

Using a socio-technical strategy to identify the use and implications of generative artificial intelligence tools on nursing education and practice

John Robert BAUTISTA (jbautista@missouri.edu)^{a,b,*}

Reagan WESTENDORF (rlwtp6@missouri.edu / rlwest0612@gmail.com)^a

Olivia GOTH (osg4g6@missouri.edu)^a

^aSinclair School of Nursing, University of Missouri-Columbia, Columbia, MO, 65211

^bInstitute for Data Science and Informatics, University of Missouri-Columbia, Columbia, MO, 65211

Word count: 8,117 / 8,000

*Corresponding author

John Robert Bautista

jbautista@missouri.edu

Sinclair School of Nursing

University of Missouri-Columbia

915 Hitt St., Columbia, MO 65211

*****This is the accepted manuscript version that was accepted by the Journal of Advanced Nursing on November 7, 2025*****

Ethics approval statement

The Institutional Review Board of the University of Missouri-Columbia provided exempt approval to the study (IRB #2100218) on January 24, 2024.

Acknowledgements

John Robert Bautista was supported by a start-up grant from the Sinclair School of Nursing, University of Missouri-Columbia. Reagan Westendorf was supported by the Essig Undergraduate Research Fellowship (August-December 2024) awarded by the Sinclair School of Nursing, University of Missouri-Columbia. We thank the 32 interview participants who consented to participate in the study. We recognize the help of Monica Young for participant recruitment and transcript validation. We are grateful for the constructive feedback provided by the editor and the reviewers.

Data availability

Due to ethical reasons, the raw data would remain confidential and would not be shared. The processed data supporting this study's findings are available in the appendices.

Conflicts of Interest

The authors declare no conflicts of interest.

Declaration of Generative AI and AI-assisted technologies in the writing process

While preparing this work, the authors used Grammarly for Education to improve language and readability. After using this tool, the authors reviewed and edited the content as needed. The authors take full responsibility for the publication's content.

Using a socio-technical strategy to identify the use and implications of generative artificial intelligence tools on nursing education and practice

Abstract (300 / 300 words)

Aim: Use a socio-technical strategy to identify the use and implications of generative artificial intelligence (GenAI) tools on nursing education and practice.

Design: Descriptive qualitative study.

Method: Online interviews with 32 nursing students, faculty, and practitioners between February and April 2024. Data were analyzed using the Framework Method.

Results: Theme 1 described participants' use of eight GenAI tools across seven use cases. Theme 2 describes the implications of using GenAI tools on nursing education. The subthemes include (2.1) facing a new pedagogical reality, (2.2) negative sentiments on using GenAI tools in nursing education, and (2.3) opportunities to improve nursing education with GenAI tools. Theme 3 describes the implications of using GenAI tools on nursing practice. Subthemes include (3.1) embedding in patient care, (3.2) nursing workflow integration, and (3.3) organizational support. Theme 4 describes GenAI capacity-building. Subthemes include (4.1) to develop an AI-ready workforce, (4.2) to promote responsible and ethical use, and (4.3) to advance the nursing profession.

Conclusion: Although GenAI tools initially disrupted nursing education, it is only a matter of time before they disrupt nursing practice. Nurses across education and practice settings should be trained in the responsible and ethical use of GenAI tools to mitigate risks and maximize benefits.

Implications for the profession and/or patient care: GenAI tools will profoundly impact how nurses of today and tomorrow learn and practice the profession. It is crucial for nurses to actively

participate in shaping this technology to minimize risks and maximize benefits to the nursing profession and patient care.

Impact: This study revealed the socio-technical intricacies of using GenAI tools in nursing education and practice. We also present wicked problems that nurses will face when using GenAI tools.

Reporting Method: COREQ

Patient or Public Contribution: This study did not include patient or public involvement in its design, conduct, or reporting.

Keywords: Artificial intelligence, Generative artificial intelligence, Nursing education, Nursing Practice, Qualitative, Socio-technical

What does this paper contribute to the wider global clinical community?

- Scholars have used a socio-technical strategy to identify issues and solutions associated with nurses' use of health information technologies, such as electronic health records, clinical decision support systems, smartphones, social media, and artificial intelligence.
- This descriptive qualitative study used a socio-technical strategy to provide a theoretical understanding of the use and implications of generative artificial intelligence (GenAI) tools on nursing education and practice.
- We identified how GenAI tools are used to accomplish tasks and the implications of their use on nursing education and practice.
- We present wicked problems that nurses will face when using GenAI tools in education and practice settings.

Using a socio-technical strategy to identify the use and implications of generative artificial intelligence tools on nursing education and practice

Word count (excluding abstract and references): 8,117 / 8,000

1. Introduction

Technologies that individuals use can be viewed from a socio-technical lens, wherein interaction with technology is influenced by social and technical systems that govern its use (Bostrom & Heinen, 1977). The technical system emphasizes technology as an object (i.e., hardware or software) that enables the performance of specific tasks. On the other hand, the social system emphasizes technology as an object that interacts with individuals directly (e.g., end-users) or indirectly (e.g., individuals affected when end-users use technology), and the way it interacts with them is influenced by structures, which are composed of policies, regulations, or social norms observed in contexts where the technology is used.

In this paper, we define socio-technical strategy as examining the interaction between the components of social (people and structure) and technical (technology and task) systems to identify issues, implications, problems, or consequences associated with the use and adoption of innovations, such as technologies (Trist, 1981). The premise of a socio-technical strategy is rooted in the inherent interdependency of the social and technical systems, which results in the humanization of technologies that affect work (Mumford, 2006). Although rooted in organizational literature (Mumford, 2006; Trist, 1981), health informatics scholars have adopted a socio-technical strategy to develop potential solutions or workarounds that can be adopted at the micro (e.g., users) and macro (e.g., organizations) levels (Westbrook et al., 2007). For

instance, several works demonstrated the utility of a socio-technical strategy to identify issues and recommendations associated with nurses' use of health information technologies, such as electronic health records (Irizarry & Barton, 2013), clinical decision support systems (Jeffries et al., 2023), smartphones (Bautista & Lin, 2016), social media (Bautista et al., 2021), and artificial intelligence (Bienefeld et al., 2025). In this study, we use a socio-technical strategy to identify the use and implications of generative artificial intelligence (GenAI) tools on nursing education and practice.

2. Generative Artificial Intelligence as a Socio-Technical Phenomenon in Nursing Education and Practice

The public release of ChatGPT on November 30, 2022 catalyzed discussions on the impact of GenAI tools across industries and work settings. Compared to earlier forms of AI technologies, such as machine learning and natural language processing, GenAI can provide more nuanced reasoning and behavioral activities. For instance, ChatGPT can fine-tune responses and generate contextual and human-like outputs through a chat-based interface (Radanliev, 2025). This allows users to use ChatGPT for a plethora of work-related tasks, such as question answering, information extraction, and content generation. Because of its usefulness, ChatGPT reached a million users within five days of its release, and it is projected to reach a billion users by the end of 2025 (Duarte, 2025).

As an innovative technology that has tremendous implications, GenAI tools can have a disruptive and transformative role in the nursing profession (Topaz et al., 2024). To illustrate this, Figure 1 shows GenAI tools as a socio-technical phenomenon in nursing education and practice. Here, we view GenAI tools, such as OpenAI ChatGPT, Microsoft Copilot, and Google Gemini,

as technology that can be used to accomplish tasks (e.g., question answering, information extraction, and content generation) by those in nursing education (i.e., faculty and students) and practice (i.e., practicing nurses). It is a disruptive technology since it alters the information-seeking routine (e.g., minimizing the need to manually look for information from multiple sources) and the amount of effort (e.g., spending less time searching and writing) needed to produce an output (Lopez-Lopez et al., 2025). In the context of nursing education, students have used ChatGPT to immediately generate content for academic writing (Gunawan et al., 2024). Likewise, practicing nurses have used GenAI-enhanced electronic health records to generate initial drafts of responses to patient messages (Garcia et al., 2024). Beyond the benefits that GenAI tools can provide, examining the interaction between their social and technical systems through a socio-technical strategy uncovers problem areas (e.g., academic integrity, decreased human connection, and bias) that the nursing profession must contend with as more nursing stakeholders use and adopt this technology. In general, using a socio-technical strategy would be a useful approach to better understand the use and implications of GenAI tools on nursing education and practice.

<Insert Figure 1 here>

3. Research Gap and Questions

Several reviews have synthesized research that discusses the implications of GenAI tools on nursing education and practice (Hobensack et al., 2024; Park et al., 2024). Based on these reviews, a major limitation of existing studies is the absence of theories or frameworks that allow a better understanding of the role of GenAI tools in the nursing profession. Thus, a significant

research gap is the lack of theoretical understanding regarding the use and implications of GenAI tools on nursing education and practice. According to the World Health Organization (WHO, 2023), in-depth studies are needed to better understand the implications of AI technologies to mitigate risks and maximize benefits as AI technologies rapidly evolve. To address the abovementioned research gap and respond to the WHO's call for such studies, our work used a socio-technical strategy to provide a theoretical understanding of the use and implications of GenAI tools on nursing education and practice. By examining the interaction between social and technical components of a socio-technical phenomenon (Bostrom & Heinen, 1977; Westbrook et al., 2007) as it relates to the use of GenAI tools on nursing education and practice, we propose the following research questions (RQ):

RQ1: What are the use cases of GenAI tools for nursing education and practice?

RQ2: What are the implications of using GenAI tools in nursing education?

RQ3: What are the implications of using GenAI tools in nursing practice?

RQ4: How does the use of GenAI tools on nursing education affect nursing practice and vice versa

4. Methods

4.1. Design and theoretical framework

Consistent with previous socio-technical studies on nurses' use of health information technologies (Bautista et al., 2021; Bautista & Lin, 2016; Jeffries et al., 2023; Pettersen et al., 2025), we used a descriptive qualitative approach to answer our research questions. This approach is applicable for this study because it allows for the extraction of socio-technical interactions based on individuals' straightforward descriptions of experiences and perceptions of

using emerging health information technologies (Coiera, 2007; Doyle et al., 2020), such as nurses' experience and perceptions of using GenAI tools. Moreover, using a descriptive qualitative approach allows us to extract not only feedback based on experiences of using technology in the past but also perceived implications for the future (Bednar & Welch, 2020; Doyle et al., 2020). The study conforms to the Consolidated Criteria for Reporting Qualitative Research (COREQ) (Tong et al., 2007).

