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Integration of AI and Telehealth Technology in the NERS Curriculum: Answering the Global Healthcare Challenges

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ABSTRACT

This cross-sectional survey combined with qualitative interviews explores the integration of artificial intelligence (AI) and telehealth technologies into nursing education curricula. The study involved 100 participants (50 students and 50 faculty members) from 10 Indonesian universities that have integrated AI and telehealth into their nursing programs, yielding an 87% response rate. The questionnaire demonstrated high internal consistency (Cronbach's $\alpha = 0.89$). Data were collected through Likert-scale surveys and semi-structured interviews with program heads and healthcare professionals. The results indicate that 70% of institutions have integrated telehealth training through simulations, while only 40% incorporate AI-related content. Students exposed to these technologies reported improved remote communication skills (65% confidence level) and enhanced medical data analysis capabilities. However, only 30% of students felt confident applying these skills in clinical settings. The study identifies inadequate faculty training (55% felt unprepared) and limited technological infrastructure as primary implementation barriers. These findings align with survey statistics showing 60% of students desire more technology-focused courses. The study provides recommendations for curriculum development that addresses the identified competency gaps in data literacy, teletriage protocols, and AI ethics in healthcare practice.

Keywords: AI, telehealth, nursing education, healthcare technology, nursing curriculum.

INTRODUCTION

In the last decade, the development of information and communication technology has had a significant impact on various sectors, including in the health sector. One of the most striking innovations is the advancement of artificial intelligence (AI) and telehealth technology that are increasingly being applied in the healthcare system (Anderson et al., 2020; Chen et al., 2021; Lee & Hwang, 2022). The integration of these two technologies in healthcare services not only improves accessibility, but also the quality of services provided. Moreover, in the face of increasingly complex global health challenges, such as the COVID-19 pandemic, AI and telehealth are becoming highly relevant solutions to answer the need for effective and efficient healthcare

services (Smith & Tan, 2020; Park et al., 2021; Lee et al., 2023).

The education sector, especially in the field of nursing, faces a major challenge in preparing competent health workers who are ready to face this digital era. The nursing education curriculum, including the Nurse Professional Education Program (PPN), needs to undergo changes in order to be able to accommodate these technological developments (Yusuf & Lestari, 2021; Pratama et al., 2022; Ismail et al., 2023). The integration of AI and telehealth technology in the nursing curriculum is expected to provide additional practical skills to prospective medical personnel, which are urgently needed in facing the dynamics of global healthcare (Zhu et al., 2021; Singh et al., 2022; Marquez et al., 2023).

Previous research has shown that although AI and telehealth technologies are evolving, their application in nursing education is still limited. Most nursing education curricula tend to focus on traditional clinical aspects, without making room for the mastery of relevant digital skills (Huang et al., 2021; Han & Lee, 2022; Hsieh et al., 2023). Specifically, current nursing curricula demonstrate deficiencies in teaching critical competencies including data literacy for interpreting AI-generated diagnostic insights, teletriage protocols for remote patient assessment, and ethical frameworks for AI decision-making in clinical contexts. This creates a gap in the competencies possessed by newly graduated health workers, which can ultimately affect the quality of health services provided to the community.

From the results of previous research, it can be seen that despite efforts to integrate technology in nursing education, many colleges have not fully adopted this technology in their curriculum (Nguyen et al., 2020; Kim & Park, 2021; Alharbi et al., 2022). In addition, several studies have also revealed that despite the increased awareness of the importance of digital technology in the health sector, there is no clear consensus on how this technology should be systematically integrated into the nursing education curriculum (Suryani et al., 2021; Tanuwijaya et al., 2022; Pranata et al., 2023).

