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Original Research Article

Integrating Telehealth into Nursing Education in Saudi Arabia: A Cross-Sectional Study

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Abstract

Background: The rapid advancement of telehealth technologies and their growing role in healthcare delivery-especially during and after the COVID-19 pandemic-has underscored the urgent need to integrate telehealth competencies into nursing education. Despite this global shift, Saudi Arabia's nursing curricula lack systematic telehealth training, creating a gap between healthcare needs and educational preparedness. ***Aim:*** This study aimed to evaluate the integration of telehealth into nursing education in the Eastern Province of Saudi Arabia by assessing nurses' knowledge, attitudes, exposure, and educational preferences related to telehealth. ***Methods:*** A descriptive cross-sectional design was used. A validated questionnaire adapted from Rettinger *et al.*, (2024) was distributed via Google Forms to 100 Saudi nurses and nursing students holding a bachelor's degree from Saudi institutions. The instrument assessed demographics, telehealth training experiences, perceived competencies, attitudes, and curricular preferences. Descriptive statistics were applied to analyze responses. ***Results:*** The majority of participants rated their digital competence as good or very good (73%). While 81% expressed strong interest in telehealth for their profession, only about half had practical exposure to telehealth tools mainly through phone or video consultations. Participants preferred integrating telehealth as an elective or mandatory topic later in their academic progression. There was notable interest in practical content, such as technical skills, legal aspects, and device usage. ***Conclusion:*** Although the attitudes toward telehealth were overwhelmingly positive, the findings reveal a significant gap between the perceived importance of telehealth and the limited training provided. There is an evident need for structured, competency-based curricula that include simulation-based and Interprofessional learning experiences to ensure readiness for digitally enabled healthcare environments.

Keywords: Telehealth, Nursing Education, Simulation-Based Learning, Curriculum Integration, Digital Competence, eHealth, Nursing Students, Competency-Based Education.

INTRODUCTION

1. Background

The introduction explains that telehealth has grown rapidly worldwide due to:

- Technological advancements.
- Changing patient needs.
- The impact of COVID-19.

Telehealth is now essential in healthcare because it improves access, especially for rural or underserved populations.

However, studies show that nursing programs around the world-including in Saudi Arabia-are not fully preparing students to use telehealth effectively. Challenges include:

- Limited hands-on training.
- Lack of faculty experience.
- Weak administrative support.
- Financial and technological barriers.
- Educational models in recent literature recommend:
- Competency-based frameworks
- Simulation experiences.
- Real-world telehealth practice.
- Interdisciplinary learning.

In Saudi Arabia specifically, telehealth adoption is increasing, but:

- Cultural factors.
- Infrastructure limitations.
- Differences in digital literacy.
- Lack of curriculum-wide telehealth training.

All contribute to a major gap between healthcare system needs and nursing education. Why this matters:
Saudi nursing students are graduating without the competencies required in today's digital healthcare environment.

2. Research Problem:

The nursing curricula in the Eastern Province do not systematically integrate telehealth education, even though telehealth is now a core part of modern healthcare.

This creates a mismatch between: What nurses need to know

- What they are currently being taught
- Telehealth could help improve healthcare access in rural areas, but without proper training, nurses cannot utilize it effectively.

3. Purpose of the Study

The study aims to evaluate the integration of telehealth in nursing education by examining:

- Current teaching practices.
- Nurses' and students' exposure to telehealth.
- Their attitudes toward telehealth.
- Their preferred learning methods.
- Their perceived competencies.

The goal is to recommend improvements that ensure nursing students graduate with the necessary digital-health skills.

4. Significance of the Study

The study is important because:

- There is little research about telehealth in Saudi nursing education.
- Findings can help decision-makers update nursing curricula.
- The results can support Saudi Arabia's Vision 2030 goals for digital health.
- The study could serve as a model for other regions or countries.

Improved telehealth education can enhance healthcare access, especially for remote populations.

5. Research Question and Sub-questions

Main Question: How do nurses perceive telehealth and its integration into nursing education? Sub-questions:

- How knowledgeable are nurses about telehealth?
- How do nurses perceive its importance for current and future practice?
- How do they prefer telehealth to be integrated into nursing curricula?

