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The benefits and challenges of the use of digital technology on clinical learning of undergraduate nursing students during the COVID-19 pandemic: An integrative literature review

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Abstract

The purpose of this study was to compile research on the advantages and challenges of using digital technology in clinical education for undergraduate nursing students during the COVID-19 pandemic. The study employed an integrative literature review with the use of the five steps as per Cooper's framework. Data were collected from four electronic databases to access research articles published from 2019 to 2023. Out of 440 potential candidates, eighteen satisfied the inclusion criteria. Three themes emerged from the analysis namely: 1) the benefits 2) the challenges of digital technology and 3) attitudes towards the use of technology in clinical learning. The use of digital technology helps nursing students become more competent and confident in their ability to practice in a friendly environment. It is imperative that there should be opportunities for workshops to create awareness regarding the importance of digital technology. The practical implications of the study are that nursing education institutions should invest in the purchase of digital technology equipment as a means of advancing the implementation of new educational advancements. The stakeholders in clinical teaching and learning should be better equipped by health facilities and nursing education institutions to make better use of digital technologies.

Keywords: Clinical learning, COVID-19 pandemic, Digital technology, Integrated review, Undergraduate nursing student.

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Contents

Contribution of this paper to the literature
This study synthesized the existing literature on the benefits and challenges of digital technology use in clinical teaching and learning among undergraduate nursing students in the era of the COVID-19 pandemic. The results of this study can also be useful to other professions.

1. Introduction

Face-to-face interactions among all stakeholders were used to conduct clinical learning, teaching and assessment activities for student nurses (Kumar et al., 2021). The 2019 pandemic which was brought on by the Sars-Cov-2 virus which was identified in China made an abrupt shift. This is the etiological agent of COVID-19, an extremely contagious virus with an incubation period ranging from 2 to 14 days (World Health Organization, 2020). According to Huang et al. (2020), the virus spreads mostly through close contact and respiratory droplets and is indicated by a high body temperature and intense fatigue. The consequences of COVID-19 include severe lung inflammation, septicemia and organ failure (Huang et al., 2020). The World Health Organisation (WHO) declared the COVID-19 virus a global public health emergency in January 2020 due to its rapid global expansion (World Health Organization, 2020). Several strategies such as social distancing were instigated to restrict further transmission (World Health Organization, 2020). As a result, face-to-face instruction, learning and assessment ceased instantly (Bryan, Corcoran, Dewart, Thirsk, & Bowers, 2022). Many institutions and colleges have to use virtual modalities for teaching and learning in order to meet COVID-19 prevention standards (Agu, Stewart, McFarlane-Stewart, & Rae, 2021). The president of South Africa declared a national state of emergency on March 15, 2020 following multiple reports of an increasing number of COVID-19 cases around the country (South African National Department of Health, 2020). COVID-19 affected livelihoods as well as the education sector (Giovannella, 2021).The teaching and learning of the nursing students were incredibly disturbed by the restrictions. In addition, there were a lot of uncertainties regarding the likelihood of being infected by COVID-19 and the challenges of distance education (Zendrato & Hiko, 2021).

2. Literature Review

Nursing students must complete the requisite number of clinical hours and gain the necessary skills during their clinical placement (Jamshidi, Molazem, Sharif, Torabizadeh, & Kalyani, 2016). Clinical hours are therefore acquired in a health care setting where learning, teaching and assessment take place by caring for patients (Jamshidi et al., 2016; Mbakaya et al., 2020). Clinical placement is an essential component of the pre-registration nursing students' curriculum as it provides nursing students with clinical learning opportunities (Motsaanaka, Makhene, & Ally, 2020). According to Visiers-Jiménez et al. (2021), the development of competency is essential for nursing students. Nursing students can develop psychomotor skills and competency through experiential learning, preparing them for entering the field after completing their training (Mbakaya et al., 2020). According to Boyd-Turner, Bell, and Russell (2016), nursing students can attain learning outcomes about professional attitudes and values while providing patient care through work-integrated learning. There was no longer any chance to acquire and apply these vital nursing professional skills because of the COVID-19 lockdowns and restrictions.

