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Digital health and community nursing: Opportunities, challenges and implications for primary health care

Rajender Prasad Bhawaria[1], Varsha Arora[2], Sushil Kumar Rundla[3], Naveen Andrews[4]
[1] Principal, Symbiosis Institute of Nursing, Jaipur, Rajasthan, India
[2] Vice Principal, Symbiosis Institute of Nursing, Jaipur, Rajasthan, India
[3] Associate Professor, Symbiosis Institute of Nursing, Jaipur, Rajasthan, India
[4] Assistant Professor, Symbiosis Institute of Nursing, Jaipur, Rajasthan, India
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Abstract
The growing use of digital technologies is transforming the way primary health-care services are planned, delivered and monitored, with important implications for community nursing. Tools such as tele-health, mobile health platforms, electronic health records, remote monitoring systems, digital education and artificial intelligence are providing new ways for community nurses to connect with patients and support care beyond conventional health-care settings. This paper critically examines the opportunities, challenges and implications associated with the integration of digital health into community nursing and primary health care. It explores the contribution of digital technologies to health assessment, preventive care, patient education, disease monitoring, follow-up, health communication and coordination of services. These technologies can help overcome geographical barriers, improve continuity of care and encourage patients to participate more actively in managing their health. At the same time, their implementation presents several concerns, including unequal access to digital resources, inadequate digital literacy, poor technological infrastructure, unreliable connectivity, data privacy and cyber security risks, interoperability difficulties and limited training opportunities for nurses. Issues surrounding confidentiality, informed consent, equitable access and the responsible use of artificial intelligence further highlight the need for appropriate ethical and professional safeguards. The paper emphasises that community nurses require relevant digital competencies and institutional support to use technology safely and effectively. Digital health should complement, rather than replace, interpersonal relationships and direct nursing care. A patient-centred, inclusive and ethically responsible approach can enable digital health to strengthen the accessibility, quality, continuity and responsiveness of community nursing and primary health-care services.

Keywords: Digital health, community nursing, primary health care, tele-health, digital health technologies

Introduction

Digital health is becoming an important part of health-care delivery and is changing the way primary health-care services are provided to individuals and communities. It refers to the use of digital technologies to support health promotion, disease prevention, diagnosis, treatment, monitoring, follow-up and health education. Common examples include tele-health, mobile health applications, electronic health records, remote patient monitoring, digital communication systems and artificial intelligence. [1] These technologies can help health professionals share information, communicate with patients and provide services beyond traditional health-care facilities. The World Health Organization (WHO) has recognised digital health as an important approach for strengthening health systems and improving access to quality health services. The WHO Global Strategy on Digital Health, initially developed for 2020–2025, has been extended to 2027, showing the continued importance of digital transformation in health care. [2]

Digital health is closely connected with the development of strong primary health care (PHC). Primary health care aims to provide essential health services as close as possible to people's homes and communities. It includes health promotion, prevention, treatment, rehabilitation and palliative care. Easy access, continuity of care, coordination between services and patient-centred care are important features of effective primary health care. However, many people around the world still experience difficulties in obtaining essential health services. WHO has reported that about 4.5 billion people were not fully covered by essential health services, while approximately 1.9 billion people experienced financial difficulties related to health-care expenses? [3] These figures show the need for approaches that can improve access to services and make health-care delivery more efficient and continuous.

Digital technologies can help address some of these difficulties by improving communication between patients, nurses, community health workers, doctors and other health professionals. For example, tele-consultation can allow patients to communicate with health professionals without travelling long distances. Electronic health records can make important patient information easier to access and share; while remote monitoring can help health, workers follow patients who need regular observation. Mobile phones and digital platforms can also be used for health education, reminders, follow-up and self-care support. [4] The WHO Digital Transformation Handbook for Primary Health Care, published in 2024, highlights the importance of people-centred and connected digital systems and recognises the role of health workers in their successful implementation. [5]

Community nurses have a direct and continuous relationship with individuals, families and communities, which make them important participants in digital health services. Their responsibilities may include health assessment, health

education, disease prevention, screening, maternal and child health care, chronic disease management, follow-up and community health surveillance. Digital tools can assist nurses in carrying out these activities more effectively. Nurses can use digital systems to record patient information, communicate with other health professionals, provide health information and monitor patients who require regular follow-up. [6] They may also help patients understand and use digital health services. Therefore, community nurses need sufficient digital knowledge and skills to use these technologies safely and appropriately. The WHO Global Strategic Directions for Nursing and Midwifery also recognises the important contribution of nurses and midwives to universal health coverage and population health.