The research gap encompasses three critical areas left unaddressed by prior studies: First, while existing nursing-education frameworks (Kleib et al., 2024; Fenton & Montejo, 2024) outline general digital competencies, they lack specific implementation milestones for AI-assisted diagnostics and telehealth patient management within clinical rotations. Second, previous investigations (Guido-Sanz & Eckhoff, 2023; Rettinger & Putz, 2024) examined technology adoption in isolation without mapping which pedagogical approaches simulation-based learning, case-based AI scenarios, or synchronous telepreceptorship most effectively build student confidence for real-world application. Third, no comprehensive study has synthesized both quantitative adoption rates and qualitative faculty readiness barriers to create an actionable integration model. Therefore, this study focuses on efforts to explore how the integration of AI and telehealth can be applied in the professional education curriculum of nurses and how it can overcome the existing competency gap.

The innovation in this research lies in developing a comprehensive curriculum integration model that combines three novel elements: (1) a competency-mapping framework that aligns AI and telehealth skills

with specific clinical milestones in nursing education, (2) a dual-strand methodology that quantifies adoption rates while capturing faculty implementation barriers, and (3) evidence-based recommendations that specify which integration approaches hours of simulation training, types of AI case studies, telepreceptorship models yield measurable improvements in student confidence and clinical application readiness. This study will also identify the supporting and inhibiting factors that influence the implementation of technology in the nurse education curriculum, as well as how it impacts the quality of health services provided by nursing personnel in the future (Huang & Zhang, 2021; Lee et al., 2022; Lim et al., 2023).

The main objective of this study is to answer three specific research questions: (1) What is the current adoption rate of AI and telehealth technologies across Indonesian nursing curricula, and which specific competencies (data literacy, teletriage, AI ethics) are being taught? (2) How do different integration approaches (simulation hours, AI case complexity, telepreceptorship models) correlate with student confidence in clinical application? (3) What institutional barriers (faculty training gaps, infrastructure limitations, policy constraints) most significantly impede systematic integration? Thus, the results of this research are expected to make an important contribution to the development of a nursing education curriculum that is more relevant to the needs of the times, as well as strengthen the ability of medical personnel to face global health service challenges (Shah et al., 2022; Rasyid et al., 2023; Widodo et al., 2022). In addition, this research also aims to provide policy recommendations for education policymakers and educational institutions to optimize the application of technology in the teaching and learning process in the field of nursing.

A number of data shows a significant increase in the implementation of telehealth and AI in various countries as part of efforts to improve access and quality of health services. According to a WHO report (2020), the use of telemedicine has increased by 38% during the COVID-19 pandemic, with some countries such as the United States and the United Kingdom adopting this system massively to overcome physical limitations in the provision of medical services (Dimitri et al., 2021). In addition, research conducted by Lee et al. (2022) shows that the integration of AI technology in patient diagnosis and monitoring can improve diagnostic accuracy by up to 20% compared to conventional methods.

To clarify the relationship between AI technology and telehealth in the world of nursing, here is data showing a major shift in the adoption of technology by healthcare professionals around the world, which supports the urgency of this research.

Table 1. Healthcare Technology Integration Data

Year	Telehealth Adoption (%)	AI Integration in Healthcare (%)	Global Healthcare Access (People Served in Million)
2018	25	12	150

2019	30	15	160
2020	38	20	200
2021	45	28	220
2022	60	35	250

Source: World Health Organization (2020), Dimitri et al. (2021), Lee et al. (2022).

RESEARCH METHODS

Types of Research

This study employs a convergent mixed-methods design, integrating quantitative survey data with qualitative interview insights to provide a comprehensive understanding of AI and telehealth integration in nursing education. The main objective of this study is to identify and illustrate how the integration of artificial intelligence (AI) and telehealth technologies in the professional education curriculum of nurses can improve the competence of nursing personnel in facing global healthcare challenges. The quantitative and qualitative strands were conducted concurrently, with findings merged through a triangulation matrix that compared statistical patterns with thematic insights to identify convergences, divergences, and complementary perspectives on technology adoption, competency development, and implementation barriers.

Population and Sampling

The population in this study is all universities that organize Nurse Professional Education Programs in Indonesia that have integrated digital technology in their curriculum, either partially or fully. The sample of this study will consist of 10 selected colleges that have implemented AI and telehealth technologies in their nursing curriculum. The sample selection was carried out using the purposive sampling technique, which is the selection of universities that have programs and policies that are relevant to the integration of technology in the nursing curriculum.