Nursing education institutions (NEI) stopped physical clinical placement in order to prevent the spread of COVID-19. The American Nurses Credentialing Center (2020) citation further noted that the interruption prevented the nursing students from completing the required 500 hours of experience learning. Consequently, the nursing students' programme did not allow them to graduate on time (American Nurses Credentialing Center, 2020). Therefore, nursing students had to adopt online learning despite its drawbacks which included high costs and poor connectivity (Zendrato & Hiko, 2021). Another concerning realization was that the quality of clinical teaching and learning was immensely compromised. Lecturers avoided spending time at the clinical facilities due to the COVID-19 infection (Tolyat, Vagharseyyedin, & Nakhaei, 2022). The standards of clinical teaching and learning are also noticed to be lowered by the lecturers' disregard for the nursing education regulations (Tolyat et al., 2022). The nursing students focused more on following the COVID-19 precautions than learning skills (Aldridge & McQuagge, 2021). Nursing students participate in clinical practice and are demotivated at the same time (Zendrato & Hiko, 2021). Innovative techniques such as technology were used to make sure that experiential learning was realized (Ilankoon, Kisokanth, & Warnakulasuriya, 2020). Screen-based simulation and virtual immersion are two examples of digital education methods (Lioce et al., 2020). In addition, i-Human® and Body Interact™ enabled an interaction between the nursing student and the real case-based medical patient (Hao et al., 2022). Teleconsultation and virtual rounds were also used to maintain clinical practice whereby the students could consult with patients (Hao et al., 2022; Weber et al., 2021). Pinto and Leite (2020) mention that digital technology enhances students' participation and performance.

3. Methods

3.1. Design

This integrative review was employed to summarize previous empirical literature and provide a more comprehensive understanding of a particular phenomenon (Torraco, 2016). Toronto and Remington (2020) suggested six steps of integrated review namely: 1) Creation of a broad purpose review question. 2) A systematic search using predetermined criteria of the literature. 3) Critical appraisal of selected research. 4) Literature analysis and synthesis and new knowledge discussion and dissemination of findings (see Figure 1).

3.1.1. Problem Formulation Stage

There are limited number of integrative literature reviews that investigated the application of technology in clinical learning during COVID-19 pandemic. Therefore, this study was guided by the following questions:

- What are the benefits of using digital technology in clinical learning for undergraduate nursing students during the COVID-19 pandemic?

- What are the challenges of using digital technology in clinical learning for undergraduate nursing students during the COVID-19 pandemic?

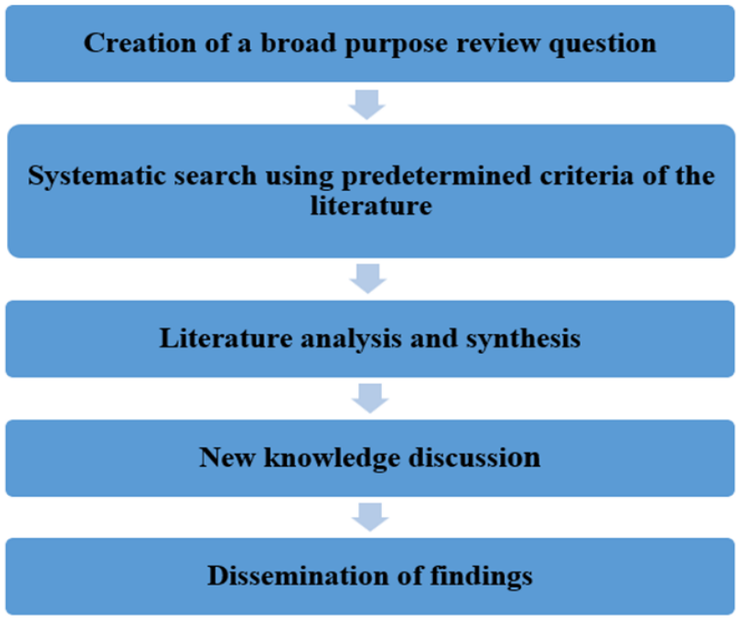

Figure 1. Steps of integrative literature review.
Source: Toronto and Remington (2020).

3.1.2. Systematic Search of Literature Using Predetermined Criteria

This integrative review evaluated peer-reviewed research articles written in English language and published from 2019 to 2023. Key search terms were digital technology, clinical learning, undergraduate nursing students and the COVID-19 pandemic. Four electronic databases were systematically searched (Science Direct, Pub Med, Google Scholar and Scopus) guided by the Medical Subject Headings (MeSH) and relevant terms (see Table 1).

Table 1. Search strategy.