India has taken several steps towards integrating digital technology into its health-care system. One major initiative is the Ayushman Bharat Digital Mission (ABDM), which aims to develop a connected digital health system in the country. Important components include the Ayushman Bharat Health Account (ABHA), Health Facility Registry and Healthcare Professionals Registry. The mission also supports the secure and consent-based exchange of health information. [7] These systems can help individuals maintain and access their health information while supporting better coordination between different levels of health care.

Another important programme is eSanjeevani, the national telemedicine service of the Government of India. It provides tele-consultation through different models, including services that connect patients at primary health-care facilities with doctors and specialists. It also allows patients to access consultations remotely. [8] This approach is particularly useful for communities where specialist services may not be easily available. Through telemedicine, patients can receive professional advice without always having to travel to distant hospitals or specialist centres.

The Ayushman Arogya Mandir (AAM) programme is another important part of India's primary health-care system. These centres are intended to provide a broader range of primary health-care services closer to local communities. By the end of December 2024, 1,75,560 Ayushman Arogya Mandirs were reported to be operational. During the same period, 31.86 crore teleconsultations had been accessed through eSanjeevani. Community Health Officers and other frontline health workers play an important role in delivering services at the community level. [9] This creates opportunities for digital tools to become part of routine community-based health services.

The role of digital health can be particularly valuable in rural, remote and underserved areas. People living in such locations may face problems related to long distances, transportation, limited health facilities, shortages of health professionals and reduced access to specialist care. Tele-health and mobile-based services can help reduce some of these barriers by connecting communities with health professionals. Digital communication can also support regular follow-up and health education. However, digital technology cannot by itself remove all inequalities in health care. Poor internet connectivity, lack of smartphones or other devices, limited digital literacy, language differences, financial difficulties and concerns about privacy may prevent some people from using digital services. [10] Therefore, digital health programmes need to consider the specific needs and circumstances of different communities.

Privacy, patient safety and professional responsibility are also important when digital technologies are used in health care. India's Telemedicine Practice Guidelines provide a framework for conducting tele-consultations and emphasise important aspects such as identifying the patient and health professional, obtaining appropriate consent, selecting a suitable communication method, assessing the patient and making appropriate management or referral decisions. For community nursing, these principles are important because digital consultation should not be treated as a replacement for physical assessment when an in-person examination is necessary. Nurses must recognise situations that require referral or direct clinical assessment.

Digital Health Applications and Opportunities in Community Nursing

The use of digital technology is changing the way community nursing services can be delivered. Earlier, most community-based nursing activities depended on face-to-face visits and paper-based records. Today, nurses can use digital platforms to communicate with patients, record health information, provide education, support follow-up and coordinate care with other health professionals. These technologies are especially useful when patients have difficulty reaching health facilities or require regular contact with health workers. Important areas of digital health in community nursing include tele-health, mobile health, electronic records, remote monitoring, digital education, health surveillance and digital decision-support systems.

Tele-health and Tele-consultation have become useful methods for extending health services to people outside hospitals and health centres. Community nurses can communicate with patients through telephone calls, video consultations and other digital platforms. These services may be used for follow-up, health advice, medication-related guidance, health education and monitoring of patients whose condition is stable. Tele-consultation can be particularly helpful in villages and remote areas where specialist services may not be readily available. In India, eSanjeevani has expanded the use of telemedicine by linking patients and health facilities with doctors and specialists. Community nurses and other health workers can assist patients in accessing these services, explain the process and help ensure that relevant information reaches the appropriate health professional. [11]

Mobile Health or mHealth is another practical application for community nursing. Mobile phones can be used to send health information, reminders and follow-up messages to patients. Community nurses may use mobile-based communication to provide information about immunisation, nutrition, personal hygiene, maternal and child health, chronic disease care and healthy lifestyles. Reminders can also support medication adherence and scheduled appointments. Regular communication through mobile devices may help nurses remain connected with patients between physical visits. However, the usefulness of mHealth depends on access to devices, connectivity, digital literacy and the patient's ability to understand the information provided. [12]

Electronic Health Records and Digital Documentation can make the recording and management of patient information more organised. Community nurses may need to document health assessments, medications, previous

consultations, referrals, follow-up findings and patient responses to care. When this information is entered into a secure digital system, it can be accessed by authorised health professionals when needed. This may improve communication and reduce the loss of important information during referrals or changes in care providers. India's Ayushman Bharat Digital Mission (ABDM) is an important initiative in this area. [13] Through components such as ABHA and health-related registries, the programme aims to support a more connected digital health system and facilitate appropriate exchange of health information.