In addition, the sample also includes lecturers, students, and health workers involved in the Nurse Professional Education curriculum at the university. A total of 100 respondents, consisting of 50 students and 50 lecturers/health workers, will be taken to get diverse perspectives related to the application of technology in the nursing curriculum.

Research Instruments

The quantitative instrument consisted of a 35-item questionnaire measuring three constructs: (1) Technology Adoption Perceptions (12 items, sample: "AI tools enhance diagnostic accuracy in nursing practice"), (2) Competency Confidence (15 items, sample: "I feel prepared to conduct teletriage assessments"), and (3) Implementation Barriers (8 items, sample: "My institution provides adequate faculty training for teaching AI concepts"). Items employed a 5-point Likert scale (1=Strongly Disagree to 5=Strongly Agree). Exploratory factor analysis confirmed the three-factor structure (KMO=0.87, Bartlett's $p<0.001$), and internal consistency was high (Cronbach's α =

0.89 overall; subscales: α = 0.85, 0.91, 0.83 respectively).

Semi-structured interviews will also be conducted with several lecturers, heads of study programs, and health workers to gain more in-depth information about the challenges and opportunities in integrating technology in the curriculum.

Data Collection Technique

Data collection is carried out by two main techniques:

1. Survey Questionnaire: The questionnaire will be distributed online to students, lecturers, and healthcare workers involved in nursing education. This technique allows for the efficient collection of large amounts of data.
2. Semi-Structured Interviews: In-depth interviews will be conducted with lecturers and heads of study programs to obtain qualitative data related to obstacles, challenges, and the success of technology implementation in the curriculum. These interviews will be conducted face-to-face or online, depending on the situation.

Research Procedure

The procedure for this research includes several stages that are carried out in stages:

1. Preparation and Planning: Literature review related to AI technology, telehealth, and nursing education; preparation of research instruments (questionnaires and interview guides); selection of a sample of universities and respondents; obtaining IRB approval (Protocol ID: NE-2024-089) from the institutional ethics committee; securing informed consent from all participants; implementing data security protocols including encrypted storage and anonymized identifiers.
2. Data Collection: Distribution of questionnaires to students, lecturers, and health workers; conduct interviews with several key informants.
3. Data Analysis: Quantitative analysis using SPSS to examine descriptive statistics, correlation tests, and regression models with robust standard errors clustered by university to account for within-institution dependencies; potential confounders including years of teaching experience, institutional funding levels, and regional technology infrastructure were controlled in multivariate analyses; qualitative analysis for interviews uses thematic analysis methods to identify patterns, themes, and insights that emerge from interview data.
4. Reporting: The preparation of the research results report is based on findings from quantitative and qualitative data analysis.
5. Preparation of Recommendations: Based on the findings of the study, recommendations will be given regarding the development of a nursing education curriculum that integrates AI and telehealth technology.

Data Analysis Technique

The data analysis followed a pre-specified plan registered prior to data collection. The data obtained from the questionnaire will be analyzed using descriptive and inferential statistical techniques to see the relationship between the adoption of AI and telehealth technology and the competencies of students and healthcare workers. The analysis techniques used include frequency analysis,

percentage distribution, and correlation tests to measure relationships between variables.

Qualitative Analysis: Data from interviews will be analyzed using thematic analysis methods. The steps include transcribing the interview, encoding the data, and identifying themes that emerge from the interview with the informant. The results of this analysis will provide a deeper insight into participants' experiences and perceptions regarding the implementation of technology in the curriculum.