Steps	Search terms
1	"Clinical placement, experiential learning, "clinical or nursing skills", "clinical learning"," work and integrated learning".
2	"Digital technology", "digital electronics", "electronics digital", "technologies digital", "virtual simulation learning".
3	"Undergraduate nursing students", "pre-registration nurses" and " student nurses".
4	"Student experiences", " attitudes", " perspectives", " view", " perceptions" " feelings" and "opinions".
5	1 and 2 and 3 and 4

The review inclusion criteria were as follows: (a) published in peer-reviewed journals, (b) written in English, (c) focused on undergraduate student nurses or clinical educators, lecturers and facilitators' experiences or perceptions (d) timeframe between 2019 and 2023 (e) the search term was included in either the title or the keywords. Excluded criteria covered research work and media reports that involved other health science education students or had a focus only on undergraduate student nurses' theoretical learning.

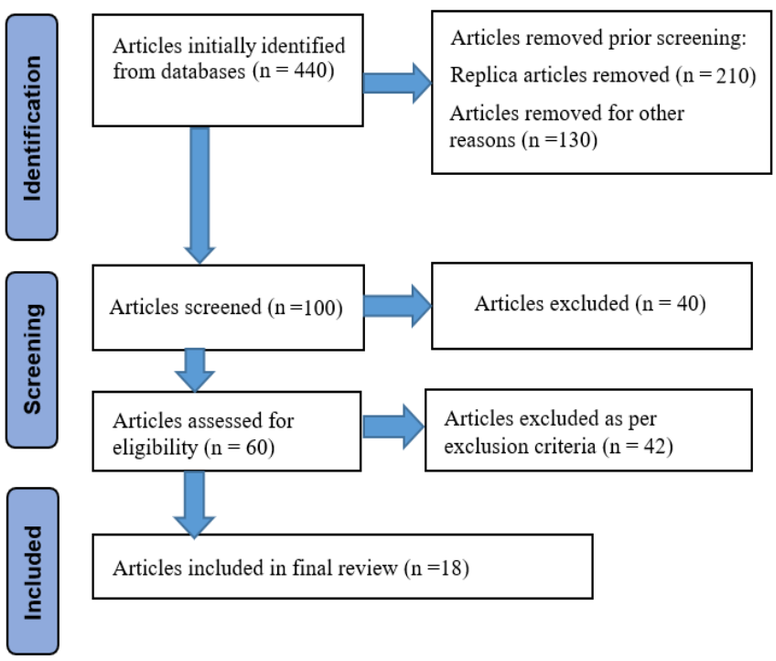

Figure 2. PRISMA 2020 study selection flowchart.

The most appropriate for review was using Preferred Reporting Items for Systemic Reviews and Meta-Analysis (PRISMA) (Moher, Liberati, Tetzlaff, Altman, & PRISMA Group, 2009). A comprehensive search yielded 440 research articles with a focus on comprehensive papers with important themes. Two hundred and ten (210) duplicates and an additional 130 were excluded following a thorough evaluation of appropriateness and titles. The resulting 100 were reviewed for title, abstract and relevance of which a further 40 were eliminated. 42 further records were removed from the final 60 after the population and methods were verified. Ultimately, 18 articles remained for critical review. The PRISMA diagram in Figure 2 depicts the process taken and Table 2 shows the articles included in the study.

3.1.3. Critical Appraisal of Selected Research

The authors equally contributed in evaluating of the reserved articles. Simultaneously, this process ensured adequate data extraction in accordance with the Critical Appraisal Skills Programme (2018). The included articles are categorized according to the following headings: author(s), year, country, aim, approach and design, sample and data quality. The rigor of the studies was quantified as A = high quality, B = good quality and C = low quality. An overall of eighteen studies that met the quality appraisal criteria were retained: qualitative (n = 10), mixed method (n = 4) and quantitative studies (n = 4) (see Table 2).

3.1.4. Analysis and Synthesis of Literature

The literature analysis and synthesis procedure was performed by two independent reviewers. Any inconsistencies were resolved consensually by the authors to avoid any loss of valuable insights. Themes were identified in order to provide clearer discussions and interpretations.

Table 2. Characteristics of studies including the quality.