Remote Patient Monitoring can be useful for individuals who require regular observation, particularly those living with chronic health conditions. Depending on the clinical requirement, digital devices may record blood pressure, blood glucose, body weight, oxygen saturation and other health measurements. Community nurses can review the information available to them and identify situations that may require further assessment or referral. [14] Remote monitoring can reduce the need for some unnecessary visits and may support continued observation of patients at home. Nevertheless, digital readings should never be considered in isolation. Nurses need to relate measurements to the patient's symptoms, medical history and overall condition before deciding on further action.

Digital Health Education and Counselling can increase the reach of health education provided by community nurses. Educational videos, mobile messages, online resources and other digital materials can be used to explain topics such as nutrition, sanitation, physical activity, disease prevention, medication use, maternal care and child health. Digital resources may also encourage patients to take greater responsibility for appropriate self-care. For example, people living with diabetes or hypertension can receive regular guidance about medicines, diet, and physical activity, monitoring and follow-up. To be effective, digital health education should use clear language and should take account of the patient's age, education, language, culture and level of digital understanding. [15]

Digital systems can also strengthen community health surveillance. Health workers can use digital platforms to record and report information related to communicable diseases, immunisation, maternal and child health and other community health indicators. When information is collected and reported in a timely manner, health teams may be able to recognise unusual patterns and respond more quickly. Community nurses can contribute to this process by collecting reliable information, maintaining accurate records and communicating important changes to the appropriate health-care team. Digital surveillance can therefore support both routine community health management and early response to emerging health concerns. [16]

The development of artificial intelligence (AI) and digital decision-support systems is creating another area of opportunity. AI-based tools can assist with analysing large amounts of information, identifying possible risks, providing reminders and supporting selected clinical decisions. In community nursing, such systems may help identify patients who need closer monitoring or follow-up. However, technology should not replace professional nursing judgement. A nurse must consider the patient's symptoms, family situation, social conditions, treatment history and personal needs before making a care decision. AI should therefore be used as an additional support rather than as an independent decision-maker. [17]

Digital health can further improve communication, referral and continuity of care. Community nurses often coordinate with doctors, primary health centres, hospitals, specialists, community health workers and family members. Digital communication can make this coordination faster and can support the transfer of relevant patient information. This is particularly important for patients who move between community services, primary-care facilities and hospitals. Proper digital documentation can help ensure that important information about treatment, follow-up and referral is not lost during this transition. Older adults, patients with chronic diseases, pregnant women and individuals requiring long-term care may particularly benefit from coordinated follow-up. [18]

Another major opportunity is the use of digitalhealth to reach rural, remote and underserved communities. People living in such areas may experience long travel distances, transportation difficulties, limited health facilities or shortages of specialist services. Tele-health and mobile communication can help bring selected health services and professional advice closer to these communities. Community nurses can play a central role in helping patients use these services. They can explain how digital consultations work, assist people who have limited digital skills and identify patients who need additional support. In this way, nurses can help reduce some of the barriers between communities and health-care services.

Digital technology may also contribute to greater efficiency in community nursing practice. Electronic records, digital reminders and organised patient information can make some administrative and follow-up activities easier. Nurses may be able to communicate with other health professionals without arranging a face-to-face meeting for every issue. This can save time and support better coordination of care. However, digital systems do not always reduce workload. Complicated software, repeated data entry and poorly designed documentation systems can increase the burden on nurses. Therefore, digital tools should be selected and implemented according to the practical needs of nurses and communities.

Implications for Community Nursing Practice and Primary Health Care

The growing use of digital technology is bringing changes to community nursing practice. Nurses are increasingly using digital systems for assessment, documentation, health education, communication, follow-up and coordination of patient care. This change is not limited to learning how to operate computers, mobile applications or other devices. Nurses also need to develop new professional skills and understand when technology is useful and when direct care is necessary. The main aim should be to use digital tools in a way that improves patient care while maintaining safety, professional responsibility and personal contact.