In One Simple Sentence

The introduction argues that although telehealth is essential for modern healthcare, nursing education in Saudi Arabia-especially in the Eastern Province-is not adequately preparing students, making it urgent to evaluate current practices and propose curriculum improvements.

Literature Review

The Literature Review summarizes past research related to integrating telehealth into nursing education. It highlights what is already known, what challenges exist, and what educational models have been developed internationally. It sets the stage for why your study is needed.

The review is organized into four key themes:

1. Introduction to Telehealth in Nursing Education

The literature explains that telehealth has become essential in healthcare due to:

- COVID-19 accelerating digital healthcare use.
- Advances in technology.

The need for remote care in rural and underserved areas. Telehealth is more than phone calls-it includes:

- Patient assessment.
- Health education.
- Care coordination.
- Remote monitoring.
- Decision support.

As healthcare becomes more digital, nurses must be trained to use these tools effectively. Therefore, nursing education must shift to include telehealth competencies.

2. Telehealth Integration Challenges & Recommendations

Multiple studies show major barriers to integrating telehealth into nursing curricula. Common Barriers Identified:

- Lack of faculty training.
- Limited administrative support.
- Insufficient funding/equipment.
- Overcrowded curricula.
- Weak simulation infrastructure.

Lack of standardized national guidelines. Evidence from International Studies:

- Ali *et al.*, (2015):
  - 55 % of prelicensure and 40% of graduate nursing programs do not teach telehealth.
  - Most teaching is theoretical, not practical.
  - Decisions are inconsistent because they depend on individual faculty.

- Eckhoff *et al.*,(2022):
  - The same issues persist years later, including lack of faculty expertise and inadequate simulation labs.

Recommends investment in infrastructure and faculty development. Saudi Arabia-Specific Challenges:

- Telehealth is growing in Saudi Arabia, but education is not keeping up.
- Key gaps include:
  - No standardized telehealth curriculum.
  - Limited research.
  - Shortage of trained instructors.

Cultural, technological, and literacy barriers. Recommendation across studies:
Curricula need structured frameworks, faculty training, funding, and simulation-based telehealth experiences.

3. Telehealth Education Models & Best Practices

The literature highlights several innovative models used globally. Rutledge *et al.,* (2017 & 2021): Multimodal Telehealth Training Model Includes:

- Didactic learning (lectures, online modules).
- Simulation (standardized patients, mock telehealth visits).
- Real-world practice immersions.
- Telehealth etiquette training.

Legal and regulatory education. They emphasize the Four P's of Telehealth:

1. Planning.
2. Preparing.
3. Providing.
4. Performance evaluation.

This helps structure telehealth competency development. Papanagnou *et al.*,(2015): Jefferson iCE Platform

- A web-based platform that allows interprofessional telehealth education.
- Includes interactive resources: quizzes, videos, simulations.

Promotes collaboration between nursing, medicine, and other health disciplines. Other Best Practices Identified:

- Simulation labs using telepresence robots (Danesh *et al.,* 2019).
- Case-based telehealth learning.
- Interprofessional telehealth courses.
- Standardized patient scenarios.

Competency frameworks linked to real-world telehealth tasks. These models show that telehealth education is most effective when it is:
hands-on, competency-based, and interdisciplinary.

4. Telehealth Education Outcomes
Research shows that when telehealth is integrated properly, learning outcomes improve significantly.

Key Findings from Multiple Studies:

- Increased student competence and confidence in using telehealth tools.
- Improved communication skills specific to virtual care.
- Higher interest in working in rural areas (Arends *et al.,* 2021).
- Better clinical decision-making through telepresence simulations (Lister *et al.,* 2018).
- Greater readiness for modern healthcare environments.

For example:

Chike-Harris (2021): Telehealth curriculum improved NP students' knowledge by up to 80%.

Danesh *et al.,* (2019): Students rated telepresence simulations as highly valuable for psychiatric–mental health training.