4.2. Setting, participants, and recruitment

Participants in the United States were recruited using a combination of purposive (inclusion criteria: at least 18 years old and must be a nursing student, faculty, or practitioner in the United States) and snowball sampling (i.e., potential participants were requested to share the study invite with others). We initially recruited participants through purposive sampling by sending email invites to the research teams' professional connections that fit the abovementioned inclusion criteria. They were also asked to forward our email invite to their contacts. To expand the reach of our recruitment, we posted invites to discussion boards of relevant nursing or informatics organizations, such as the Midwest Nursing Research Society, American Medical Informatics Association, and American Nursing Informatics Association. We performed maximum variation sampling to obtain rich and diverse perspectives by recruiting participants with various GenAI experiences (Chu et al., 2022; Schuetze et al., 2023).

4.3. Data collection

Online in-depth interviews via Zoom were conducted by JRB between February and April 2024. All participants completed their interviews based on their preferred schedule (i.e., no

dropouts). Participants provided verbal informed consent to participate in the study and record the interviews. Appendix A shows the semi-structured interview guide that was developed by reviewing GenAI in nursing literature (Byrne, 2023; Carroll, 2023; Hong et al., 2023; Topaz et al., 2024). Considering the novelty of this technology, participants were provided with a brief overview of what GenAI tools are. Modifications were made to the interview questions to account for emerging insights from earlier interviews and GenAI trends (e.g., Google rebranded Bard as Gemini). Participants were given a \$25 Amazon gift voucher for their time.

4.4. Data analysis

We used the Framework Method to guide our qualitative data analysis (Gale et al., 2013). This data analysis method is applicable to this study since it has been used to generate socio-technical insights based on descriptive qualitative research of health professionals' use and perceptions of health information technologies (Arendse et al., 2025; Klingberg et al., 2022). The Framework Method involves seven stages: (1) transcription, (2) familiarization with the interview, (3) coding, (4) developing a working analytical framework, (5) applying the analytical framework, (6) charting data into the framework matrix, and (7) interpreting the data (Gale et al., 2013).

Our qualitative analysis was initiated by reviewing notes after each interview. We then uploaded each interview recording into Microsoft Word for automatic transcription. To ensure accuracy, a nursing undergraduate research assistant validated each transcript. All authors (i.e., JRB is a PhD-prepared nursing faculty and RW and OG are nursing undergraduate research assistants) independently read the transcripts for qualitative immersion. The validated transcripts and interview notes were then uploaded to MAXQDA 24 for qualitative coding. All authors

individually coded the transcripts. During open coding, we performed hybrid coding by combining *in vivo* (i.e., from the data) and *a priori* codes (i.e., from the literature; Byrne, 2023; Carroll, 2023; Hong et al., 2023). We then generated axial codes by grouping open codes into meaningful conceptual bins. These axial codes served as the foundation of our themes and subthemes. The research team held meetings throughout the qualitative analysis process to resolve disagreements, develop themes, identify unique cases based on participant characteristics, assess data saturation, and engage in team-based reflexivity (Rankl et al., 2021). Additional interviews were not required since we reached data and theoretical saturation, as evidenced by the absence of new emerging themes and a well-developed coding tree supported by relevant quotes (see Appendix B).

4.5. *Ethical considerations*

The Institutional Review Board (IRB) of the University of Missouri-Columbia provided exempt approval to the study (IRB #2100218) on January 24, 2024. We uphold participant confidentiality and privacy by recording only the audio during Zoom interviews, requesting participants to use their participant ID as their Zoom name during audio recording, de-identifying interview transcripts, storing data files (audio recordings, transcripts, and participant information sheets) in password-secured and university-approved cloud storage, and limiting access to the data files among the research team.

4.6. *Rigor*

We apply the principles of credibility, transferability, dependability, and confirmability to demonstrate the rigor and trustworthiness of our work (Shenton, 2004). First, we uphold

credibility by building rapport (to elicit honest responses), performing iterative questioning (to minimize recall bias and clarify details), member checking (shared results with six participants composed of one student, two faculty, and three practitioners), and peer debriefing (acquiring peer feedback during presentation of preliminary results in an AI in Nursing workshop in July 2024 and finalized results in an AI in Nursing symposium in March 2025). Second, we uphold transferability with maximum variation sampling. Third, we uphold dependability by adhering to our approved protocol, conducting research meetings, screening participants for conflicts of interest before interviews, and using COREQ. Finally, we uphold confirmability by attributing each quote with the participants' assigned ID (e.g., Student 1, Faculty 2, Practitioner 3, etc.).

4.7. Reflexivity statement

JRB has a decade of experience conducting socio-technical research and is a PhD-prepared male nurse working as a nursing school faculty member. JRB translates his research findings by providing appropriate guidance on the responsible use of AI for teaching and learning among faculty and students within and outside of the nursing profession. His interaction with colleagues and students involving their use of AI influences his professional and personal outlook towards this technology. Nonetheless, as a socio-technical researcher, JRB's work includes examining both the positive and negative implications of technology use. As a result, his research involving nurses' use of GenAI tools accounts for both the benefits and risks, including its implications for the nursing profession.

To perform their role as undergraduate student assistants in conducting this research, JRB trained RW and OG in relevant topics, such as AI in nursing, socio-technical strategy, and qualitative research. Although JRB recognizes the value of faculty-student relationships in

fostering academic development in nursing research (Opoku-Danso et al., 2025), our team is cognizant of the potential power imbalance that comes with a mentor-mentee relationship (Mantzourani et al., 2022). To minimize power imbalance, RW and OG were constantly reminded by JRB to speak freely about their thoughts (in a respectful manner) and delegated work that they could independently perform (e.g., open and axial coding). Moreover, we also conducted regular meetings to facilitate team discussions that enhanced open communication among the team. These meetings were instrumental in obtaining diverse perspectives on interpreting the data, especially since JRB is a Millennial and RW and OG belong to Generation Z.

5. Findings

5.1. Participant characteristics

A total of 32 individual interviews ($M = 28.5$ minutes, $SD = 5.9$ minutes) were conducted among nursing stakeholders, composed of nursing students ($n = 10$), faculty ($n = 11$), and practitioners ($n = 11$). The sample size is similar to previous socio-technical health research (Bautista et al., 2021; Bautista & Lin, 2016). Aside from conducting more than 20 interviews to enhance data saturation (Wutich et al., 2024), we establish thematic saturation since no new themes were emerging (Rahimi & Khatooni, 2024). Table 1 shows a summary of their characteristics. In general, most of the participants are female, young adults, White, and have moderate GenAI experience. Nonetheless, we also included participants from other groups based on gender, age group, race, and GenAI experience.

<Insert Table 1 here>

We also enrich our data by including broad categories of participants. For instance, our 10 student participants include undergraduate (i.e., traditional BSN and pre-nursing students; $n = 6$), RN to BSN ($n = 2$), and graduate students (i.e., master's and PhD in nursing; $n = 2$). Next, our 11 faculty participants teach various courses (e.g., leadership and management, informatics, medical-surgical, community health, fundamentals, psychiatric, and research) across undergraduate ($n = 10$), master's ($n = 5$), and doctoral programs ($n = 2$). Finally, our 11 practitioner participants work in clinical ($n = 7$) or community health settings ($n = 4$) as staff nurses ($n = 3$), advanced practice nurses ($n = 4$), or administrators ($n = 4$). Those in clinical settings work in various areas, such as clinical informatics, outpatient, primary care, oncology, and pediatrics. Notably, a few practitioners are students enrolled in graduate nursing programs ($n = 4$) or faculty members in nursing schools ($n = 3$).

5.2. Theme 1: Use cases of GenAI tools for nursing education and practice (RQ1)

Figure 2 presents the coding tree, and Table 2 summarizes how GenAI tools were used by nursing students, faculty, and practitioners for nursing education and practice. Results reveal that participants used eight GenAI tools across seven use cases (UC1-UC7). ChatGPT was the most frequently used GenAI tool, and it accounted for most of the use cases (i.e., UC1-UC5), followed by Copilot (i.e., UC1, UC2, UC4, and UC6) and Perplexity (UC1, UC3, UC4, and UC7). GenAI tools were mostly used for nursing education but are primarily driven by faculty (i.e., six GenAI tools for six use cases: UC1-UC5 and UC7) rather than student use (i.e., five GenAI tools for four use cases: UC1, UC4, UC6, and UC7). In contrast, using GenAI tools for nursing practice was limited as practitioners used just two GenAI tools (i.e., ChatGPT and Copilot) for three (i.e., UC1, UC2, and UC4) use cases. Appendix B provides relevant quotes for each use case.

<Insert Figure 2 here>

<Insert Table 2 here>

5.3. Theme 2: Implications of using GenAI tools on nursing education (RQ2)

We uncovered three subthemes describing the implications of using GenAI tools on nursing education: (1) Facing a new pedagogical reality; (2) Negative sentiments on using GenAI tools in nursing education; and (3) Opportunities to improve nursing education with GenAI tools. Figure 3 shows the coding tree.

<Insert Figure 3 here>

5.3.1. Subtheme 2.1: Facing a new pedagogical reality

GenAI tools are “*here to stay and we’ve got to figure out a way to incorporate AI into students and what they’re doing*” (Faculty 9, Undergraduate and graduate faculty). This pedagogical reality is what nursing schools must face, as both faculty and students are now increasingly exposed to GenAI tools in their daily lives. At the time of the study, students and faculty expressed that their nursing schools do not have an established policy by which it should be used. A typical scenario is that AI use guidelines might exist at the university level, but they are less likely to be reflected in nursing schools' course syllabi or faculty handbooks. “*I don’t know that we have a policy that says sort of the parameter [of how to use it]. In fact, I don’t think we do. We don’t have [a policy] about the use of AI. I’m sure it’s coming, but there really isn’t anything developed at the moment.*” (Faculty 4, Graduate faculty)

Faculty participants also described how their colleagues' attitudes toward GenAI tools influenced the development and implementation of such tools for teaching and learning. For instance, faculty in favor of it are likely to have policies regulating its use, while those against it would not have any. *"50% of my colleagues have written a policy and put it in their syllabus. So, it's that 50% is a really interesting line because it's the 50% who are embracing, 50% are not and hate it. It goes hand in hand with the policy. You embrace AI, you have a policy. You hate AI, you're putting your head in the sand."* (Faculty 9, Undergraduate and graduate faculty).