One of the first requirements is to improve the digital skills of community nurses. Nurses should be familiar with electronic health records, tele-consultation services, mobile health applications and other digital tools used in their workplace. They also need basic knowledge about confidentiality, data security, safe handling of patient information and responsible use of technology. [19] These skills should be introduced during nursing education and

strengthened through regular in-service training. Practical training is particularly important because nurses need to use these systems confidently during real community situations.

Digital technology can also influence patient assessment and nursing decisions. Nurses may receive information from electronic records, teleconsultations, mobile applications or monitoring devices. Such information can be useful, but it cannot provide the complete picture of a patient's health. For example, an abnormal digital reading should be considered along with the patient's symptoms, previous health problems and current condition. If a patient requires a physical examination, emergency care or specialist assessment, the nurse should arrange appropriate referral. [20] Thus, technology should assist nursing judgement rather than replace it.

The growth of digital services also creates opportunities for nurse-supported tele-health and remote care. Community nurses can help patients connect with doctors or specialists through tele-consultation platforms. They can also provide health advice, follow up with patients and communicate important information to other members of the health-care team. [21] This can be particularly helpful for people living in remote areas and for patients who require regular follow-up. Nurses can therefore act as an important link between the patient, family, community health services and higher levels of care.

Digital systems can improve continuity and coordination of primary health care when patient information is recorded accurately and made available to authorised health professionals. Community nurses may need information about previous treatment, medicines, investigations, referrals and follow-up. Easy access to relevant information can support better coordination when a patient moves from home care to a primary health centre or hospital. [22] This is especially useful for people with chronic illnesses who may require long-term and regular care from different health professionals.

Another important area is health education and patient involvement. Community nurses can use mobile phones, digital messages, educational videos and online platforms to provide information about nutrition, exercise, medication use, immunisation, maternal and child health and disease prevention. Digital resources may also encourage patients to take an active role in their own health. However, nurses should not assume that every patient can understand digital information in the same way. Information should be provided in simple language and should be appropriate to the person's age, education, language, culture and level of digital literacy. [23]

Digital technology can also support preventive and community-based nursing activities. Electronic information systems may help identify people who require screening, vaccination, follow-up or other preventive services. Digital reporting can support the monitoring of communicable diseases and other community health conditions. When information is collected and communicated on time, health teams may be able to recognise health problems earlier and take suitable action. [24] This can strengthen the preventive role of community nursing and support early intervention.

However, digital health must be introduced with attention to health equity and digital inclusion. Technology may improve access for some people while creating difficulties for others. People without smartphones, reliable internet access or adequate digital knowledge may find it difficult to use online health services. Older adults, people with disabilities, economically disadvantaged families and individuals who face language barriers may need additional support. Community nurses can help identify these problems and provide guidance or alternative ways of receiving care. Digital health should not result in people being excluded simply because they cannot use technology. [25]

Patient privacy and confidentiality are also major concerns in digital nursing practice. Community nurses handle personal information, medical records and other sensitive data. Such information should be collected, stored and shared only through appropriate and authorised systems. Patients should be informed about the use of their health information whenever consent is required. Nurses also need to be aware of risks such as accidental disclosure, incorrect data entry, unauthorised access and inappropriate sharing of information. Safe handling of digital information should therefore be considered part of professional nursing responsibility. [26]

The introduction of technology can also affect nursing workload and working conditions. A well-designed digital system can make documentation, communication and follow-up easier. In contrast, complicated software, repeated data entry or technical failures can increase the workload of nurses. Health-care organisations should therefore involve nurses when selecting and introducing new digital systems. Adequate training, technical assistance, staffing and sufficient time for adjustment are necessary. Digital technology should be introduced because it addresses a real health-care need and improves practice, not simply because it is a new technology. [27]

Digital health should also be connected with existing primary health-care programmes and services. In India, initiatives such as the Ayushman Bharat Digital Mission (ABDM), eSanjeevani and Ayushman Arogya Mandirs provide opportunities to combine digital services with community-based and primary health care. Community nurses and other frontline workers can support these initiatives through patient education, digital assistance, documentation, follow-up and referral. Strong cooperation between health departments, health facilities, nurses, technology providers and local communities is needed for these services to work effectively. [28]

There are important educational and policy implications as well. Nursing education should provide students with practical knowledge of tele-health, electronic records, digital communication and health information systems. Students should also learn about privacy, consent, cyber-security and ethical issues associated with digital technologies. Health authorities need clear guidelines covering digital nursing practice, teleconsultation, professional accountability, patient data protection and the appropriate use of artificial intelligence. Policies should also address the needs of rural and disadvantaged communities so that digital health contributes to greater equality rather than increasing existing gaps.