Authors	Aim	Study design and sample	Data quality
Abram, Guilamo-Ramos, Lobelo, Forbes, and Caliendo (2021) United States of America (USA)	The study aimed to explore student perceptions of using telehealth technology to manage the crisis care of psychiatric patients in the COVID-19 pandemic.	Qualitative study of undergraduate nursing students (n = 12)	Aims and objectives are clearly described. Design and methods are appropriate. Results are consistent. Study implications are described. Quality appraisal =High quality (A)
Badowski, Rossler, and Reiland (2021) United States of America (USA)	The study aimed to explore students' perceptions of virtual simulation in meeting their learning needs when compared to traditional clinical experiences and manikin-based simulation environments.	Qualitative study of undergraduate nursing students (n = 97)	Aims and objectives are clearly described. Design and methods are appropriate. Results are consistent. Study implications are described. Quality appraisal =High quality (A)
Balante, Candelaria, Perez, and Koo (2023) Australia	The study explored nursing student perceptions and experiences of using Flipcharts for learning clinical nursing skills during the COVID-19 pandemic.	Qualitative study of undergraduate nursing students (n = 12)	Aims and objectives are clearly described. Design and methods are appropriate. Results consistent Study implications are described. Quality appraisal =High quality (A)
Bryan et al. (2022) Canada	The aim of the study was to explore Licensed practical nurse Bachelor of nursing (LPN-BN) students' experiences in clinical courses during the COVID -19 pandemic.	Qualitative study of undergraduate nursing students (n = 15)	Aims and objectives are clearly described. Design and methods appropriate. Results are consistent. Study implications are described. Quality appraisal =High quality (A)
Flo, Byermoen, Egilsdottir, Eide, and Heyn (2021) Norway	The aim of the study was to explore how second-year undergraduate nursing students experienced learning through virtual simulations during the COVID-19 pandemic.	Mixed-method study undergraduate nursing students (n = 36)	Aims and objectives are clearly described. Design and methods are appropriate. Results are consistent Study implications are described. Quality appraisal =High quality (A)
Fung et al. (2021) Hong Kong	The study aimed to evaluate the effect of a virtual simulation education programme with debriefing on undergraduate nursing students.	Qualitative study of undergraduate (n = 188)	Aims and objectives are clearly described. Design and methods appropriate. Results are consistent. Study implications are described. Quality appraisal =High quality (A).
Goldsworthy et al. (2022) Canada, England, Scotland Australia	To explore the impact of a virtual simulation intervention on the recognition and response to rapidly deteriorating patient among undergraduate nursing students.	Mixed-methods study of undergraduate nursing students (n = 88)	Aims and objectives are clearly described. Design and methods appropriate. Results are consistent. Study implications are described. Quality appraisal =High quality (A).
Hu, Ow Yong, Chng, Li, and Goh (2022) Singapore	The aim of the study was to explore nursing students' experiences of using home-based learning as pedagogy during the COVID-19 pandemic.	Qualitative study undergraduate of nursing students (n = 23)	Aims and objectives are clearly described. Design and methods are appropriate. Results are consistent. Study implications are described. Quality appraisal =High quality (A)
Jiménez-Rodríguez and	The study aimed to analyse	Mixed-methods study	Aims and objectives are clearly