Variations in use guidelines might have a negative implication for students since they create confusion and uncertainty about whether GenAI tools should be used. *"I have not been told that I could or couldn't use these [GenAI tools]"* (Student 9, BSN student). This creates an impression wherein GenAI tools should not be used as part of nursing education. *"Honestly, I feel like it's not currently used in nursing education right now. I guess you can use it like individually but I think that a lot of professors are weary of incorporating it into our learning."* (Student 3, BSN student)

5.3.2. Subtheme 2.2: Negative sentiments on using GenAI tools in nursing education

Participants expressed three negative sentiments about using GenAI tools in nursing education: (1) skepticism that students would use it responsibly; (2) violations of academic integrity; and (3) reduced critical thinking, creativity, and skills.

First, faculty expressed skepticism that students would use it responsibly. This sentiment is due to the potential misuse of GenAI tools outside of nursing. *"There are already a number of stories of people using GenAI tools to fake things, to fake people's voices, to fake people's images."* (Faculty 2, Director of graduate nursing informatics program). Faculty feel that they

are unable to guide students with the responsible use of GenAI tools because of a lack of understanding of this technology. *“I don't know how it can be used or integrated successfully and beneficially and I just really don't know a whole lot about it except that I've heard it has not been really great.”* (Faculty 10, Undergraduate faculty). Among students, one expressed their skepticism of GenAI tools being used in nursing education. *“All I see is a disadvantage... introducing myself to a software [GenAI tools] which will give me answer for everything rather than looking for it. That is, that is hard for me to accept”* (Student 8, PhD student)

Second, misusing GenAI tools can lead to violations of academic integrity, as expressed by faculty and a practitioner who has a faculty appointment. A common academic integrity violation is plagiarism in writing-related tasks. This concern was viewed from two sides. For faculty, it is a challenge to detect if a submitted work was written by GenAI. This creates doubt about students' compliance with academic integrity. *“What faculty are going through now is they can't trust anything students submit. They feel like if there's a discussion question or a short essay... students are always going to use ChatGPT because it works well, students are time-constrained, and it's a shortcut. I know faculty have gone back to like handwritten essays and handwritten tests”* (Practitioner 9, Informatics nurse administrator). For students, relying on GenAI tools puts them at risk of disciplinary actions due to violations of academic integrity. *“ChatGPT lacks the citations, so there will be a huge red flag in writing academic papers. So academic integrity issues would be the first thing that I can think of”* (Faculty 1, Undergraduate faculty).

The abovementioned negative sentiments predispose faculty and students to believe that its use could reduce critical thinking, creativity, and skills. In the context of writing papers, Student 5 (PhD nursing student) shared that *“writing skills could be offloaded to generative AI*

and not be developed.” Moreover, given the focus on the output (e.g., submitting the assignment) rather than the process (e.g., learning to write by completing the assignment), Faculty 9 (Undergraduate and graduate faculty) believed that *“it discourages critical thinking potentially. That would be the disadvantage of generative AI.”* Although GenAI tools facilitate rapid search for information, the skill and creativity in finding rich information might be lost. *“Being dependent on the information that will be given... if they [nursing students] are not going to be careful, it's going to be... absorbing everything that the AI gives them. So, it may curb their creativity”* (Faculty 1, Undergraduate faculty). Moreover, there is a concern that reduced critical thinking can reduce nursing students' capability to identify biases in GenAI outputs. *“GenAI tends to have some of the same biases that we do in the communities and that's different ethnic groups, genders, all kinds of people. Their information may not be included in where the AI collects information. So, the information it spits out to us may ignore those groups”* (Faculty 3, Undergraduate faculty).

5.3.3. Subtheme 2.3: Opportunities to improve nursing education with GenAI tools

Despite the negative aspects of its use, participants expressed three opportunities wherein the use of GenAI tools can improve nursing education: (1) facilitating efficiency, (2) advancing accessibility, and (3) improving learning.

Faculty and students believe that using GenAI tools facilitates efficiency in information seeking. For students, it can provide immediate and concise answers to facilitate learning. *“It compiles information from many different sources to give you one concise answer and they were all pretty quick in doing so”* (Student 3, BSN student). Moreover, GenAI tools allow faculty to immediately find information to complete their teaching tasks. *“I type in the key concepts that*

the students mentioned throughout the week and then it [ChatGPT] generates a nice summary. That takes 30 seconds and about 5 minutes to edit it. In the past, it would take me about 15 minutes to generate those kinds of summaries” (Faculty 9, Undergraduate and graduate faculty). Moreover, the efficiency brought by using GenAI tools allows faculty to cope with teaching-related issues (e.g., heavy workload and low salary). *“We are paid way too little and worked way too hard. AI has just improved our workload of gazillion times”* (Faculty 9, Undergraduate and graduate faculty).

Faculty also suggest that GenAI tools advance accessibility in nursing education. For instance, it can be a tool *“to meet their [students’] different learning styles”* (Faculty 1, Undergraduate faculty). Moreover, since not all faculty come from institutions that have adequate access to teaching materials, GenAI tools were described as containing *“a wealth of information for us to be able to tap into that we really don’t have easy access to right now”* (Faculty 4, Graduate faculty). Nonetheless, faculty are mindful about the responsible use of that accessible information from GenAI tools. *“I think it might be a great resource, but they need to understand that they have to comprehend it and they can’t copy and paste”* (Faculty 11, Undergraduate faculty).

Faculty and students also expressed optimism wherein GenAI tools can help improve learning, despite their drawbacks. Among faculty, a major concern in nursing education is that students are susceptible to cognitive overload. With GenAI tools, it is possible to mitigate cognitive overload, which can then enhance learning. *“Our students are cognitively overloaded with information that is available. I see a lot of potential in just the use of AI tools and how we can utilize those to reduce cognitive overload in our students”* (Faculty 8, Undergraduate and graduate faculty). GenAI can also act as a virtual tutor or mentor that can improve students’

learning experience. *“I think generative AI as a mentor to help you understand information at all hours is really valuable. You can take an abstract and really difficult-to-understand ideas and subjects and break them down into digestible information”* (Student 5, PhD nursing student).

5.4. Theme 3: Implications of using GenAI tools on nursing practice (RQ3)

We uncovered three subthemes describing the implications of GenAI tools on nursing practice: (1) embedding in patient care; (2) nursing workflow integration; and (3) organizational support. Figure 4 shows the coding tree.

<Insert Figure 4 here>

5.4.1. Subtheme 3.1: Embedding in patient care

Practitioners noted that GenAI tools will be embedded in patient care. This is an anticipated future considering that *“every tool that we can provide that would help support the clinical staff and effectively taking care of patients should be explored and utilized”* (Practitioner 11, Nursing professional development nurse administrator). Besides, practitioners suggested that nurses need to be familiar with GenAI tools because patients are also using them for health information seeking. *“We need to be current, and we need to be adaptable. Our patients are using this technology [GenAI tools]. We need to know how they're using it, why they're using it, and how we can serve our patients better through it”* (Practitioner 2, Home health nurse). Some examples of where GenAI tools can be used as part of patient care in the clinical setting include the development of care plans and discharge instructions. *“I do see generative AI being one of the underlying software in avatars that patients will speak to in a digital setting, whether through*

video chats, phone calls, or texts, in which we offload some of the more time-intensive and repetitive conversations that nurses have” (Practitioner 8, Informatics nurse administrator). On the other hand, practitioners in the community health setting think that it can help with generating patient education materials and locating community resources. *“I think it [GenAI tools] would be helpful with finding community resources to bring to our clients during home visits*” (Practitioner 5, Community health nurse).

Despite its potential benefits, participants are cautious or skeptical of its use for patient care. For instance, practitioners shared that privacy concerns can hamper its development and availability. *“I think it's [GenAI tools] going to be slower to develop and make available for clinical staff because there is a patient privacy component [in clinical settings].”* (Practitioner 11, Nursing professional development nurse administrator). Moreover, practitioners were concerned with GenAI tools’ information quality given their potential for hallucination and bias. *“I want to make sure that the answers formulated by these AI search engines were evidence-based and not just pulling from Web MD or sources that aren't trustworthy”* (Practitioner 6, Family nurse practitioner). Finally, a clinical instructor noted that the uncertainty of not knowing how GenAI tools work can endanger the patient. *“I don't want to say that it would contribute to unsafe care, but not knowing a whole lot about it [GenAI], the clients could be very easily taken advantage of or abused in ways with the insertion of AI into their plan of care”* (Faculty 10, Undergraduate faculty).

5.4.2. Subtheme 3.2: Nursing workflow integration

GenAI tools would eventually be integrated into nurses’ workflow. As one practitioner shared, *“I think whether we like it or not, nurses are going to use these [GenAI tools] just like*

they used early search engines” (Practitioner 9, Informatics nurse administrator). We present subthemes regarding workflow integration in the context of decision-making, information seeking, and documentation.

For practitioners, GenAI tools can aid in decision-making since they can be used to digest large amounts of information that could lead to timely recommendations. *“Generative AI [can] make those suggestions much quicker than it would be for us to run all of that data ourselves manually. [It can] analyze a large amount of data and then be able to kind of spit out a suggestion of what’s the best way to target a specific pattern or disease process”* (Practitioner 4, Community health nurse). A practitioner also noted that GenAI tools can be an effective decision aid tool if they can interface with patients’ electronic health records. *“Generative AI tools are not going to be able to be maximally helpful unless they are linked to the patient’s electronic health record, so that inferences can be made about very specific patient factors, because the more specific the recommendations are, the more actionable and helpful they are for nurses”* (Practitioner 8, Informatics nurse administrator). On the other hand, another practitioner noted that GenAI tools do not supersede a nurse’s judgment and decision-making process. *“You really don’t want to turn into somebody who just parrots somebody else’s thoughts [referring to GenAI tools], and you really need to be independent thinkers. I think this is as long as it’s a tool to spark a thought... it would be wise for everyone to approach this technology with caution”* (Practitioner 2, Home health nurse).