Challenges, Barriers and Ethical Issues in Digital Community Nursing

Digital health has expanded the possibilities of community nursing by making communication, consultation, monitoring and follow-up easier in many situations. However, the use of digital technology also creates several difficulties. Not

every patient has equal access to smartphones, internet services or digital platforms, and some community nurses may also have limited experience with new technologies. Concerns related to privacy, cyber security, informed consent, workload and professional responsibility are also important. Therefore, digital health should be implemented carefully so that technological development does not compromise patient safety, privacy or the human aspects of nursing care.

Digital Divide and Unequal Access

Unequal access to technology is one of the important challenges in digital community nursing. People living in rural, remote or economically disadvantaged communities may not have smartphones, computers or dependable internet connections. Older people and individuals with disabilities may also require additional support to use digital services. Limited knowledge of digital technology can make it difficult for patients to access online consultations, use health applications or understand digital health information. Differences in language and local culture can create additional difficulties. Without proper support, digital health may benefit some groups more than others and may widen existing differences in access to health care.

Infrastructure and Connectivity Problems

Effective digital nursing services require dependable technological facilities. Poor internet networks, electricity interruptions, limited mobile coverage and a shortage of suitable devices can interfere with teleconsultations and remote monitoring. Such difficulties can be particularly serious in rural and underserved areas. Technical problems may delay communication between patients, nurses and other health professionals. Healthcare facilities therefore need suitable hardware, software, secure networks and technical assistance to maintain reliable digital services.

Limited Digital Knowledge and Training

Community nurses require adequate training to use digital health technologies correctly and safely. Their work may involve electronic health records, tele-consultation systems, mobile health applications, remote monitoring equipment and digital communication tools. When nurses do not receive sufficient training, they may experience difficulty in using these systems or may make mistakes while recording and sharing patient information. Digital skills should therefore be included in nursing education and strengthened through regular professional training and practical support.

Patient Privacy and Confidentiality

Protecting patient information is an important ethical responsibility in digital community nursing. Digital records and online consultations involve personal and health-related information that may be stored and transferred electronically. Inadequate protection can result in information being accessed by people who are not authorised to see it. Nurses must therefore use digital systems responsibly and maintain patient confidentiality. Patients should also receive clear information about what data are being collected, why they are needed and how they may be used or shared.

Informed Consent

Consent remains an essential part of ethical nursing care when digital technologies are used. Before a digital consultation or health service is provided, patients should be able to understand the purpose of the service, the type of information involved and the limitations of receiving care through digital communication. Consent should be freely given and based on adequate understanding. Participation in an online consultation should not automatically be considered complete consent for every form of data collection or use. Additional assistance may be necessary for older people and patients who have limited digital or health literacy.

Cyber security and Data Protection

The growing use of electronic health systems also increases the risk of cyber security problems. Unauthorised access, data theft, loss of information and unsafe use of digital devices can threaten patient confidentiality. Weak passwords, unsecured networks and careless sharing of information can increase these risks. Community nurses should follow safe practices when using digital systems, while healthcare organisations should provide secure infrastructure, access controls, regular security checks and appropriate staff training.

Accuracy and Reliability of Digital Information

The quality of digital healthcare depends partly on the accuracy of the information entered into electronic systems. Incorrect, incomplete or outdate records can influence clinical decisions and may affect patient safety. Nurses should therefore enter information carefully and keep patient records updated. Data received from mobile applications, wearable devices or remote monitoring systems should also be assessed in relation to the patient's overall condition. Digital readings should support clinical assessment rather than completely replace professional judgement.

Ethical Issues Related to Artificial Intelligence

Artificial intelligence is increasingly being used to support health assessment, risk identification and clinical decision-making. Although these systems may assist nurses, they can sometimes provide inaccurate or biased results. This may happen when the data used to develop an AI system do not adequately represent different populations or health conditions. Nurses should therefore treat AI-generated recommendations as supportive information rather than as a substitute for professional judgement. There should also be clear responsibility and accountability when an AI-supported recommendation contributes to an inappropriate clinical decision.