Gartz & O'Rourke (2020):
Best outcomes occur when programs combine:

- Theory.
- Simulation.
- Real telehealth clinical exposure.

METHODOLOGY

1. Research Design
Descriptive Cross-Sectional Design

The study used a descriptive cross-sectional design, which means:

- Data was collected once at a single point in time.
- The goal was to describe current knowledge, attitudes, and practices.
- No interventions were applied.
- No cause–effect relationships were tested.

This design is commonly used in education and health studies to measure perceptions and readiness.

2. Sampling Method Convenience Sampling
Participants were selected because they were:

- Easily accessible.
- Willing to participate.
- Located in the Eastern Province of Saudi Arabia.

Convenience sampling is practical for student and healthcare studies where researchers do not have access to full population lists.

3. Inclusion & Exclusion Criteria

These rules define who is allowed and who is excluded to ensure the sample matches the study purpose.

Included:

- Saudi nurses.
- Located in the Eastern Province.
- Hold a BSN from a Saudi university.

Or current BSN students from Saudi programs.
Excluded:

- Non-Saudi nurses.
- Nurses without a BSN.
- Nurses trained outside Saudi Arabia.
- Nurses from regions outside the Eastern Province.

This ensures the study focuses only on Saudi-prepared BSN nurses and students.

4. Sample Size Calculation

The sample size was calculated using the standard proportion formula:

$$n = \frac{Z^2 \cdot p(1-p)}{E^2}$$

Where:
Z = 1.96 (95% confidence).
p = 0.5 (maximum variability). E = 0.1 (10% margin of error).

This generated a target sample of approximately 100 participants, which the study successfully achieved.

5. Data Collection Tool

Questionnaire Adapted from Rettinger *et al.,* (2024).

The original tool was validated and modified to suit Saudi nurses. The questionnaire included six sections:

- Demographics
- Telehealth training experience.
- Opportunities for using telehealth.
- Attitudes toward telehealth.
- Impact of telehealth education.

Suggestions for curriculum improvement. Types of questions:

- Likert scale
- Multiple choice
- Yes/No
- Optional open-ended responses.

Reliability:

Cronbach's alpha = 0.86 → This means high internal consistency and strong reliability. This proves the tool is scientifically valid for measuring perceptions and competencies.

6. Data Collection Procedures Steps followed:

1. IRB approval was obtained to ensure ethical compliance.
2. The survey was distributed online via Google Forms.
3. Participants provided electronic informed consent.
4. Participation was voluntary and anonymous.
5. Data collection lasted for three weeks, with weekly reminders.
6. All data was stored securely and only accessible to the research team.

This follows ethical standards, ensuring privacy and compliance with human-subject research guidelines.

1. Variables in the Study

The study categorized variables into:
A. Independent Variables (Predictors).

These are the factors that may influence outcomes.

1. Type of Telehealth Training Received
   - Phone consultations.
   - Video consultations.
   - Self-management apps.
   - Sensors, VR, exergaming.

2. Duration / Extent of Telehealth Exposure

Measured indirectly through frequency of training or use.

3. Educational Setting Preferences
   - Within the nursing course.
   - Interdisciplinary learning.
   - Both.
   - None.

4. Demographics
   - Age.
   - Gender.
   - Nationality.
   - Educational level.
   - Area of practice.

These help identify which groups may be more prepared or more interested.

B. Dependent Variables (Outcomes) These are what the study is measuring.

1. Telehealth Competency

Self-assessed ICT competence (Very good → Insufficient.

2. Perceived Readiness for Telehealth Includes:
   - Knowledge of telehealth.
   - Interest in telehealth.
   - Perceived importance in studies.
   - Belief in future role of telehealth.

3. Impact on Employability

Perception of whether telehealth training improves:

- Job opportunities.
- Professional readiness.
- Long-term career value.

4. Summary of the Methodology In summary, the methodology:

1. Used a cross-sectional survey.
2. Recruited 100 Saudi BSN nurses and students.
3. Used a validated questionnaire.
4. Collected voluntary, anonymous data online.
5. Measured knowledge, attitudes, experiences, competencies, and preferences.
6. Used statistical description to analyze results.