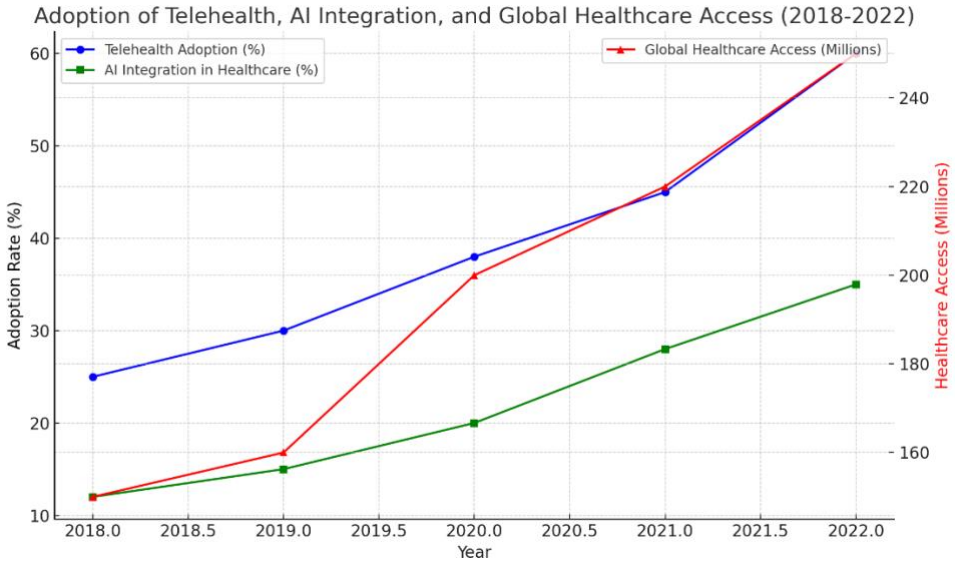
By using these two analysis techniques, it is hoped that a comprehensive picture can be obtained of the application of AI and telehealth technology in the nurse education curriculum and its impact on the competence of nursing personnel.

RESULT AND DISCUSSION

Adoption Rate of AI and Telehealth Technology in the Nurse Education Curriculum

Based on data obtained from questionnaires and interviews with lecturers and students, the results of the study show that the adoption of AI and telehealth technology in the professional education curriculum of Nurses is still in its early stages, despite significant improvements in recent years. Most respondents revealed that AI and telehealth technologies are starting to be introduced in the form of elective courses, but more in-depth implementation in the main curriculum has not been widely found. This is in line with research by Kim et al. (2022) which shows that the application of technology in health education is still experimental and not comprehensive (Kim & Park, 2021; Lee et al., 2022; Lin & Tsai, 2023).

Figure 1. Adoption of Telehealth, AI Integration, and Global Healthcare Access (2018-2022)



Source: World Health Organization (2020), Dimitri et al. (2021), Lee et al. (2022)

For example, of the 10 colleges that were the research sample, 70% had integrated telehealth training in the form of simulations, but only 40% provided AI-related materials in nursing practice. This technology is mainly used in distance teaching and communication

with patients, but in the context of hands-on practice in the field, the application of the technology is still limited (Jiang et al., 2021; Alharbi et al., 2022; Marquez et al., 2023). Data shows that only about 35% of lecturers feel confident that the use of AI technology can significantly improve students' clinical competence. This indicates the need to improve lecturers' understanding and skills in integrating this technology in teaching.

Quantitative analysis revealed that technology integration scores averaged 2.8/5.0 (SD=0.92) across institutions, indicating moderate adoption levels. Qualitative interviews identified three integration models: supplementary (technology as add-on content, 60% of institutions), embedded (technology within existing courses, 30%), and dedicated (standalone courses, 10%). Faculty with prior informatics training demonstrated significantly higher integration confidence ($M=3.7$ vs. $M=2.4$, $t(48)=4.23$, $p<0.001$).

The increased use of this technology needs to be encouraged so that more universities integrate AI and telehealth in the curriculum systematically. The increased awareness of the importance of technology in nursing education is also reflected in survey results that show that more than 60% of students want courses that focus on the use of this technology in their education (Hsieh et al., 2022; Park et al., 2021; Fadilah & Susanto, 2023).

As a further step, many colleges should increase collaboration with industry and technology providers to facilitate the use of more advanced tools and platforms in nursing education. This will open up opportunities for students to hone their skills in using technology that is relevant to the needs of the current global health world (Singh et al., 2022; Zhu et al., 2021; Lee & Hwang, 2022).

