patient surveys
Diabetes management	Continuous glucose monitoring	Improved glycemic control, fewer complications	Clinical trials, diabetes management programs
Dermatology	Teledermatology consultations	Timely diagnosis, early treatment	Dermatology journals, clinical case studies

Table 5: Telemedicine adaptation in nursing practice.

Nursing specialty	Telemedicine applications	Potential benefits	Notable challenges
Teledermatology	-Skin condition assessments	-Timely diagnosis -Involvement of healthcare and care partner teams	-Limited physical examination capability
Telecardiology	-ECG monitoring -Remote cardiac consultations	-Early detection -Reduced hospitalizations -Involvement of teams	-Limited physical assessments -Need for specialized equipment
Telepsychiatry	-Mental health counseling -Psychiatric assessments	-Improved access -Reduced travel	-Privacy and stigma concerns -Limited non-verbal cues
Teleoncology	-Cancer care consultations -Chemotherapy follow-ups	-Access to specialized care -Reduced travel	-Complex treatment discussions -Emotional support
Telesurgery nursing	-Surgical consultations -Preoperative assessments	-Expert opinions -Reduced surgical risks	-Limited hands-on assessments -Technical challenges during surgery
Tele-ICU nursing	-Intensive care monitoring -Vital sign monitoring	-Early intervention -Reduced mortality -Involvement of teams	-Data overload
Teletriage and emergency nursing	-Remote patient assessments -Symptom assessment	-Prioritized care -Reduced ED overcrowding -Involvement of teams	-Limited physical assessments
Telepharmacy nursing	-Medication management -Medication therapy management	-Medication adherence -Enhanced safety -Involvement of teams	-Limited hands-on medication administration -Lack of in-person medication review
Tele-home based health nursing	-Home-based patient care -Chronic disease management	-Patient comfort -Reduced hospitalizations	-Limited physical assessments -Technical challenges during visits

DISCUSSION

It gives more people access to the best healthcare and prevents geographical barriers and traveling time in pursuit of that care. It has ongoing guidance and counselling work, effectively extending patient welfare levels and protecting them from harm. Through telemedicine, remote patient monitoring makes it possible to reduce unnecessary emergency room transfers and excessive wear and tear on providers. Emergent idea driving discovery nursing professionals integrate new information and communication technologies into their practice while maintaining security measures. Nurses are able to deliver care from a distance thanks to telemedicine, providing an effective means how to monitor and help patients.⁴ Today nursing education and training efforts can look ahead to innovative ways of providing care by training nurses with ready access at our schools for recruiting the best teachers of generations ahead.¹⁰

The integration of telemedicine into nursing practice has already significantly transformed healthcare delivery, yet its full potential remains unrealized. As technological advancements progress and healthcare systems evolve, several key directions and recommendations can guide the future trajectory of telemedicine in nursing.⁸ Anticipated developments in telemedicine technology encompass enhancements to telehealth platforms, wearable devices, and remote monitoring tools, which will augment nurses' capabilities in remote patient assessment and care. Risk management constitutes a critical aspect of telenursing processes. Healthcare institutions are obligated to establish protocols for identifying, evaluating, and mitigating risks associated with digital device utilization, thereby ensuring patient safety, data security, and regulatory compliance. This necessitates nurse training, safety guideline development, and technological functionality supervision to minimize potential risks. Consequently, it is advisable for nurses to maintain awareness of technological innovations and be prepared to adapt to emerging tools and platforms. Furthermore, healthcare organizations should allocate resources to state-of-the-art telemedicine infrastructure to enhance nursing practice.¹⁵

Improving patient outcomes directly research has shown that telemedicine can reduce hospital readmission rates and improve medication compliance.⁷ It delivers timely and appropriate care which can help avert complications resulting from lack of treatment for medical conditions. Through this method there is helped to establish patient enthusiasm and satisfaction with its great access to medical information plus resources.