Considering that nurses engage in information seeking as part of nursing practice, practitioners shared insights on how GenAI tools can influence nurses’ information-seeking workflow. *“I really see a potential for these [AI] tools to be utilized that can produce an actionable result with the best practice in mind. I love Copilot because it references the actual*

articles and I'd like to see it pull in more scholarly articles.” (Practitioner 11, Nursing professional development nurse administrator). However, practitioners also caution that GenAI tools can provide biased and inaccurate responses that could harm patients. *“The biggest concern I have is bias. It then perpetuates that bias through the outputs that LMM [large language model] produces. It's probably my number one concern, closely followed by its capacity for producing outputs that are incorrect. I mean hallucinations or outputs that are not correct for the clinical context and could result in harm”* (Practitioner 9, Informatics nurse administrator). Given both the advantages and disadvantages of integrating GenAI tools as part of information seeking in nursing practice, it is crucial that nurses continuously monitor this technology and evaluate the output it produces. *“I think having [nursing] experts in a particular area test out the various tools to see how it checks out. You want them [GenAI tools] to give the right kinds of answers and not steer people off onto the wrong track, because medicine and subsequently nursing have become increasingly more complex”* (Practitioner 7, Vascular access nurse specialist).

Students and practitioners also shared ideas on how GenAI tools will be part of the documentation workflow. For students, there is the belief that documentation is *“one of the toughest things to do in nursing practice”* (Student 6, Undergraduate student), and there is hope that GenAI tools can be used to make it easier, especially for new nurses. *“One of the most difficult parts about being in a hospital for your first time is learning charting. I think [Generative] AI could [help and] potentially in the future have a positive impact on helping people navigate the chart so that we're using it to its full potential”* (Student 4, Undergraduate student). Nonetheless, practitioners noted that students should still learn the basics of documentation. *“I'll be honest, I do think that, especially new nurses, they need to learn the skill*

of writing. I think that's important. I think it's important that they learn how to write before they start using something like artificial intelligence” (Practitioner 1, Oncology nurse manager).

Among practitioners, GenAI tools can help in generating a first draft report of patient interaction.

“I'm aware of initiatives [in our hospital] that Epic can generate patient summaries and end-of-shift notes. Significant events and the interventions delivered in a concise form that can be edited by nurses.” (Practitioner 8, Informatics nurse administrator). Aside from clinical documentation, some practitioners think that GenAI tools can assist them with writing reports related to their work as leaders or administrators. *“I was playing around with it [Copilot] to help [write] a background for a grant for my policy development... Also, I foresee it being helpful for managers. Like starting to write evaluations or reviews because I think that's kind of the most time-consuming writing that nursing leadership does”* (Practitioner 3, Pediatric nursing practice leader).

5.4.3. Subtheme 3.3: Organizational support

Practitioners described how their respective organizations have supported the use of GenAI tools. For instance, some organizations have started or planned to allow them to use GenAI tools to improve writing (UC1), generate texts (UC2), and information seeking (UC4). Those that have been allowed to use it were situated in three academic medical centers that allowed access to “off the shelf” versions of ChatGPT (in one academic medical center) or Copilot (in all three academic medical centers). *“In our Nursing Leadership Group, another nursing practice leader shared that our hospital had acquired Copilot and gave a brief overview of our login ability”* (Practitioner 3, Pediatric nursing practice leader). Other practitioners mentioned that they use Copilot since their academic medical center, being part of a university

system, have an enterprise subscription to Microsoft applications. *“We have a major medical system. That is part of our university. I think our university has made Microsoft Copilot available [for staff of the medical system]”* (Faculty 2, Director of graduate nursing informatics program). As a result, hospitals are likely to instruct their staff to use Copilot. *“There was information put out [by the hospital management] about which AI programs we are allowed to use in our system. Right now it's only Microsoft [Copilot]”* (Practitioner 1, Oncology nurse manager). While adoption of GenAI tools might occur initially in clinical settings, a practitioner from a local public health agency indicated their organization’s potential adoption of Copilot. *“We’re connected through Google, but we are going to be moving to Microsoft pretty soon, so I can imagine there is that potential that we would be using Copilot”* (Practitioner 4, Community health nurse).

Aside from commercially available GenAI tools, practitioners shared that their academic medical centers are developing custom GenAI tools. *“There's two parts. There's using the off the shelf tools like ChatGPT and Bing chat [now Copilot]. [Another] it's around the development of generative AI tools using our own institutional data”* (Practitioner 11, Informatics nurse administrator). These practitioners also expressed that their organizations are developing custom GenAI tools to ensure the confidentiality of protected health information. *“The main concern is any confidential information. Putting it into a public domain... with any protected health information... that wouldn't be appropriate to place into like ChatGPT”* (Practitioner 11, Nursing professional development nurse administrator). Practitioners emphasized that academic medical centers support the development of custom GenAI tools to fulfill their organizational mission. *“My workplace is very vocal about wanting to be the number one global leader for digital*

health. For example, I got a \$1,000,000 grant to work on this” (Practitioner 8, Informatics nurse administrator).

5.5. Theme 4: GenAI capacity-building efforts (RQ4)

We present a theme referred to as “GenAI capacity-building efforts” to describe how the use of GenAI tools in nursing education affects nursing practice and vice versa. These are reflected in three subthemes: (1) To develop an AI-ready workforce; (2) To promote responsible and ethical use; and (3) To advance the nursing profession. Figure 5 shows the coding tree.

<Insert Figure 5 here>

5.5.1. Subtheme 4.1: To develop an AI-ready workforce

Participants raised the need for capacity-building among nursing stakeholders (i.e., faculty, practitioners, and students) to develop an AI-ready nursing workforce. *“I don't think in five years from now that the way that we practice today will be the way that we practice tomorrow... new nurses coming need to have a baseline understanding of how to prompt these [GenAI] systems to get an output that would be helpful in a clinical environment”* (Practitioner 11, Nursing professional development nurse administrator). Within nursing education, a faculty shared that faculty capacity building is a priority as they will be the ones responsible for teaching learners (e.g., students or practitioners). *“If we are going to want to educate students and nurses, we first have to educate the educators. We have to make sure that the faculty who are tasked with teaching this first understand it to be able to teach that”* (Faculty 5, informatics undergraduate and graduate faculty). However, one faculty noted a key barrier to faculty capacity building on

GenAI. *“I think the biggest barrier is going to be who's the [AI] expert to tell us how we set this up or to tell us how to use this the best way”* (Faculty 8, Undergraduate and graduate faculty).

Practitioners also shared that those in nursing practice must work with those in nursing education to align the curriculum on how GenAI tools are used in nursing practice.

“Foundational knowledge about how generative AI tools work and critically understanding their limitations and how we might respond to those must be integrated into nursing and other health profession education because their integration into clinical practice is inevitable and coming very soon” (Practitioner 8, Informatics nurse administrator). However, a faculty noted that nursing faculty members will have to rely on practitioners to educate new nurses about GenAI tools being used in practice since it takes time for nursing schools to incorporate GenAI in the curriculum. *“If they (students) weren't trained in nursing education [about GenAI], which they most likely won't be... and nurses take forever to incorporate new stuff in their education, I think orientation or during a [nursing] residency is the best way to get nurses up to speed until nursing education can get a new grad up to speed”* (Faculty 9, Undergraduate and graduate faculty).

5.5.2. Subtheme 4.2: To promote responsible and ethical use

Practitioners emphasize the need for capacity building to promote the responsible and ethical use of GenAI tools to minimize risks and maximize benefits. A practitioner shared that nursing faculty should integrate GenAI tools in classes so that students learn about the responsible and ethical use of GenAI tools. *“What we need to do is use them well and [for faculty to] teach people [students] how to use them... there's the ethical component of it that we still need to continue to grapple with. But, I definitely am on the pro-AI [side]. I think we should*

explore it and start playing with it. I think there's great potential there to optimize how nurses operate within the clinical setting" (Practitioner 11, Nursing professional development nurse administrator). As explained by a practitioner, teaching students about the responsible and ethical use of GenAI tools will not only promote adherence to academic integrity principles but also contribute to their development as safe and competent nurses when they start to practice. *"I think what faculty, students, and academic administrators have to negotiate is what is [the] appropriate use [of GenAI tools]... figuring out how to make assignments so that students... understand responsible use. Also, when to use it and not in a clinical context because it could produce dangerous results"* (Practitioner 9, Informatics nurse administrator). Besides, allowing students to use GenAI tools as part of class activities could be a safe space to foster responsible and ethical use of GenAI tools in nursing practice. *"Students may go down the route of leaning on generative AI as the pilot, and not know that they're doing [it] wrong or not know that they are not learning the [nursing] skills that they need"* (Student 5, PhD nursing student).

5.5.3. Subtheme 4.3: To advance the nursing profession

Practitioners noted that nurses are just starting to learn the role and implications of GenAI on the nursing profession. *"I've been in nursing education recently. I don't think they're [faculty] as familiar [with GenAI]. Potentially, some of the gap between generative AI being implemented into nursing practice, [there is a] lack of understanding of how it works. There's a large lack of knowledge [among] many nurses in nursing as a whole"* (Practitioner 4, Community health nurse). Thus, there is a need for GenAI capacity-building efforts in both nursing education and practice settings as a means of advancing our profession. *"I think they [nursing students and practitioners] do need to be part of that and be aware of how it's being used currently in*

practice, and maybe they generate an idea of how it could be used in nursing, specifically for nurses” (Faculty 7, RN-BSN informatics faculty). As one practitioner added, educating nurses on GenAI tools ensures that nurses will be able to make informed decisions to ensure that GenAI tools benefit the nursing profession. “Without that level of competency, nurses are inevitably going to be victims of the decisions made about us without us” (Practitioner 8, Informatics nurse administrator).

6. Discussion

This paper presents a theoretical understanding of the implications of GenAI tools in the nursing profession. Specifically, we used a socio-technical strategy (Bostrom & Heinen, 1977; Trist, 1981; Westbrook et al., 2007) to examine how nursing stakeholders, such as nursing students, faculty, and practitioners, use GenAI tools, including the implications of their use on nursing education and practice. Overall, our findings contribute to research that demonstrates the usefulness of a socio-technical strategy to better understand nurses' use and adoption of emerging technologies. The following sections provide an integrative discussion of the study's key findings.