Increased Workload and Professional Responsibility

Digital technology does not necessarily reduce the responsibilities of community nurses. Nurses may have to maintain electronic records, conduct teleconsultations, respond to digital messages, monitor patients remotely and continue their routine community-based activities. When digital systems are poorly organised, these additional tasks can increase workload and stress. Healthcare organisations should establish clear procedures regarding documentation, communication, working responsibilities and responses to urgent digital health concerns.

Reduced Face-to-Face Interaction

Personal interaction is an important part of community nursing because nurses often need to understand the

patient's family situation, behaviour, emotional state and social environment. Excessive reliance on digital communication may reduce opportunities for direct observation and personal interaction. Some health problems may also be difficult to identify through a telephone or video consultation alone. Digital services should therefore be used alongside appropriate face-to-face care. Nurses should determine when digital consultation is suitable and when a physical assessment or home visit is necessary.

Legal and Professional Challenges

Digital nursing also raises issues related to professional accountability, documentation, patient safety and clinical responsibility. Nurses must work within their professional scope and follow relevant laws, guidelines and institutional procedures. Digital healthcare requires clear standards regarding how patient information is handled, how consultations are documented and who is responsible for clinical decisions. Appropriate professional guidance is important to protect patients while also supporting nurses in their digital practice.

Importance of an Inclusive and Ethical Approach

The challenges associated with digital community nursing demonstrate that technology alone cannot improve primary health care. Digital services should be developed according to the needs and abilities of different patient groups. Reliable infrastructure, digital training, accessible platforms, privacy safeguards and technical assistance are necessary for effective implementation. Community nurses can contribute by identifying patients who face difficulties in accessing digital services and by helping they develop the confidence and skills required to use these services.

Conclusion

Digital health is increasingly becoming part of community nursing and primary health care. The use of tele-health, mobile health applications, electronic health records, remote monitoring and digital communication has created new ways for nurses to provide and coordinate care. These technologies can help patients receive health information, follow-up services and nursing support without always needing to visit a health facility. They can also assist nurses in identifying health concerns at an early stage, maintaining communication with patients and supporting continuous care. When used appropriately, digital health can therefore contribute to better nursing outcomes and more timely healthcare delivery.

However, the benefits of digital health are influenced by several practical challenges. Poor internet connectivity, limited access to digital devices, inadequate digital knowledge and insufficient training may prevent patients and nurses from using digital services effectively. Differences in socioeconomic conditions, age, disability and language can further affect access. In addition, issues related to patient privacy, data security, informed consent and the use of artificial intelligence require careful attention. If these concerns are ignored, digital healthcare may create risks for patient safety, trust and satisfaction rather than improving the quality of care.

Digital technologies can support important nursing outcomes when they are properly integrated into practice. Regular online follow-up can help maintain continuity of care and treatment adherence, while remote monitoring may help nurses recognise changes in a patient's health condition at an earlier stage. Digital health education can strengthen patient knowledge, self-care and involvement in healthcare decisions. Accurate electronic documentation and faster communication can improve coordination among healthcare professionals and contribute to patient safety. Tele-health can also make nursing support more accessible to patients who have difficulty travelling to healthcare facilities.

Despite these advantages, technology cannot replace the professional role of the community nurse. Effective nursing care requires an understanding of the patient's physical condition as well as psychological, social and family circumstances. Information obtained through digital systems should therefore be considered together with clinical judgement and, when necessary, direct assessment. Patients should be referred for face-to-face care when their condition cannot be adequately assessed or managed through digital communication.

For digital community nursing to achieve better outcomes, nurses need appropriate knowledge and digital competencies. Education and training in electronic documentation, tele-health, remote monitoring, data protection, digital communication and ethical practice can improve the safe use of technology. Healthcare organisations also need to provide reliable infrastructure, technical assistance, clear procedures and adequate staffing. Such support can help nurses use digital systems effectively without creating excessive workload or reducing the quality of patient care.

Digital community nursing can positively influence access to healthcare, patient safety, treatment adherence, self-care, and early identification of health problems, continuity of care, communication and patient satisfaction. However, these outcomes depend on the responsible and appropriate use of technology. Digital services must be accessible, secure, and ethical and supported by competent nursing professionals. Therefore, digital health should be considered a means of strengthening nursing practice rather than replacing human care. A patient-centred and community-focused approach can ensure that digital innovation contributes to safer, more equitable and higher-quality primary health care.

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