Authors	Aim	Study design and sample	Data quality
Arrogante (2020) Spain	undergraduate nursing students' perceptions of simulated nursing video consultations.	undergraduate nursing students (n = 93)	described. Design and methods appropriate. Results are consistent. Study implications are described. Quality appraisal =High quality (A)
Kazawa, Teramoto, Azechi, Satake, and Moriyama (2022) Japan	The study explored the students' learning experiences of telehealth clinical practice program.	Qualitatively study of undergraduate nursing students (n = 26)	Aims and objectives are clearly described. Design and methods appropriate. Results are consistent. Study implications are described. Quality appraisal =High quality (A)
Kim, Kang, and De Gagne (2021) Korea	The study aimed to understand prelicensure nursing students' perceptions and experiences of using virtual simulation as an alternative to clinical practice during the coronavirus 2019 (Pandemic in South Korea.	Qualitative study of undergraduate nursing students (n = 20)	Aims and objectives are clearly described. Design and methods appropriate. Results are consistent. Study implications are described. Quality appraisal =High quality (A)
Mbombi, Muthelo, and Phukubye (2022) Republic of South Africa (RSA)	The aim of the study was to explore the use of virtual learning among learner nurses in a rural-based university by following the E-learning context, design, delivery, and outcomes (el-CDDO) framework.	Quantitative study of undergraduate nursing students (n = 1490)	Aim and objectives clearly described Design and methods appropriate. Results are consistent. Study implications are described. Quality appraisal =High quality (A)
Ndayisenga et al. (2022) Rwanda	The study described students' perceptions and experiences of BL in Rwanda's post-secondary nursing and midwifery programs in public and private higher learning institutions (HLIs).	Qualitative study of undergraduate nursing students (n = 33)	Aims and objectives are clearly described Design and methods appropriate. Results are consistent. Study implications are described Quality appraisal =High quality (A)
Oducado and Soriano (2021) Philippines	The study aimed to examine nursing students' attitudes towards e-learning in two selected nursing schools in the Philippines.	Quantitative study of undergraduate nursing students (n = 111)	Aims and objectives are clearly described. Design and methods appropriate. Results are consistent. Study implications are described. Quality appraisal =High quality (A)
Schiavenato, Edwards, Tiedt, and Owens (2022) United States of America (USA)	The study aimed to explore the learning effectiveness of three virtual simulation tools used in the COVID -19.	Mixed-methods study of undergraduate nursing students (n = 36)	Aims and objectives are clearly described. Design and methods appropriate. Results are consistent. Study implications are described. Quality appraisal =High quality (A)
Thapa, Bhandari, and Pathak (2021) Nepal	The study aimed to identify the nursing students' attitudes towards the practice of e-learning during COVID-19.	A descriptive web-based cross-sectional study. Nursing students (n = 470)	Aims and objectives are clearly described. Design and methods appropriate. Results are consistent. Study implications described. Quality appraisal =High quality (A)
Yi, Yan, Hui, and Yang (2022) China	The aim of the study was to describe the perceptions and experiences of undergraduate nursing students in e-internships during COVID-19 pandemic.	Qualitative study of undergraduate nursing students (n = 17)	Aims and objectives clearly described. Design and methods appropriate. Results are consistent. Study implications are described. Quality appraisal =High quality (A).
Zaragoza-García, Ortuño-Soriano, Posada-Moreno, Sánchez-Gómez, and Raurell-Torredà (2021) Spain	The study aimed to evaluate whether a based-web virtual simulation (VS) platform is a useful tool in terms of knowledge, satisfaction and self-confidence in learning during COVID-19.	Quantitative study of undergraduate nursing students (n = 112)	Aims and objectives are clearly described Design and methods are appropriate. Results are consistent. Study implications are described. Quality appraisal =High quality (A)

Note: A =High quality.
B=Good quality.
C=Low quality.

4. Results and Discussion

4.1. Results

All eighteen articles assessed in the review entailed qualitative (n = 10), quantitative (n = 4) and mixed-methods (n = 4) and were published between 2021 and 2023. Four mixed method studies were conducted in the following countries: USA (n = 1) (Schiavenato et al., 2022), Norway (n = 1) (Flo et al., 2021), Spain (n = 1) (Jiménez-Rodríguez & Arrogante, 2020), Canada, England, Scotland and Australia (n = 1) (Goldsworthy et al., 2022). The ten qualitative studies were carried out in the USA (n = 2) (Abram et al., 2021; Badowski et al., 2021); Australia (n = 1) (Balante et al., 2023), Canada (n = 1) (Bryan et al., 2022), Hong Kong (n = 1) (Fung et al., 2021), Singapore (n=1) (Hu et al., 2022), Japan (n = 1) (Kazawa et al., 2022), Korea (n = 1) (Kim et al., 2021) and Rwanda (n = 1) (Ndayisenga et al., 2022). Four quantitative studies were conducted as follows: RSA (n = 1) (Mbombi et al., 2022), Philippines (n = 1) (Oducado & Soriano, 2021), Nepal (n = 1) (Thapa et al., 2021) and Spain (n = 1)

(Zaragoza-García et al., 2021). All studies met 100% critical appraisal criteria (Critical Appraisal Skills Programme 2018). The data review revealed three themes: benefits of digital technology, challenges of digital technology, attitude towards the use of digital technology in clinical learning (see Table 3).

4.1.1. Benefits of Digital Technology in Clinical Learning

The first theme that emerged from the literature was the benefits of digital technology in clinical learning for undergraduate nursing students during the COVID-19 pandemic. Ten out of the final eighteen articles cited that the use of digital technology enhanced clinical learning among undergraduate nursing students (Bryan et al., 2022; Flo et al., 2021; Fung et al., 2021; Goldsworthy et al., 2022; Jiménez-Rodríguez & Arrogante, 2020; Kim et al., 2021; Panepucci, Roe, Galbraith, & Thornton, 2022; Saab et al., 2022; Schiavenato et al., 2022). These studies unanimously supported the notion that digital technology enhanced clinical learning which is described by the following categories: Provide the link between theory and practice, promote different clinical learning styles and promote satisfaction during clinical learning. Another benefit highlighted by the literature is that the digital technology improved clinical competence among the nursing students by building confidence for clinical practice or readiness to practice and promoting the acquisition of clinical skills (Badowski et al., 2021; Balante et al., 2023; Hu et al., 2022). The nursing students had debriefing opportunities which also boosted reflective learning by using digital technology (Flo et al., 2021; Goldsworthy et al., 2022; Jiménez-Rodríguez & Arrogante, 2020). Table 3 depicts the themes, subthemes and categories identified from the literature.