Notable weaknesses or drawbacks

Lack of standardized competencies and curricula across regions, hindering a unified approach to integrating telehealth in nursing education. The reliance on experiences and initiatives that is not yet widely implemented or tested, limiting the generalizability of

findings and recommendations. The potential for technological disparities to impact the effectiveness of telehealth and telemedicine, particularly in developing countries or under-resourced areas. Insufficient emphasis on the evaluation of long-term outcomes of telehealth education and practice changes on patient care and health systems.

CONCLUSION

Nurses' roles have evolved, necessitating enhanced training and digital skills integration. Telemedicine, particularly in managing oral anticoagulation, offers numerous benefits. Telehealth is becoming an integral part of healthcare delivery, ensuring equal access to care. Despite challenges in Europe, telehealth has shown advantages during the COVID-19 pandemic. Nurses play a crucial role in developing remote telemonitoring systems, but older adults face challenges in accessing telemedicine. Nursing competencies are essential for developing eHealth programs for healthy aging, and advanced nurse practitioners play a significant role in improving eHealth educational programs.

Recommendations

Transforming patient care delivery after the advent of telemedicine was that through making care available, timely intervention, patient education and promotion of adherence measures, a frightful situation was relaxed. The aggregation of these the development of telehealth competencies for nursing education and practice introduces a structured framework to guide curriculum development and future research in telehealth, addressing the gap in standardized competencies for advanced practice nursing.

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REFERENCES

1. Davydov G. Revolutionizing Healthcare Delivery: The Transformative Impact of Telemedicine in the Post-Pandemic Era. *J Int Med Graduates*. 2023;6(2):1-3.
2. Al Baalharith I, Al Sherim M, Almutairi SHG, Saleh A, Albaqami A. Telehealth and Transformation of Nursing Care in Saudi Arabia: A Systematic Review. *Int J Telemed Appl*. 2022;2022:8426095.
3. Elendu C, Emmanuel OE, Opashola KA, Afuh RN, Adebambo SA. The Role of Telemedicine in Improving Healthcare Outcome: A Review. *Adv Res*. 2023;24(5):55-9.
4. Adriana HH. Transforming Patient Outcomes Through Effective Nursing Clinical Handover. 2022.
5. Arbabi Z, Gholampour M, Zare-Kaseb A, Somayeh S, Ghazanfari JM. Tele-nursing: A novel opportunity to