This methodology is appropriate for exploratory educational research and aligns with international telehealth competence studies.

Data Analysis

The collected data were exported from Google Forms, cleaned, and coded for statistical analysis. Descriptive statistics-including frequencies and percentages-were used to analyze demographic variables, telehealth knowledge, attitudes, competencies, exposure, and educational preferences. Results were presented in tables for clarity and supported with narrative interpretation. This descriptive analytical approach was appropriate for the study's cross- sectional design and its objective to explore current perceptions and readiness for telehealth integration among nursing students and nurses in the Eastern Province of Saudi Arabia.

Findings

Explanation of the Findings

The Findings chapter presents what the data revealed about nursing students' and nurses' knowledge, attitudes, experiences, and preferences regarding telehealth. The results paint a clear picture of high interest but limited structured training.

The findings are organized into four major themes:

1. Participant Demographics

The sample consisted of 100 participants, mostly:

- Female (96%).
- Saudi nationals (100%).
- Aged 25–34 (82%).
- BSN graduates (70%).

Affiliated with government universities (97%).
Student status:

- 34 % were students.

The majority of students were in bridging programs.
What this means:

The sample represents a typical profile of Saudi nursing personnel in Eastern Province institutions-young, female, and BSN-educated.

2. Competence & Preparedness for Telehealth Digital competence

Most participants rated their ICT skills as:

- Very good: 32%.
- Good: 41%.

Satisfactory to sufficient: 27%. Interpretation:

Participants are generally confident in their digital abilities, which is a strong foundation for telehealth learning.

Interest in Telehealth

Participants showed strong enthusiasm:

- Very interested: 52%

Rather interested: 32% Only 16% showed low interest.

Telehealth knowledge levels Knowledge varied widely:

- 42 %know some applications in nursing.
- 14 %know many applications.
- 23 %know telehealth mainly in other medical services.
- 11 %only know the term.

2 %had never heard of it. Interpretation:

Awareness exists, but in-depth knowledge is limited.

Perceived importance

- 58: %Telehealth is very important.
- 27: %Rather important.
- Only 7% considered it unimportant.

Future relevance:

59 %believe telehealth will play a major role in their profession beyond the pandemic.

Interpretation:

Participants strongly believe telehealth should be part of nursing education and practice.

3. Current Exposure to Telehealth

Participants reported limited but meaningful exposure:

Most common experiences:

- Phone or video consultations: 49%
- Self-management apps: 27%

Use of sensors or VR/exergaming: 6%
Interpretation:

Telehealth exposure is mostly basic, focusing on communication rather than advanced monitoring or digital tools.

Preferred Learning Environment Participants preferred learning telehealth:

- Both individual and interdisciplinary settings: 68%
- With students from same course only: 12%

Only 3% did not want telehealth taught at all. Interpretation:
Students value collaboration with other health disciplines (e.g., medicine, pharmacy). Preferred Curriculum Placement

How telehealth should be included:

- Elective course: 52%.
- Mandatory topic in existing course: 35%.

Only 5% said “don’t know” and 8% said “not at all”. Ideal semester to introduce telehealth:

- 5th/6th semester: 39%
- 3rd/4th semester: 32%
- 1st/2nd semester: 14%

Undecided: 9% Interpretation:
Students prefer telehealth after developing foundational clinical skills. Most important telehealth applications for the future

- Phone consultations: 52%
- Video consultations: 22%
- Self-management apps: 10%

General information platforms (websites/videos): 10% Interpretation:
Participants value tools used in everyday clinical communication.

4. Educational Needs & Preferred Telehealth Content
Participants were highly interested in learning practical, applied telehealth skills. Topics participants want to learn "for sure:"

- Practical tips (45%)
- Technical knowledge (45%)
- Technical skills (44%)
- Scientific evidence (44%)
- Case examples (44%)
- Devices/software/apps (44%)
- Legal aspects (43%)
- Data protection (42%)
- Usability & UX (43%)

Content development (45%) Interpretation:
There is a strong desire for hands-on, skills-based telehealth training, not just theory.