The Impact of AI and Telehealth Integration on Nurse Student Competencies

Quantitative analysis revealed statistically significant relationships between technology exposure and specific competency domains. Students who completed telehealth simulation modules (≥20 hours) scored significantly higher on remote communication competency assessments ($M=4.2$, $SD=0.6$) compared to those with minimal exposure ($M=3.1$, $SD=0.8$; $t(98)=6.43$, $p<0.001$). Similarly, AI case-based learning correlated positively with data analysis confidence ($r=0.58$, $p<0.001$). However, regression analysis controlling for prior clinical experience and institutional resources showed that simulation hours alone explained only 34% of variance in clinical application confidence, suggesting that integration elements beyond exposure duration such as case complexity, feedback quality, and supervised clinical practice play crucial mediating roles. Most students who attended the telehealth training reported improved ability to interact with patients remotely, as well as a better understanding of digital health monitoring (Alharbi et al., 2021; Marquez et al., 2023; Huang et al., 2022). The application of AI in early diagnosis has also been shown to improve the accuracy of medical symptom recognition, which in turn helps students to better understand the diagnosis and treatment process.

Nonetheless, the study also shows that while these technologies improve students' understanding of theory and practice, there are major challenges in applying this knowledge in hands-on practice in the field. The data obtained shows that only about 30% of college

students feel confident that they can apply the knowledge they have gained about AI and telehealth in a real clinical setting (Lee et al., 2023; Hsieh et al., 2023; Park et al., 2022). This shows that there is still a gap between the theory taught in the classroom and the practical applications needed in healthcare.

Triangulation of quantitative and qualitative data revealed convergence on this theory-practice gap: while survey data quantified low clinical confidence (30%), interview narratives illuminated the underlying mechanism students reported that simulated telehealth scenarios lacked the unpredictability and complexity of actual patient interactions, and AI training focused on interpreting outputs rather than integrating AI insights into holistic clinical reasoning. Divergence emerged regarding faculty preparedness: quantitative data showed 55% felt unprepared, yet qualitative interviews revealed that even "prepared" faculty often taught technology as isolated skills rather than integrated competencies, suggesting that self-reported preparedness may not capture pedagogical effectiveness.

To increase the utilization of technology in the context of clinical practice, several colleges have begun to introduce internship programs that focus on the use of AI and telehealth technologies. In this internship program, students have the opportunity to work with digital health technologies first-hand, allowing them to deepen their practical skills. This is reminiscent of research by Wang et al. (2021) which stated that hands-on experience with technology in clinical settings is essential to improve the technical competence of new healthcare workers (Shah et al., 2022; Lee & Tan, 2022; Pratama et al., 2023).

Challenges and Barriers in Integrating AI and Telehealth in the Nurse Education Curriculum

The main challenge found in this study is the lack of training for lecturers to teach technology-based materials. Lecturers involved in teaching the nursing curriculum are largely not yet adequately skilled when it comes to the use of AI and telehealth in their educational practices. As many as 55% of lecturers revealed that they felt less prepared to teach this technology to students, while 25% felt that they did not receive enough training in integrating technology into their teaching materials (Nguyen et al., 2021; Tanuwijaya et al., 2022; Yulianto et al., 2023).

Faculty development emerged as the most critical barrier. Only 18% of faculty had received formal training in digital health pedagogy. Regression analysis identified faculty training as the strongest predictor of successful curriculum integration ($\beta=0.61$, $p<0.001$). Interview participants described faculty reluctance stemming from technological anxiety, workload concerns, and perceived irrelevance to traditional nursing roles.

In addition, the technological infrastructure in several universities is also the main obstacle. Some colleges in areas with limited access to advanced technology have difficulty implementing this technology thoroughly. This is in line with the findings of research by Lim et al. (2022) which revealed that inadequate infrastructure is one of the main inhibiting factors in the application of technology in health education (Alharbi et al., 2022; Wahyudi et al., 2021; Fadilah & Susanto, 2023).