6.1. Implications of GenAI tools on nursing education

Our results suggest that the use of GenAI tools is more evident in nursing education than in nursing practice in early 2024. However, within nursing education, faculty were more likely to use a variety of GenAI tools (six out of seven tools in Table 2) across several use cases (six out of seven use cases in Table 2) compared to students. A potential reason is that, at the time of the study, nursing schools might not have yet fully implemented GenAI use policies, which has led

to confusion about appropriate use among students. Given that GenAI tools are becoming widely used in higher education (Wang & Fan, 2025), it is crucial for nursing schools and their faculty to explicitly provide instructions on GenAI use (Kobeissi, 2023). For instance, faculty can adopt one of three possible AI-use statements in their syllabus (i.e., AI integration allowed, limited AI use permitted, or AI usage prohibited; University of Missouri, 2025) based on the extent to which GenAI can be used in class activities. Doing this would allow faculty and students to reduce the risks and maximize the benefits of using GenAI tools as part of nursing education. This also fosters a safe environment wherein students and faculty can responsibly and ethically use GenAI tools as part of nursing education.

6.2. Implications of GenAI tools on nursing practice

Our findings provide insights into the state of GenAI use in nursing practice. Similar to the development of electronic health records (Evans, 2016), GenAI tools for healthcare were initially developed and used in clinical settings, particularly in academic medical centers. Moreover, we found two paths to adoption. The first path involves using commercially available GenAI tools (e.g., use of an enterprise version of Microsoft Copilot) while the second path involves using custom (i.e., home-grown) GenAI tools. Although the first path involves less cost (e.g., smaller investment in research and development), the second path provides greater functionality since it can be customized to safely interface with electronic health records data. This pathway enables nurses from these institutions to obtain first-hand experience in designing and developing cutting-edge GenAI tools for patient care (e.g., GenAI-assisted documentation), which foster greater nurse-driven innovation (Schanilec, 2025). Regardless of the pathway, it is crucial that nurses in these institutions are involved in the design, development, and deployment

of GenAI tools. Historically, nurses' suggestions have been neglected in the development of electronic health records (Black Book Research, 2014). To avoid this situation, it is crucial that nurses across nursing education (Cary et al., 2025) and practice (Yakusheva et al., 2025) become competent in GenAI. This involves curricular alignment that reflects advances in GenAI, making investments in the development of nurse scientists, and providing research support for nurse-led GenAI research endeavors.

6.3. GenAI capacity building among nursing stakeholders to address wicked problems

Overall, our findings indicate that using GenAI tools, be it in the context of nursing education or practice, has both advantages and disadvantages, which lead to wicked problems. A wicked problem is defined as *“a class of social system problems which are ill formulated, where the information is confusing, where there are many clients and decision makers with conflicting values, and where the ramifications in the whole system are thoroughly confusing”* (Churchman, 1967, B-141). It is particularly challenging to come up with a definite solution to a wicked problem, and potential interventions to address it may be suboptimal, thus leading to uncertainty and an undefined endpoint (Westbrook et al., 2007). In the context of nursing education, using GenAI tools can enhance learning by reducing cognitive workload among faculty and students. However, these benefits come with risks, such as potential reduction to critical thinking (Durmuş Sarıkahya et al., 2025) and student mistrust of faculty-developed teaching materials (Berlinerblau, 2025). Likewise, in the context of nursing practice, GenAI tools are seen as a potential technology that could reduce nurses' workload and improve patient care. However, challenges reminiscent of implementing electronic health records (Harrington et al., 2011; Zandieh et al., 2008), such as poor workflow integration, lack of organizational support, and data

privacy risks, are roadblocks that have to be dealt with. Despite the risks involved in using GenAI tools in nursing education and practice, this technology is here to stay, and discouraging nurses from using it in both education and practice settings will not resolve these wicked problems. Nonetheless, identifying and acknowledging these wicked problems in this study is a path towards potential solutions that nurses (along with other health professionals) will develop in the future. A potential solution is to start capacity-building efforts for nurses to enable them to actively participate in the design, development, and deployment of GenAI tools in healthcare.

6.4. Strengths, limitations, and future research directions

This study is one of the first to explicitly present a theoretical understanding of the implications of GenAI tools in nursing education and practice through a socio-technical strategy. Moreover, the results were derived from various nursing stakeholders, such as students, faculty, and practitioners. Despite these strengths, we are cognizant of the limitations of the study. Given the fast pace at which GenAI advances, the findings only provide a snapshot of how the participants perceived GenAI tools during the first half of 2024. This might have changed by the time of the study's publication. However, we believe that the insights provided here can serve as a baseline for how the initial adoption of GenAI tools has influenced nursing education and practice. Moreover, the findings should be interpreted within the context of nursing education and practice in the US. Given differences in nursing education and practice across countries, we call for more socio-technical research that examines how GenAI tools influence the nursing profession between countries.

7. Conclusion

This study found that GenAI tools initially disrupted nursing education as reflected by the use of eight GenAI tools across seven use cases, compared to two GenAI tools in three use cases for nursing practice. However, it is only a matter of time before GenAI tools disrupt nursing practice. This is evidenced by the presence of support from health institutions for nurses to use and develop GenAI tools to enhance both patient care and nursing workflow. Despite the potential benefits of GenAI tools across nursing education and practice, our findings also brought to light wicked problems that need to be addressed as nurses adopt GenAI tools. Thus, it is crucial that we begin training nurses on the use of GenAI tools. Capacity building is needed not only because it advances the nursing profession or contributes to the development of an AI-ready workforce, but, more importantly, it paves the way for the responsible and ethical use of GenAI tools that could mitigate risks and maximize benefits across education and practice settings. Overall, our socio-technical work forecasts that GenAI tools will have profound implications for how nurses of today and tomorrow learn and practice the profession.

References

- Arendse, K. D., Day, S., Guzha, B. T., Ras, T., Sills, V. A., Tegama, N., Moodley, J., Walter, F. M., & Scott, S. E. (2025). Health Care Workers' Perspectives on the Barriers and Facilitators to Digital Health Technology Use to Support Symptomatic Cancer Diagnosis in Southern Africa: Qualitative Study. *Journal of Medical Internet Research*, 27, e68412–e68412. <https://doi.org/10.2196/68412>

- Bautista, J. R., & Lin, T. T. C. (2016). Sociotechnical analysis of nurses' use of personal mobile phones at work. *International Journal of Medical Informatics*, 95, 71–80.
<https://doi.org/10.1016/j.ijmedinf.2016.09.002>
- Bautista, J. R., Zhang, Y., & Gwizdka, J. (2021). Healthcare professionals' acts of correcting health misinformation on social media. *International Journal of Medical Informatics*, 148, 104375. <https://doi.org/10.1016/j.ijmedinf.2021.104375>
- Bednar, P. M., & Welch, C. (2020). Socio-Technical Perspectives on Smart Working: Creating Meaningful and Sustainable Systems. *Information Systems Frontiers*, 22(2), 281–298.
<https://doi.org/10.1007/s10796-019-09921-1>
- Berlinerblau, J. (2025, May 17). *The difficult reason more professors today are turning to ChatGPT*. MSNBC.Com. <https://www.msnbc.com/opinion/msnbc-opinion/are-professors-using-chatgpt-college-classes-rcna207138>
- Bienefeld, N., Keller, E., & Grote, G. (2025). AI Interventions to Alleviate Healthcare Shortages and Enhance Work Conditions in Critical Care: Qualitative Analysis. *Journal of Medical Internet Research*, 27(1), e50852. <https://doi.org/10.2196/50852>
- Black Book Research. (2014, October 17). *Hospital Nurses Forced to Develop Creative Workarounds to Deal with EHR ...* <https://blackbookmarketresearch.com/hospital-nurses-forced-to-develop-creative-workarounds-to-deal-with-ehr-8>
- Bostrom, R. P., & Heinen, J. S. (1977). MIS Problems and Failures: A Socio-Technical Perspective. Part I: The Causes. *MIS Quarterly*, 1(3), 17–32.
<https://doi.org/10.2307/248710>
- Byrne, M. D. (2023). Generative Artificial Intelligence and ChatGPT. *Journal of PeriAnesthesia Nursing*, 38(3), 519–522. <https://doi.org/10.1016/j.jopan.2023.04.001>

- Carroll, W. M. (2023). Generative AI in clinical practice and operations. *Nursing Management*, 54(10), 56. <https://doi.org/10.1097/nmg.0000000000000056>
- Cary, M. P., Grady, S. D., McMillian-Bohler, J., Bessias, S., Silcox, C., Silva, S., Guilamo-Ramos, V., McCall, J., Sperling, J., & Goldstein, B. A. (2025). Building competency in artificial intelligence and bias mitigation for nurse scientists and aligned health researchers. *Nursing Outlook*, 73(3). <https://doi.org/10.1016/j.outlook.2025.102395>
- Chu, D., Lessard, D., Laymouna, M. A., Engler, K., Schuster, T., Ma, Y., Kronfli, N., Routy, J.-P., Hijal, T., Lacombe, K., Sheehan, N., Rougier, H., & Lebouché, B. (2022). Understanding the Risks and Benefits of a Patient Portal Configured for HIV Care: Patient and Healthcare Professional Perspectives. *Journal of Personalized Medicine*, 12(2), Article 2. <https://doi.org/10.3390/jpm12020314>
- Churchman, C. W. (1967). Wicked Problems. *Management Science*, 14(4,), B141–B142. <http://www.jstor.org/stable/2628678>
- Coiera, E. (2007). Putting the technical back into socio-technical systems research. *International Journal of Medical Informatics*, 76, S98–S103. <https://doi.org/10.1016/j.ijmedinf.2006.05.026>
- Doyle, L., McCabe, C., Keogh, B., Brady, A., & McCann, M. (2020). An overview of the qualitative descriptive design within nursing research. *Journal of Research in Nursing*, 25(5), 443–455. <https://doi.org/10.1177/1744987119880234>
- Duarte, F. (2025, October 2). *Number of ChatGPT Users (October 2025)*. Exploding Topics. <https://explodingtopics.com/blog/chatgpt-users>
- Durmuş Sarikahya, S., Özbay, Ö., Torpuş, K., Usta, G., & Çınar Özbay, S. (2025). The impact of ChatGPT on nursing education: A qualitative study based on the experiences of faculty