- improve the quality of nursing care. *J Nurs Rep Clin Pract.* 2023;1(3):154-5.
6. Yahiya EA, Ali SR. Evaluation of Nurse-led patients education Using Telehealth and artificial intelligence on Selected Outcomes among Orthopedic Patients with Restricted Mobility. *Assiut Scient Nursing J.* 2023;11(37):14-21.
7. Villegas A. The Use of Telehealth to Improve Patient Outcomes Among Prediabetes and Diabetic Patients in a Rural Women's Health Clinic: An Evidence-Based Practice Project. University of San Diego. 2022.
8. Van Houwelingen CTM. Telehealth Competence in Nursing: Enhancing Skills and Practice in Providing Care Remotely. UMC Repository, Publisher: Utrecht University. 2018.
9. Sharlovyh Z. Digital transformation in the activities of a nursing specialist as an information and communication component of the development of their professional skills. *Visnik Žitomirskogo deržavnogo universitetu imeni ĭvana Franka.* 2022;4(111):262-72.
10. Arkandhi AJ, Harjaningsih W. Effectiveness of telemedicine use to improve patient outcome in cancer patients: A narrative review. *Pharmacy Educat.* 2022;22(2):248-53.
11. Elendu C, Egbunu EO. The Role of Telemedicine in Improving Healthcare Outcome: A Review. *Adv Res.* 2023;24(5):55-9.
12. Delana K, Deo S, Ramdas K, Subburaman GBB, Ravilla T. Multichannel Delivery in Healthcare: The Impact of Telemedicine Centers in Southern India. *Management Sci.* 2023;69(5):2568-86.
13. Cesar TC, Gohardarakshan N, Li Q, Tovar S, Chien GW. Impact of Healthcare System and Patient Factors on Telemedicine Adoption. *ResearchSquare.* 2023;1-17.
14. Al Maghlouth I, Almalag HM, AlZuhair HA, Bedaiwi A, Hassen LM, Alzomia S et al. Pos1584-hpr impact of telemedicine on disease activity assessment: a case-cross over nested within a cohort of systemic lupus erythematosus patients. *Ann Rheumat Dis.* 2023;82(1):1168.
15. Ayabakan S, Bardhan IR, Zheng Z. Impact of Telehealth and Process Virtualization on Healthcare Utilization. *Informat Systems Res.* 2024;35(1):45-65.
16. Rodriguez HP. Assessing the Impact of Telemedicine Implementation in Diverse Health Care Systems. *Med Care.* 2023;61(1):S1-3.
17. Caminiti C, Antonietta M, Paola A, Giulio D, Isa IM, Mosconi P, et al. Psychosocial Impact of Virtual Cancer Care through Technology: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. *Cancers.* 2023;15(7):2090.
18. Poreddi V, Veerabhadraiah BK, Reddy S, Manjunatha N, Channaveerachari N, Math BS. Nursing Interns' Perceptions of Telenursing: Implications for Nursing Education. *Telehealth Med Today;* 2021:6(2).
19. Khoong EC, Sharma AE, Gupta K, Adler-Milstein J, Sarkar U. The Abrupt Expansion of Ambulatory Telemedicine: Implications for Patient Safety. *J General Int Med.* 2022;37(5):1270-4.
20. Herbert K. Patient Satisfaction with Telemedicine, a Review Article. *ResearchGate.* 2022.
21. Khairatun U, Irianto H, Ghazali I, Amri MM. Telemedicine and COVID-19 Pandemic: Valuable Lessons for Future Implementations. *J Novel Engineering Sci Technol.* 2022;1(02):63-8.
22. Paulson MR, Torres-Guzman RA, Avila FR, Maita KC, Forte AJ, Butera JE, et al. Telemedicine allows for effective communication between a medically complex cancer patient and his virtual hospital medical team. *Clin Case Rep.* 2022;10(10):e6456.
23. Chatterjee A, Andreas P, Michael AR, Das J. The Conceptualization and Implementation of a Patient Monitoring System Based on the Internet of Things for Use in Telemedicine. *BMC Health Serv Res.* 2023;23(1):1047.
24. Goldman JG, Merkitich D, Brewington D, Peirce H, Rho M, Jayabalan P, et al. Patient experiences receiving rehabilitation care via telehealth: Identifying opportunities for remote care. *Front Rehabil Sci.* 2023;4:1049554.
25. Lazárová M, Hlavinka A, Šulc P, Dodulík J, Václavík J. Use of telemedicine in patients with heart failure. *Vnitřní lékařství.* 2022;68(3):154-8.
26. Ghilencea L, Chiru M, Stolcova M, Spiridon G, Maria L, Ana M, et al. Telemedicine: Benefits for Cardiovascular Patients in the COVID-19 Era. *Front Cardiovascular Med.* 2022;9:868635.
27. Goldklang M, Wells MJ, D'Armiento J. Telemedicine for Patients with Chronic Pulmonary Diseases in the COVID-19 Era and Beyond. *Ann Am Thorac Soc.* 2022;19(9):1448-50.
28. Ploog NJ, Coffey JD, Wilshusen LL, Demaerschalk BM. Outpatient visit modality and parallel patient satisfaction: A multi-site cohort analysis of telemedicine and in-person visits during the COVID-19 pandemic. *Patient Experience J.* 2022;9(3):93-101.
29. Anitha KK, Sharma A, Subitsha T, Muhil VS, Apoorva D. Applications of Internet of Things in Telemedicine in Emerging Computational Approaches in Telehealth and Telemedicine: A Look at The Post-COVID-19 Landscape vol 1, Bentham books. 2022;1-25.
30. Hollien AH, Avey MC, Winkelmann ZK. Clinical Implications of Telemedicine for Post-Surgical Care: An Evidence-to-Practice Review. *Clin Pract Athl Train.* 2022;5(1):69-74.
31. Seliverstov PV, Bakaeva SR, Valentin VV, Aleshko OV. Telemedical technologies: from theory to practice. *Med Council.* 2022;(23):366-72.
32. Hezer B, Massey EK, Reinders MEJ, Tielen M, Van de Wetering J, Hesselink DA, et al. Telemedicine for Kidney Transplant Recipients: Current State, Advantages, and Barriers. *Transplantation.* 2023;108(2):409-20.
33. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020