4.1.2. Challenges of Digital Technology

This study also revealed several challenges about digital technology utilization for clinical learning (Badowski et al., 2021; Bryan et al., 2022; Flo et al., 2021; Fung et al., 2021; Hu et al., 2022; Jiménez-Rodríguez & Arrogante, 2020; Kim et al., 2021; Mbombi et al., 2022; Ndayisenga et al., 2022; Oducado & Soriano, 2021; Saab et al., 2022; Yi et al., 2022). Technical challenges such as accessibility or usability issues and unavoidable technical difficulties were cited as impediments to the use of digital technology among undergraduate nursing students during the COVID -19 pandemic. Mbombi et al. (2022) confirmed the challenges such as weak networks and a lack of ICT facilities and skills. Another challenge related to the use of digital technology entailed the knowledge gap among whereby the facilitators and students lacked technology use skills (Ndayisenga et al., 2022; Oducado & Soriano, 2021). Technology in clinical learning was also viewed as a threat to affection and humanity. Saab et al. (2022); Yi et al. (2022) and Thapa et al. (2021) observed that it is difficult to provide affection in a simulated case as compared to the real patient.

4.1.3. Attitude towards the use of Technology in Clinical Teaching

The majority of the studies identified attitudes towards the use of digital technology in clinical learning (Badowski et al., 2021; Bryan et al., 2022; Flo et al., 2021; Fung et al., 2021; Jiménez-Rodríguez & Arrogante, 2020; Mbombi et al., 2022; Oducado & Soriano, 2021; Saab et al., 2022; Yi et al., 2022). These studies agreed that the use of digital technology is also related to individual perceptions. The subthemes that supported this notion included 1) the use of technology is suitable for the young as compared to the older generation. 2) Technology cannot replace face- to- face clinical learning and assessment.

Table 3. Themes and subthemes emerged from the data analysis.

Themes	Subthemes	Categories
1. Benefits	1.1. Enhanced clinical learning	• Provide the link between theory and practice. • Promote different clinical learning styles. • Promotes satisfaction during clinical learning.
	1.2. Improved clinical competence	• Building confidence for clinical practice-readiness to practice. • Promote clinical skills acquisition.
	1.3. Debriefing opportunities	• Reflective learning.
2. Challenges	2.1. Technical problems	• Accessibility and usability issues. • Unavoidable technical difficulties.
	2.2. Knowledge gap	• Facilitators and students lack of technology use skills.
	2.3. Threat to affection and humanness	• Reduced emotional interaction with patients.
3. Attitude towards the use technology in clinical teaching	3.1. Individual preferences	• Suitable for young versus old generation. • Technology cannot replace face-to-face or physical clinical learning experience or assessment.

4.2. Discussions

This study's aim was to synthesize existing literature on the benefits and challenges of the usage of digital technology for the clinical learning of undergraduate nursing students during the COVID-19 pandemic. Clinical learning forms a pivotal component of nursing education through which nursing students acquire practical skills and competence. However, during the pandemic, the physical clinical placement of the nursing students was difficult. Additionally, technology use was also considered a way to ensure the continuation of the teaching and learning of students within the clinical sphere. The deliberation in this paper is based on the main themes, subthemes and categories that occurred in this *study*.

4.2.1. Benefits of the Use of Digital Technology in Clinical Learning

The majority of the studies considered that digital technology had positive benefits for the clinical learning of nursing students during the COVID-19 pandemic. Goldsworthy et al. (2022) maintained that student nurses stated

that virtual simulations added value to their learning and helped them attain positive learning outcomes during COVID-19. Online learning addresses the knowledge gap between theory and reality. The positive learning experience could be related to the self-confidence of being able to practice procedures in a less intimidating environment. Similar sentiments were shared by Badowski et al. (2021); Fung et al. (2021); Yi et al. (2022) and Saab et al. (2022). In this regard, students had various opportunities to carry out trial and error in the re-prioritization of nursing diagnosis while receiving prompt feedback, thus creating positive learning experiences (Badowski et al., 2021; Saab et al., 2022). In addition, Flo et al. (2021) established that the nursing students had pleasurable feelings as they were able to systematically assess the simulated situation in a sequentially structured manner. These positive learning experiences could be related to the fact that they had to critically analyse the scenarios and apply them in simulated situations, thus bridging the gap between theory and practice. The results unanimously highlighted that the nursing students' clinical learning outcomes were met.