- members. *Nurse Education Today*, 152, 106755.
<https://doi.org/10.1016/j.nedt.2025.106755>
- Evans, R. S. (2016). Electronic Health Records: Then, Now, and in the Future. *Yearbook of Medical Informatics, Suppl 1*, S48–S61. <https://doi.org/10.15265/IYS-2016-s006>
- Gale, N. K., Heath, G., Cameron, E., Rashid, S., & Redwood, S. (2013). Using the framework method for the analysis of qualitative data in multi-disciplinary health research. *BMC Medical Research Methodology*, 13(1), 117. <https://doi.org/10.1186/1471-2288-13-117>
- Garcia, P., Ma, S. P., Shah, S., Smith, M., Jeong, Y., Devon-Sand, A., Tai-Seale, M., Takazawa, K., Clutter, D., Vogt, K., Lugtu, C., Rojo, M., Lin, S., Shanafelt, T., Pfeffer, M. A., & Sharp, C. (2024). Artificial Intelligence–Generated Draft Replies to Patient Inbox Messages. *JAMA Network Open*, 7(3), e243201.
<https://doi.org/10.1001/jamanetworkopen.2024.3201>
- Gunawan, J., Aunguroch, Y., & Montayre, J. (2024). ChatGPT integration within nursing education and its implications for nursing students: A systematic review and text network analysis. *Nurse Education Today*, 141, 106323.
<https://doi.org/10.1016/j.nedt.2024.106323>
- Harrington, L., Kennerly, D., & Johnson, C. (2011). Safety Issues Related to the Electronic Medical Record (EMR): Synthesis of the Literature from the Last Decade, 2000-2009. *Journal of Healthcare Management*, 56(1), 31.
https://journals.lww.com/jhmonline/abstract/2011/01000/safety_issues_related_to_the_electronic_medical.6.aspx
- Hobensack, M., von Gerich, H., Vyas, P., Withall, J., Peltonen, L.-M., Block, L. J., Davies, S., Chan, R., Van Bulck, L., Cho, H., Paquin, R., Mitchell, J., Topaz, M., & Song, J. (2024).

A rapid review on current and potential uses of large language models in nursing.

International Journal of Nursing Studies, 154, 104753.

<https://doi.org/10.1016/j.ijnurstu.2024.104753>

Hong, M., Shin, H., Kim, S. S., & De Gagne, J. C. (2023). Nurse Educators' Perceptions and Experiences of Generative Artificial Intelligence: A Cross-Sectional Study Analysis. *CIN: Computers, Informatics, Nursing*, 10.1097/CIN.0000000000001273.

<https://doi.org/10.1097/CIN.0000000000001273>

Hsiao, S. (2024, February 8). *Bard becomes Gemini: Try Ultra 1.0 and a new mobile app today.*

Google. <https://blog.google/products/gemini/bard-gemini-advanced-app/>

Irizarry, T., & Barton, A. J. (2013). *A Sociotechnical Approach to Successful Electronic Health...*

Clinical Nurse Specialist. 27(6), 283–285. [https://journals.lww.com/cns-](https://journals.lww.com/cns-journal/FullText/2013/11000/A_Sociotechnical_Approach_to_Successful_Electronic.3.aspx?casa_token=__ctTFK685cAAAAA:zPerchzfGOCW3huZPC4JSXGqhmLRXA8f-Z4Fo9pyBMjXWjytUvOxfTnx7f_bMjrsehA4rHKD7UOQrvfcG9V7jkze7Q&casa_token=tyJZ99q-B8IAAAAA:XXhHIks7qvrwaaIXcY0uhgSIUbbO04LidDgXJJsvyTdkjLS7gPJipHfPOjlIkGx2AFCsy7zPTt8Wcmkro34EDJiJg)

[\[B8IAAAAA:XXhHIks7qvrwaaIXcY0uhgSIUbbO04LidDgXJJsvyTdkjLS7gPJipHfPOjlIkGx2AFCsy7zPTt8Wcmkro34EDJiJg\]\(https://journals.lww.com/cns-journal/FullText/2013/11000/A_Sociotechnical_Approach_to_Successful_Electronic.3.aspx?casa_token=__ctTFK685cAAAAA:zPerchzfGOCW3huZPC4JSXGqhmLRXA8f-Z4Fo9pyBMjXWjytUvOxfTnx7f_bMjrsehA4rHKD7UOQrvfcG9V7jkze7Q&casa_token=tyJZ99q-B8IAAAAA:XXhHIks7qvrwaaIXcY0uhgSIUbbO04LidDgXJJsvyTdkjLS7gPJipHfPOjlIkGx2AFCsy7zPTt8Wcmkro34EDJiJg\)](https://journals.lww.com/cns-journal/FullText/2013/11000/A_Sociotechnical_Approach_to_Successful_Electronic.3.aspx?casa_token=__ctTFK685cAAAAA:zPerchzfGOCW3huZPC4JSXGqhmLRXA8f-Z4Fo9pyBMjXWjytUvOxfTnx7f_bMjrsehA4rHKD7UOQrvfcG9V7jkze7Q&casa_token=tyJZ99q-</p></div><div data-bbox=)

Jeffries, M., Salema, N.-E., Laing, L., Shamsuddin, A., Sheikh, A., Avery, T., Chuter, A., Waring, J., & Keers, R. N. (2023). Using sociotechnical theory to understand medication safety

work in primary care and prescribers' use of clinical decision support: A qualitative study.

BMJ Open, 13(4), e068798. <https://doi.org/10.1136/bmjopen-2022-068798>

Klingberg, S., Motlhatlhedhi, M., Mabena, G., Mooki, T., Verdezoto, N., Densmore, M., Norris, S.

A., & Network, on behalf of the C. (2022). "Must you make an app?" A qualitative

- exploration of socio-technical challenges and opportunities for designing digital maternal and child health solutions in Soweto, South Africa. *PLOS Global Public Health*, 2(12), e0001280. <https://doi.org/10.1371/journal.pgph.0001280>
- Kobeissi, M. M. (2023). Artificial Intelligence Syllabus Statement: Setting Expectations. *Nurse Educator*, 48(5), 275. <https://doi.org/10.1097/NNE.0000000000001456>
- Lopez-Lopez, E., Abels, C. M., Holford, D., Herzog, S. M., & Lewandowsky, S. (2025). Generative artificial intelligence-mediated confirmation bias in health information seeking. *Annals of the New York Academy of Sciences*, 1550(1), 23–36. <https://doi.org/10.1111/nyas.15413>
- Mantzourani, E., Chang, H., Desselle, S., Canedo, J., & Fleming, G. (2022). Reflections of mentors and mentees on a national mentoring programme for pharmacists: An examination into relationships, personal and professional development. *Research in Social and Administrative Pharmacy*, 18(3), 2495–2504. <https://doi.org/10.1016/j.sapharm.2021.04.019>
- Mumford, E. (2006). The story of socio-technical design: Reflections on its successes, failures and potential. *Information Systems Journal*, 16(4), 317–342. <https://doi.org/10.1111/j.1365-2575.2006.00221.x>
- Opoku-Danso, R., Commey, I. T., Agyare, D. F., Owusu, G., Amoadu, M., & Abraham, S. A. (2025). Quality faculty-nursing students' relationship: A systematic review of facilitators, barriers, and impact on students. *BMC Nursing*, 24, 925. <https://doi.org/10.1186/s12912-025-03580-1>
- Park, G. E., Kim, H., & Go, U. R. (2024). Generative artificial intelligence in nursing: A scoping review. *Collegian*, 31(6), 428–436. <https://doi.org/10.1016/j.colegn.2024.10.004>

- Pettersen, S., Eide, H., & Berg, A. (2025). The self-perceived role of tech champions in municipal healthcare services—A descriptive qualitative study. *BMC Health Services Research*, 25(1), 856. <https://doi.org/10.1186/s12913-025-12994-1>
- Radanliev, P. (2025). Artificial intelligence: Reflecting on the past and looking towards the next paradigm shift. *Journal of Experimental & Theoretical Artificial Intelligence*, 37(7), 1045–1062. <https://doi.org/10.1080/0952813X.2024.2323042>
- Rahimi, S., & khatooni, M. (2024). Saturation in qualitative research: An evolutionary concept analysis. *International Journal of Nursing Studies Advances*, 6, 100174. <https://doi.org/10.1016/j.ijnsa.2024.100174>
- Rankl, F., Johnson, G. A., & Vindrola-Padros, C. (2021). Examining What We Know in Relation to How We Know It: A Team-Based Reflexivity Model for Rapid Qualitative Health Research. *Qualitative Health Research*, 31(7), 1358–1370. <https://doi.org/10.1177/1049732321998062>
- Schanilec, K. (2025, September 17). Mayo Clinic nurses lead the way with AI-powered Nurse Virtual Assistant. *Mayo Clinic News Network*. <https://newsnetwork.mayoclinic.org/discussion/mayo-clinic-nurses-lead-the-way-with-ai-powered-nurse-virtual-assistant/>
- Schuetze, L., Srivastava, S., Missenye, A. M., Rwezaula, E. J., Stoermer, M., & Allegri, M. D. (2023). Factors Affecting the Successful Implementation of a Digital Intervention for Health Financing in a Low-Resource Setting at Scale: Semistructured Interview Study With Health Care Workers and Management Staff. *Journal of Medical Internet Research*, 25(1), e38818. <https://doi.org/10.2196/38818>

Shenton, A. K. (2004). Strategies for ensuring trustworthiness in qualitative research projects.

Education for Information, 22(2), 63–75. <https://doi.org/10.3233/EFI-2004-22201>

Tong, A., Sainsbury, P., & Craig, J. (2007). Consolidated criteria for reporting qualitative research (COREQ): A 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*, 19(6), 349–357.

<https://doi.org/10.1093/intqhc/mzm042>

Topaz, M., Peltonen, L.-M., Michalowski, M., Stiglic, G., Ronquillo, C., Pruinelli, L., Song, J., O, 'Connor Siobhan, Miyagawa, S., & Fukahori, H. (2024). The ChatGPT Effect: Nursing Education and Generative Artificial Intelligence. *Journal of Nursing Education*, 0(0), 1–4. <https://doi.org/10.3928/01484834-20240126-01>

Trist, E. L. (1981). *The Evolution of Socio-technical Systems: A Conceptual Framework and an Action Research Program*. Ontario Ministry of Labour, Ontario Quality of Working Life Centre.