- statement: An updated guideline for reporting systematic reviews. *BMJ.* 2021;372:n71.
34. UNC-Chapel Hill Libraries. Available at: <https://library.unc.edu/>. Accessed on 30 January 2025.
 35. Long AF, Godfrey M. An evaluation tool to assess the quality of qualitative research studies. *Int J Social Res Methodol.* 2007;7(1):181-96.
 36. Haddaway NR, Page MJ, Pritchard CC, McGuinness LA. PRISMA2020: An R package and Shiny app for producing PRISMA 2020-compliant flow diagrams, with interactivity for optimised digital transparency and Open Synthesis. *Campbell Systematic Rev.* 2022;18(2):e1230.
 37. Kruse CS, Molina-Nava A, Kapoor Y, Anerobi C, Maddukuri H. Analyzing the Effect of Telemedicine on Domains of Quality Through Facilitators and Barriers to Adoption: Systematic Review. *J Med Internet Res.* 2022;25:e43601.
 38. Burgess C. Assessing the Impact of Telemedicine Implementation in Diverse Health Care Systems. *Med Care.* 2023;61(1):S1-3.
 39. Tabibzadeh M, Tran H. Improving Quality of Care and Patient Safety in Virtual Visits: Investigating Barriers of Telehealth Implementation. *Proceedings of the Human Factors and Ergonomics Society. Ann Meeting.* 2022;66(1):1564-8.
 40. Cosma A, Zamfir A. The Implementation of Telemedicine Increases the Quality of Medical Services. *BASIQ 2023 International Conference on New Trends in Sustainable Business and Consumption.* 2023;369-379.
 41. Shu J, Xia Q, Zhou D. Efficacy evaluation of telemedicine-based biopsychosocial model: a retrospective study in central China. *Int J Neuropsychopharmacol.* 2022;25(1):A8.
 42. Ghilencea L, Chiru M, Stolcova M, Spiridon G, Maria L, Ana M, et al. Telemedicine: Benefits for Cardiovascular Patients in the COVID-19 Era. *Front Cardiovascular Med.* 2022;9:868635.
 43. Frick MA, Baniel C, Bagshaw HP. The Impact of Telemedicine on Indirect Patient Costs in an Outpatient Radiation Oncology Department. *Int J Radiation Oncol Biol Physics.* 2022;114(3):e344.
 44. Shih YH, Wang JY, Chou PH, Lin KH. The effects of treatment via telemedicine interventions for patients with depression on depressive symptoms and quality of life: a systematic review and meta-analysis. *Ann Med.* 2023;55(1):1092-101.
 45. Knaepen L, Falter M, Scherrenberg M, Dendale P, Desteghe L, Heidbuchel H. Assessment of functionalities and attitude toward telemedicine for patients with cardiovascular disease. *Digital Heal.* 2023;9:20552076231176941.
 46. Haimi M. The tragic paradoxical effect of telemedicine on healthcare disparities a time for redemption: a narrative review. *BMC Med Informat Decision Making.* 2023;23(1):95.
 47. Multichannel Delivery in Healthcare: The Impact of Telemedicine Centers in Southern India. *Management Sci.* 2023;69(5):1-32.
 48. Szymczak JE, Fiks AG, Craig S, Mendez DD, Ray KN. Access to What for Whom? How Care Delivery Innovations Impact Health Equity. *J General Internal Med.* 2023;38(5):1282-7.
 49. Harper K, Hanson C, Eoff B, Riebau D, Charles D. Teleneurology via tablet technology: an effective low-cost method to increase healthcare accessibility. *Rural Remote Health.* 2023;23(1):7591.
 50. Forti C, Rosato WA, Cassano N, Vena GA, Fanigliulo G, Ambrogio F, et al. Usefulness of telemedicine with digitized grid reconstruction to improve the value of photo assessment in late patch test readings. *Contact Dermatitis.* 2023;89(4):292-4.

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