The study revealed that digital technology usage improved the nursing students' clinical competence. In most cases, the studies pointed out that the nursing students' confidence improved a lot due to the fact they were able to practice on the models on their own without the actual presence of the lecturers and the patients (Jiménez-Rodríguez & Arrogante, 2020; Kim et al., 2021; Panepucci et al., 2022; Saab et al., 2022). Kim et al. (2021) highlighted that students were given opportunities to provide holistic comprehensive care to the simulated patients from admission to discharge. Nursing students gained confidence and competency by promptly responding to a change in the condition of the patient and acting accordingly to manage the situation. Through digital clinical learning, nursing students were expected to identify a patient's problem, develop a nursing plan and an intervention and most importantly provide a rationale for their actions (Panepucci et al., 2022). This kind of activity improved the development of clinical judgement abilities since it required the student to diagnose a patient and make prompt decisions regarding the next course of action.

A debriefing is a conversation that follows an event and encourages reflection and learning. Simulation clinical education permits engagements to improve knowledge and skill acquisition (Fegran et al., 2023; Stafford et al., 2021; Tavares et al., 2020). Similarly, according to this study, debriefing is a form of technology-assisted clinical learning for nursing students (Flo et al., 2021; Goldsworthy et al., 2022; Jiménez-Rodríguez & Arrogante, 2020). The nursing students were able to reflect on lessons learned from mistakes made during simulation (Jiménez-Rodríguez & Arrogante, 2020). Debriefing enabled educators to offer emotional support, alleviate stress and ultimately promote a culture of continuous learning with improved patient care (Stafford et al., 2021). Stafford et al. (2021) emphasised the need for optimizing team debriefing while providing a supportive culture to overcome any pandemic challenges. The nursing students were able to learn by discussing their personal concerns regarding the COVID-19 epidemic in addition to benefiting from the debriefing gestures.

4.2.2. Challenges Related to the Use of Digital Technology in Clinical Learning

This research highlighted challenges such as technical problems, knowledge gaps, threats to affection and humanness and inconsistencies in nursing care. Wilcha (2020) and Subedi, Nayaju, Subedi, Shah, and Shah (2020) also revealed that teaching and learning were disturbed by problems related to the internet and electricity. Additionally, Mbombi et al. (2022) pointed out that nursing students living in rural areas experienced difficulties with internet access. The issue of inaccessibility has been corroborated by Xie, Siau, and Nah (2020) who have confirmed that students from developing countries and low-income backgrounds are unable to own well-functioning devices. This further supports the issue of accessibility. Furthermore, different countries have diverse network facilities (Xie et al., 2020). An illustration of such gaps can be attributed to the network issue due to electricity problems and load shedding in South Africa.

Similarly, lack of knowledge about using digital technology was identified as a problem (Ndayisenga et al., 2022; Oducado & Soriano, 2021). Technologically unskilled nurse lecturers are unable to support their learners. The negative attitude towards the use of digital technology could also be attributed to a lack of knowledge. In this regard, a lack of knowledge would result in one's perception that digital technology is difficult to use especially in a clinical field. According to Koivunen and Saranto (2018) and Robichaux, Tietze, Stokes, and McBride (2019), negative attitudes among nurses and insufficient technical capabilities are very different. In this case, nurses would believe that technology will probably connect the private and personal information of the patients (Robichaux et al., 2019). Furthermore, using digital technology to execute specific treatments was another limitation mentioned by the nursing students. In nursing, compassion and understanding are crucial elements in the patient's recovery process. However, this study found it concerning that technology did not provide opportunities for nurses to show affection to their simulated patients (Jiménez-Rodríguez & Arrogante, 2020; Saab et al., 2022; Thapa et al., 2021; Yi et al., 2022). They stipulated that they could not connect emotionally or feel the skin or pulse of the patient (Saab et al., 2022). It was also difficult to communicate sensibly with the digital patient. According to Saab et al. (2022), it is almost impossible to have emotional interactions with the simulated patient. Similarly, Robichaux et al. (2019) stated that there is a possibility that the use of digital technology may be seen as a deviation from the standard practice of nurses offering the highest level of direct patient care and healing. Xie et al. (2020) also cited a lack of connectedness between the student, lecturers and peers. As a result, it would be difficult to engage in social relations with other students, thus making one feel lonely and isolated. Most nursing procedures are dependent on the patient's physical presence. Communication, touching and listening might not be effectively executed in digital technology thus making the student miss a lot in mastering such critical nursing skills. Therefore, the pre-briefing session can include comprehensive life scenarios which can make the student virtualise the real patient in the whole clinical teaching.