University of Missouri. (2025). *Syllabus Information*. Office of the Provost.

<https://provost.missouri.edu/faculty-affairs/syllabus-information/>

Wang, J., & Fan, W. (2025). The effect of ChatGPT on students' learning performance, learning perception, and higher-order thinking: Insights from a meta-analysis. *Humanities and Social Sciences Communications*, 12(1), 621. <https://doi.org/10.1057/s41599-025-04787-y>

Westbrook, J. I., Braithwaite, J., Georgiou, A., Ampt, A., Creswick, N., Coiera, E., & Iedema, R. (2007). Multimethod Evaluation of Information and Communication Technologies in Health in the Context of Wicked Problems and Sociotechnical Theory. *Journal of the*

- American Medical Informatics Association : JAMIA*, 14(6), 746–755.
<https://doi.org/10.1197/jamia.M2462>
- World Health Organization. (2023). *Regulatory considerations on artificial intelligence for health*. World Health Organization. <https://iris.who.int/handle/10665/373421>
- Wutich, A., Beresford, M., & Bernard, H. R. (2024). Sample Sizes for 10 Types of Qualitative Data Analysis: An Integrative Review, Empirical Guidance, and Next Steps. *International Journal of Qualitative Methods*, 23, 16094069241296206.
<https://doi.org/10.1177/16094069241296206>
- Yakusheva, O., Bouvier, M. J., & Hagopian, C. O. P. (2025). How Artificial Intelligence is altering the nursing workforce. *Nursing Outlook*, 73(1).
<https://doi.org/10.1016/j.outlook.2024.102300>
- Zandieh, S. O., Yoon-Flannery, K., Kuperman, G. J., Langsam, D. J., Hyman, D., & Kaushal, R. (2008). Challenges to EHR Implementation in Electronic- Versus Paper-based Office Practices. *Journal of General Internal Medicine*, 23(6), 755–761.
<https://doi.org/10.1007/s11606-008-0573-5>

Table 1. Participant characteristics

Characteristics	Students (<i>n</i> = 10)	Faculty (<i>n</i> = 11)	Practitioners (<i>n</i> = 11)	Overall (<i>N</i> = 32)
Gender				
Female	7 (70%)	9 (82%)	9 (82%)	25 (78%)
Male	3 (30%)	2 (18%)	2 (18%)	7 (22%)
Age group				
Young adults (18-39)	9 (90%)	1 (9%)	5 (45%)	15 (47%)
Middle-aged adults (40-59)	1 (10%)	3 (27%)	4 (37%)	8 (25%)
Older adults (60+)	0 (0%)	7 (64%)	2 (18%)	9 (28%)
Race				
White	8 (80%)	10 (91%)	9 (82%)	27 (84%)
Asian	2 (20%)	1 (9%)	1 (9%)	4 (13%)
Black	0 (0%)	0 (0%)	1 (9%)	1 (3%)
GenAI experience				
None (not using it)	4 (40%)	2 (18%)	2 (18%)	8 (25%)
Limited (rarely used it)	2 (20%)	2 (18%)	4 (37%)	8 (25%)
Moderate (used it sometimes)	3 (30%)	4 (37%)	2 (18%)	9 (28%)
Extensive (used it always)	1 (10%)	3 (27%)	3 (27%)	7 (22%)

Table 2. Use cases per GenAI tool

Use cases (UC) per GenAI tool	Students	Faculty	Practitioners	Overall
1. ChatGPT				
UC1. Improve writing	3	2	3	8
UC2. Generating text (e.g., purpose statements; recommendation letters for students; document summaries; patient care summaries; rubrics)	0	4	1	5
UC3. Developing class activities (e.g., create case studies or test questions)	0	3	0	3
UC4. Information seeking (e.g., literature search; asking clinical questions)	0	2	1	3
UC5. Virtual assistant (e.g., grading papers and reviewing student work)	0	1	0	1
2. Claude				
UC5. Virtual assistant (e.g., provide mentorship about research papers)	1	0	0	1
3. Copilot				
UC1. Improve writing	0	1	0	1
UC2. Generate text (e.g., meeting summary; drafting recommendation letters for students)	0	1	1	2
UC4. Information seeking (e.g., asking clinical questions)	0	0	1	1
UC6. Brainstorming (e.g., quiz preparation)	1	0	0	1
4. Perplexity				
UC1. Improve writing	0	1	0	1
UC3. Developing class activities (e.g., create case studies)	0	1	0	1
UC4. Information seeking	0	1	0	1
UC7. Obtaining feedback (e.g., recommend a journal based on abstract)	1	0	0	1
5. Gemini				
UC1. Improve writing	2	1	0	3
UC4. Information seeking (e.g., literature search; synonym)	1	1	0	2
6. Grammarly				
UC1. Improve writing	1	0	0	1
7. Hello History				
UC4. Information seeking (e.g., obtaining information from a historical figure like Florence Nightingale)	0	1	0	1
8. Yoodli				
UC7. Obtaining feedback (e.g., presentation skills)	0	1	0	1

Figure 1. GenAI tools as a socio-technical phenomenon in nursing education and practice

Figure 2. Theme 1 coding tree: Use cases of GenAI tools for nursing education and practice

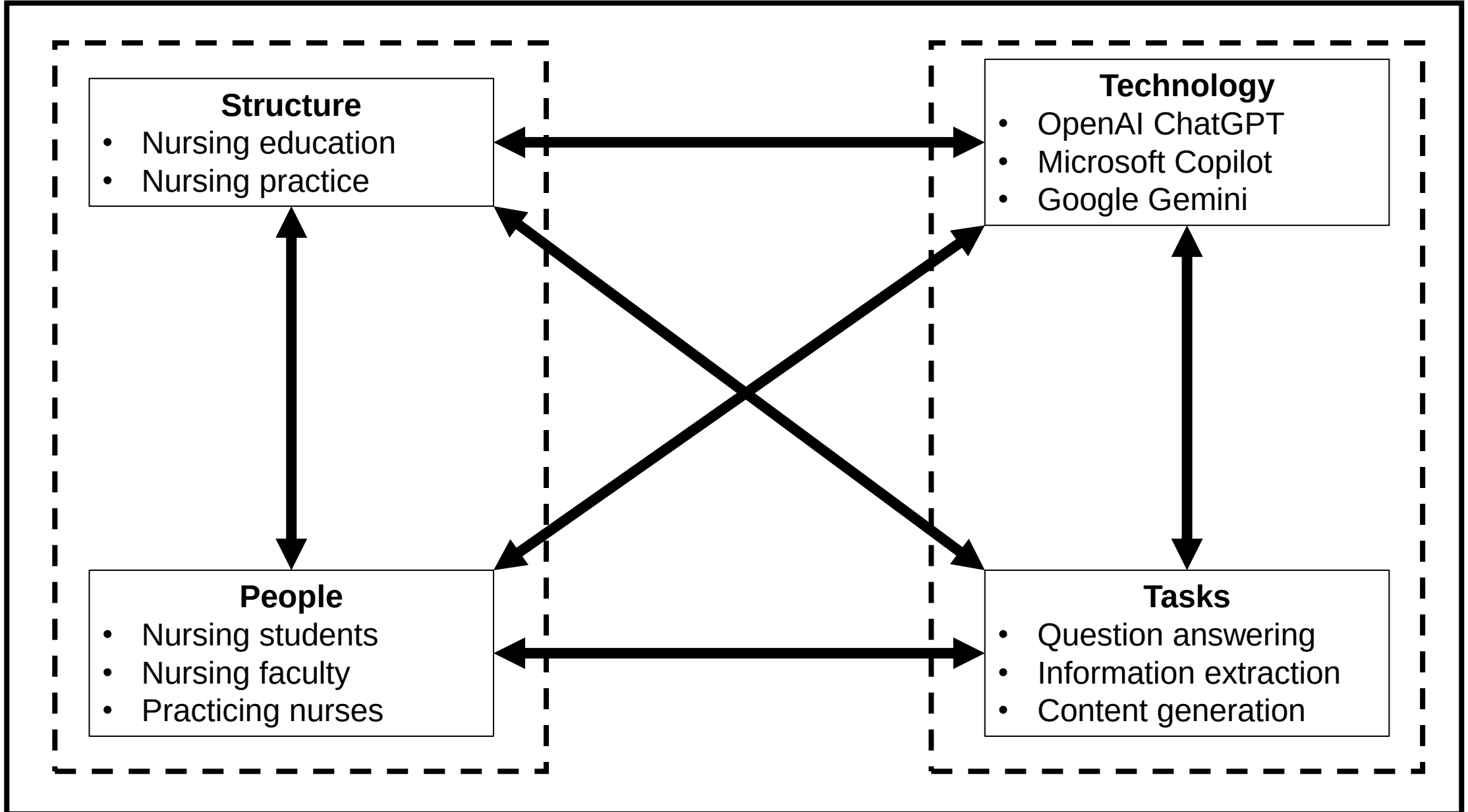
Figure 3. Theme 2 coding tree: Implications of using GenAI tools on nursing education