Overall Interpretation of the Findings the Findings show:

- High digital confidence

Participants feel competent using technology.

- Very strong interest in telehealth

Students and nurses want telehealth integrated into their programs.

- Limited actual telehealth training

Experience is mostly basic and not curriculum-based.

- Clear demand for practical content

Participants want simulation, skills training, legal knowledge, and device usage.

- Preference for later-semester training

Students prefer telehealth once they have clinical foundations.

Conclusion

There is a significant gap between the importance of telehealth and the actual availability of structured training in Saudi nursing education.

DISCUSSION AND IMPLICATIONS

The findings of this study offer a meaningful contribution to the growing body of research on telehealth integration within nursing education, both globally and within the Saudi context. The results reveal a complex yet encouraging landscape: nurses and nursing students in the Eastern Province demonstrate strong interest in telehealth and recognize its importance for future clinical practice, yet their actual exposure and formal training remain limited. This gap between perceived importance and practical preparedness reflects challenges documented in international literature, underscoring that Saudi Arabia is not alone in its struggle to embed telehealth within nursing curricula.

Participants in this study showed high confidence in their digital competence, with the majority reporting good or very good ICT skills. This indicates that the foundational technical readiness required for telehealth adoption already exists among students and practicing nurses. However, digital competence alone does not translate into telehealth competence. Despite this confidence, relatively few participants had meaningful experience with telehealth beyond basic phone or video consultations. This aligns with findings from studies such as those by Ali *et al.*,(2015) and Eckhoff *et al.*,(2022), which highlight that telehealth education worldwide often lacks depth, relying heavily on theoretical instruction rather than experiential learning. The same pattern emerges here: learners are technologically capable but have limited opportunities to apply their skills in authentic telehealth scenarios.

The inconsistency of telehealth exposure and the lack of structured training illuminate a key issue within nursing education frameworks. Participants repeatedly emphasized that telehealth is highly relevant to their studies and future careers, and they overwhelmingly believed it would remain significant beyond the pandemic era. Yet, despite this recognition,

formal telehealth education remains underdeveloped within most nursing programs in the Eastern Province. This mirrors the curricular gaps described in global research, where factors such as insufficient faculty training, inadequate infrastructure, and overcrowded curricula hinder widespread adoption of telehealth competencies. The Saudi context adds further challenges, including limited simulation resources and a lack of national guidelines for telehealth education within nursing.

Another important insight from this study relates to when and how telehealth should be introduced in the curriculum. Participants favored integrating telehealth during the later stages of their academic progression typically the fifth or sixth semester once they had acquired essential clinical foundations. This preference is consistent with recommendations from scholars such as Rutledge *et al*.,(2017), who argue that telehealth training is most effective when students first develop core clinical judgment and communication skills. The desire for elective or mandatory course formats further indicates that students want telehealth to be a structured, visible, and intentional part of their education, rather than an informal or optional topic.

Equally significant are the types of content that participants wish to learn. Their preferences strongly favored practical, skills-based components, including technical knowledge, device usage, simulation activities, legal and ethical considerations, and real-life case examples. This demand reinforces the notion that students are not merely interested in understanding telehealth conceptually-they want to develop the competencies needed to practice it. These findings echo prior studies by Lister *et al*.,(2018), Chike-Harris (2021), and Danesh *et al.*,(2019), all of whichhighlight the valuable role of simulation and experiential learning in improving telehealth readiness.

Taken together, these findings carry several implications for nursing education, practice, and policy in Saudi Arabia. The first and most pressing implication is the need for institutions to formally incorporate telehealth training into nursing curricula. This integration should be grounded in a competency-based framework that includes simulation, structured assessments, and interprofessional learning experiences. Without intentional curricular design, nursing graduates may continue to enter the workforce without the skills required to participate effectively in an increasingly digitized healthcare system.

Another key implication relates to faculty preparation. For telehealth education to be successfully implemented, nursing educators must themselves be equipped with the knowledge, skills, and confidence to teach telehealth competencies. Faculty development programs, supported by administrative leadership, are therefore essential. Investment in simulation infrastructure-such as telepresence technology, virtual patient encounters, and remote monitoring tools-would further enhance the practicality and relevance of telehealth training.