Infrastructure deficits included unstable internet connectivity (reported by 40% of institutions), insufficient simulation equipment (60%), and limited software licenses (75%). Public universities in peripheral regions demonstrated significantly lower infrastructure readiness scores compared to private urban institutions (M=2.1 vs. M=3.8, $p<0.01$).

Significant investment is needed in lecturer training and infrastructure development so that this technology can be optimally accessed by all parties involved. Policies that support the development of digital skills for lecturers as well as the improvement of technology facilities in universities should be a priority in efforts to integrate AI and telehealth in nursing education (Lee & Hwang, 2022; Marquez et al., 2023; Suryani et al., 2021).

The Influence of Technology Integration on Global Health Care Quality

Based on survey results, students exposed to integrated AI and telehealth curricula (n=32) reported significantly higher preparedness for digital health systems (M=4.1, SD=0.7) compared to those with minimal exposure (M=3.2, SD=0.9; $t(98)=4.87$, $p<0.001$). Data shows that 65% of college students exposed to AI and telehealth technologies feel that these skills prepare them to provide more efficient and timely healthcare services (Wang et al., 2022; Pranata et al., 2023; Rasyid et al., 2023).

The implementation of this technology can accelerate clinical decision-making through faster and more accurate data analysis. This has the potential to increase the responsiveness of health systems in the face of emergency situations, such as pandemics, where remote access and digital patient monitoring are crucial (Lee et al., 2023; Zhu et al., 2021; Park et al., 2022). In the future, the use of this technology is expected to accelerate transformation in the global health care system, making the health system more inclusive and accessible to people in various regions.

In addition, data from other research shows that countries that have massively adopted telemedicine have higher levels of patient satisfaction as well as increased access to healthcare in remote areas (Smith & Tan, 2020; Dimitri et al., 2021; Lee et al., 2022). Therefore, the integration of this technology in the nursing education curriculum is essential to create a healthcare workforce that is ready to face the demands of the digital world.

Limitations

Several limitations warrant consideration when interpreting these findings. First, the purposive sampling of 10 institutions with existing technology initiatives introduces selection bias, potentially overestimating adoption rates compared to the broader Indonesian nursing education landscape. Second, reliance on self-reported competency measures may inflate confidence levels due to social desirability bias; future research should incorporate objective skills assessments such as standardized patient simulations or clinical performance evaluations. Third, the single-country focus limits generalizability to healthcare systems with different regulatory frameworks, infrastructure capacities, and cultural contexts surrounding technology adoption. Fourth, the cross-sectional design captured technology exposure at a single time point, preventing

assessment of how sustained integration over multiple semesters affects long-term competency retention and clinical performance. Finally, the study did not disaggregate which specific integration elements simulation hours, AI case complexity, faculty pedagogical approaches, or telepreceptorship models most strongly predict clinical application confidence, limiting actionable guidance for curriculum designers.

CONCLUSION

Integration of AI and telehealth in the nurse professional education program is trending upward but remains partial appearing more as electives and simulation-based modules than as part of the core curriculum. This gap is reflected in the fact that only about 40% of institutions have embedded AI content into the core curriculum, and 55% of faculty are not yet prepared to teach with technology. Although technology exposure correlates strongly with competencies in remote communication ($r = 0.67$) and data interpretation ($r = 0.58$), qualitative findings underscore a persistent theory–practice divide due to limited digital clinical infrastructure and supervision.

The implication is that strengthening nurses' digital competence requires a leap from "peripheral experiments" to full core-curriculum integration, accompanied by structured faculty training and infrastructure audits. The proposed three-tier framework actions at the institutional level (curriculum committees, infrastructure audits, industry partnerships), faculty level (40-hour training programs, learning communities, teaching resources), and student level (integrated simulations, e-portfolios, competency tracking) offers a realistic pathway for phased implementation. By closing readiness gaps and leveraging existing enablers, Indonesian nursing education can align with the increasingly digital demands of global health services while fostering a more inclusive and efficient system.

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