4.2.3. Attitudes towards the use of Technology in Clinical Teaching

The study conducted by Olum et al. (2020) highlighted negative attitudes towards e–learning and technology as part of medical education. This study revealed attitudes such as whether the use of technology is suitable for the young versus the old generation. Similarly, Padilha, Machado, Ribeiro, and Ramos (2018) revealed a feeling of willingness, exhilaration and positive attitudes towards the use of virtual simulation among the young nursing students. This kind of preparedness and motivation of the young nurses to use digital technology could be

attributed to the fact that most of the youth were born in the era of digitization. In that regard, Padilha et al. (2018) suggested the need for more resource allocation which would encourage the use of technology in nursing. Technology cannot replace face-to-face clinical learning. According to Olum et al. (2020), factors such as available monthly income, quality of internet connection, personal computer ownership and previous use of academic sites can influence these negative attitudes. In the current study, there were challenges such as a lack of knowledge which can influence attitudes towards digital technology for clinical learning. Strategies to enhance awareness about digital technology usage in nursing clinical teaching might address these negative attitudes.

5. Limitations of the Study

The authors acknowledge that there are limitations that can be applied to this integrative literature review. Restrictions connected with inconsistent search terminology and indexing problems may have produced only 50% of potentially eligible studies (Whittemore & Knafl, 2005). The authors attempted to consistently use the correct key terms. Furthermore, conducting an integrative review may contribute to possible biases through the inclusion of only published works. Other limitations may include the inability to generalize review findings (Toronto & Remington, 2020). In addition, a thorough description of the systematic steps during the literature search was taken to prevent the bias. Furthermore, relevant studies were included through the critical application of the inclusion and exclusion criteria. Even though the two authors worked together to search the literature and co-checked it for relevancy searched literature, some befitting studies in grey literature might have been omitted.

6. Conclusion

The aim of this study was to identify both the benefits and challenges of digital technology usage for the clinical learning of undergraduate nursing students during the COVID-19 pandemic and to make recommendations. This literature review study established that the use of digital technology contributed to enhancing clinical learning, competence and debriefing opportunities. At the same time, challenges such as lack of knowledge, technical problems and threats to affection and humanness were revealed by this study. Attitudes towards the use of technology in clinical teaching were also of concern. The study findings are expected to afford imperative data for the creation of awareness about the important contribution of digital technology to nursing clinical teaching and learning.

7. Implications of the Study

7.1. Nursing Education Implications

The nursing education institutions should ensure that curriculum development adequately incorporates the utilization of digital technology especially in the clinical learning of undergraduate nursing students. Nursing education institutions can benefit from investing in the purchase of digital technology equipment as a way forward in the realization of new educational developments. The use of debriefing should be incorporated into the nursing curriculum in order to develop the nursing students' ability to be critical and rational thinkers.

7.2. Nursing Management Implications

Health facilities and nursing education institutions should implement strategies that prepare the stakeholders in clinical teaching and learning in order to improve the utilization of digital technology. There should be regular staff development and in-service training on the use of digital technology in routine patient care. Health facilities and nursing education institutions should put strategies in place to equip the stakeholders responsible for clinical teaching and learning in order to enhance the use of digital technology. This will help to sensitize the nurses to the use of digital technology and at the same time equip them to teach and support undergraduate nursing students. Patients and relatives should also be educated regarding the use of self -monitoring digital technology devices such as pocket digital glucometers and blood pressure machines to improve self-care at home and alleviate congestion at clinical health facilities.

7.3. Implications for Policy Makers

Policy makers should develop guidelines and policies that support the use of digital technology in clinical settings and practice to enhance the culture of using technology in nursing care while observing patients' rights to privacy and confidentiality.

7.4. Implications for Education

Schools should be adequately equipped to teach the learners regarding the use of digital technology as a strategy to ensure continuity in post- primary education and prepare them for the future.

7.5. Implications for Research

It would be beneficial to conduct a study on the collaboration between health facilities and nursing education institutions in the enhancement of the digital technology readiness of nursing education. There is also a need to conduct studies on the effects of digital technology use on skills acquisition during nursing students' clinical learning.

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