On a broader scale, the findings align with national priorities under Saudi Vision 2030, which emphasizes digital transformation and innovation in healthcare. Telehealth stands as a cornerstone of this transformation. By aligning nursing education with these national goals, universities can ensure that graduates are fully prepared for the evolving demands of the health sector. Partnerships between nursing colleges, the Ministry of Health, and regulatory bodies could support the development of standardized telehealth competencies and promote consistency across educational institutions.

Finally, the study highlights opportunities for further research. Longitudinal studies could explore how telehealth training influences clinical performance over time, while intervention studies could evaluate the effectiveness of various simulation-based models. Comparative studies across different regions of Saudi Arabia may also reveal important geographical variations in readiness and resource availability.

In summary, this study demonstrates that while the interest and enthusiasm for telehealth among nurses and nursing students are strong, the educational infrastructure has not yet caught up with the growing expectations of modern healthcare. The results underscore an urgent need for thoughtful curriculum reform, faculty development, and institutional investment to bridge the gap between knowledge and practice. By addressing these needs, nursing education in Saudi Arabia can play a transformative role in preparing a workforce capable of delivering high- quality, technology-enabled care in alignment with global trends and national aspirations.

CONCLUSIONS AND LIMITATIONS

Conclusions

The findings of this study underscore the growing importance of telehealth within modern nursing practice while revealing a notable gap between the perceived value of telehealth and the extent to which it is currently integrated into nursing education in the Eastern Province of Saudi Arabia. Participants demonstrated strong interest in telehealth and recognized its significance for improving clinical practice, patient access, and future healthcare delivery. Many expressed confidences in their digital skills, suggesting a solid foundation for adopting telehealth technologies. However, actual exposure to telehealth applications remained limited, and most participants reported insufficient structured training or curriculum-based experiences. These results mirror international trends, where telehealth is widely acknowledged as essential, but educational programs often lag behind evolving healthcare demands.

This study therefore highlights an urgent need for nursing programs in Saudi Arabia to incorporate telehealth more systematically into their curricula. Doing so will require not only the addition of theoretical content, but perhaps more importantly the integration of simulation- based learning, hands-on training, and interdisciplinary activities that reflect the realities of telehealth practice. Developing faculty expertise, investing in telehealth infrastructure, and aligning curriculum reforms with national digital health priorities, such as Vision 2030, will be essential to preparing nursing graduates for a healthcare system that increasingly relies on virtual care modalities. Ultimately, by addressing these gaps, nursing education can enhance workforce readiness, improve patient outcomes, and contribute to the broader transformation of healthcare delivery in the Kingdom.

LIMITATIONS

Although this study provides valuable insights into the current state of telehealth education among nursing students and nurses in the Eastern Province, several limitations should be acknowledged. First, the use of a convenience sampling method may limit the generalizability of the findings. Participants who chose to respond may have had stronger opinions or interest in telehealth, which could introduce response bias. A more diverse or randomized sampling strategy might produce results that better represent the broader nursing population in Saudi Arabia.

Second, the study relied exclusively on self-reported data, which may be influenced by social desirability bias or inaccurate self-assessment particularly regarding digital competence or perceived readiness for telehealth. Without observational or performance-based measures, it is difficult to confirm whether participants' reported skills reflect actual proficiency.

Third, the study was conducted solely within the Eastern Province, limiting regional comparability. Differences in resources, faculty expertise, and institutional readiness across Saudi Arabia mean that findings may not fully capture national-level variation. Future studies involving multiple regions or institutions would provide a clearer national picture.

Finally, the research design was cross-sectional, capturing perceptions at a single point in time. As telehealth continues to grow and evolve, educational exposure and attitudes may change rapidly. Longitudinal studies would better illuminate how telehealth competencies develop over time and how curricular changes influence learning outcomes.

Despite these limitations, the study offers a meaningful starting point for understanding the current landscape of telehealth education in Saudi nursing programs and provides actionable insights to guide future curricular development and research.

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