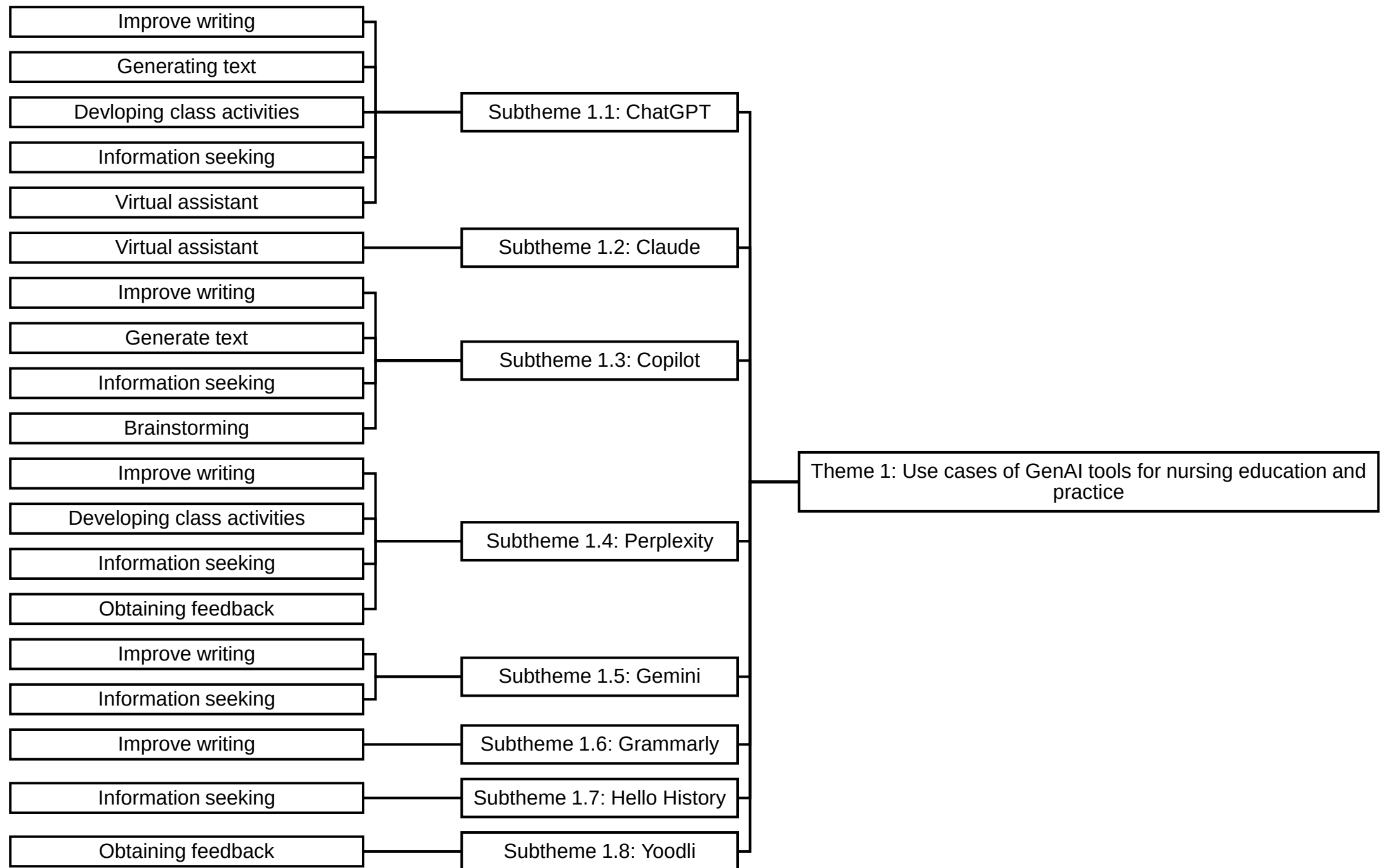
Figure 4. Theme 3 coding tree: Implications of using GenAI tools on nursing practice

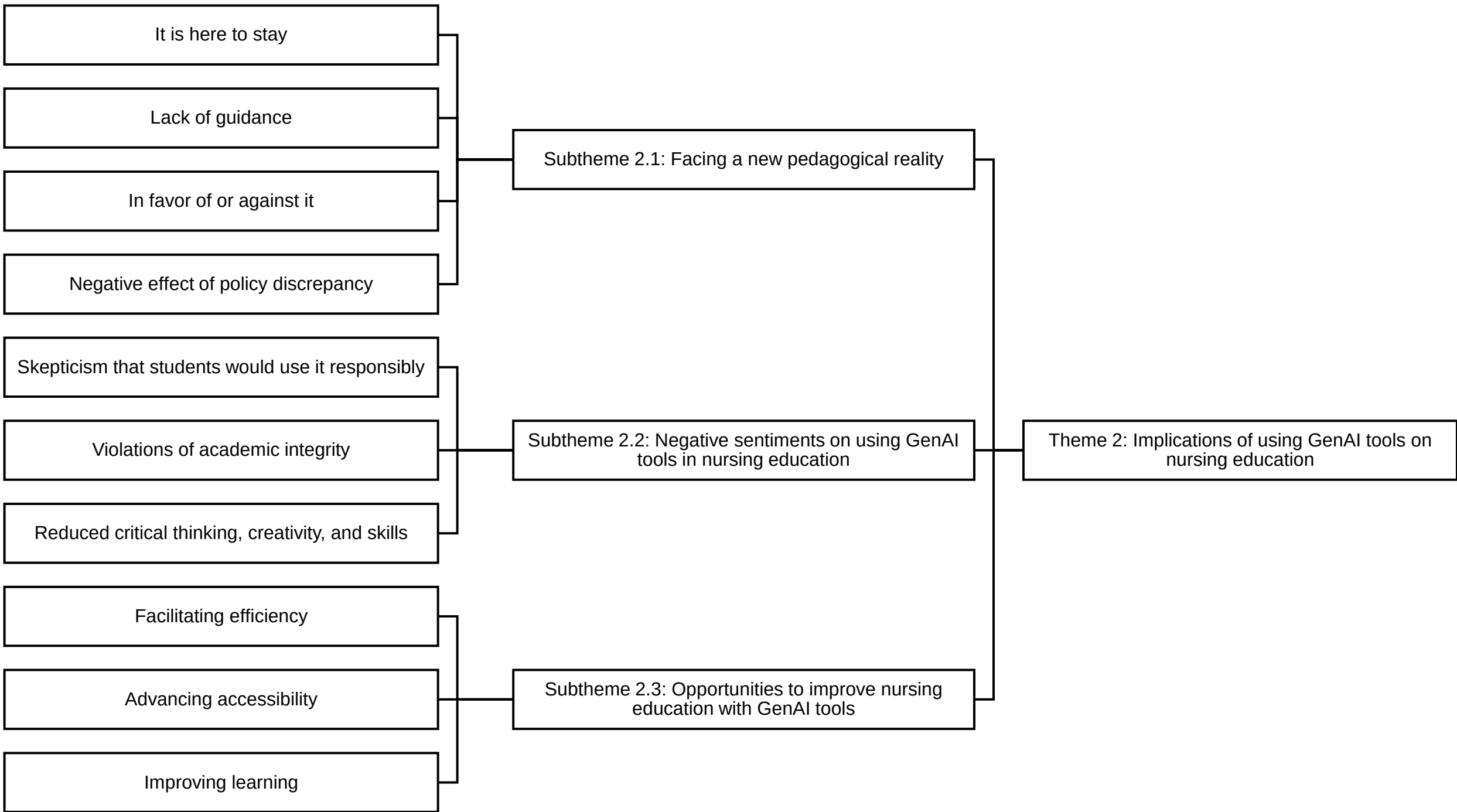
Figure 5. Theme 4 coding tree: GenAI capacity-building efforts

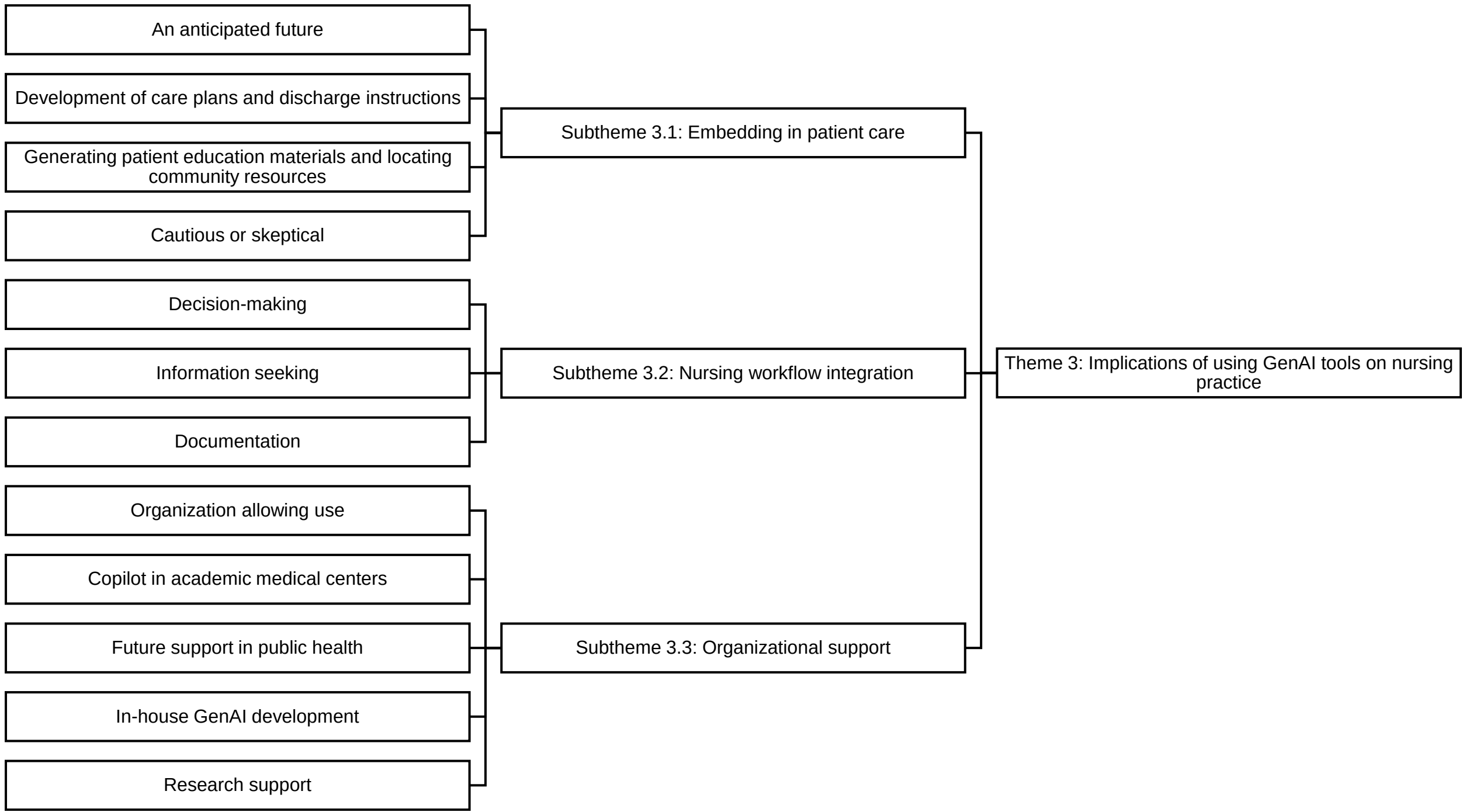
Social System

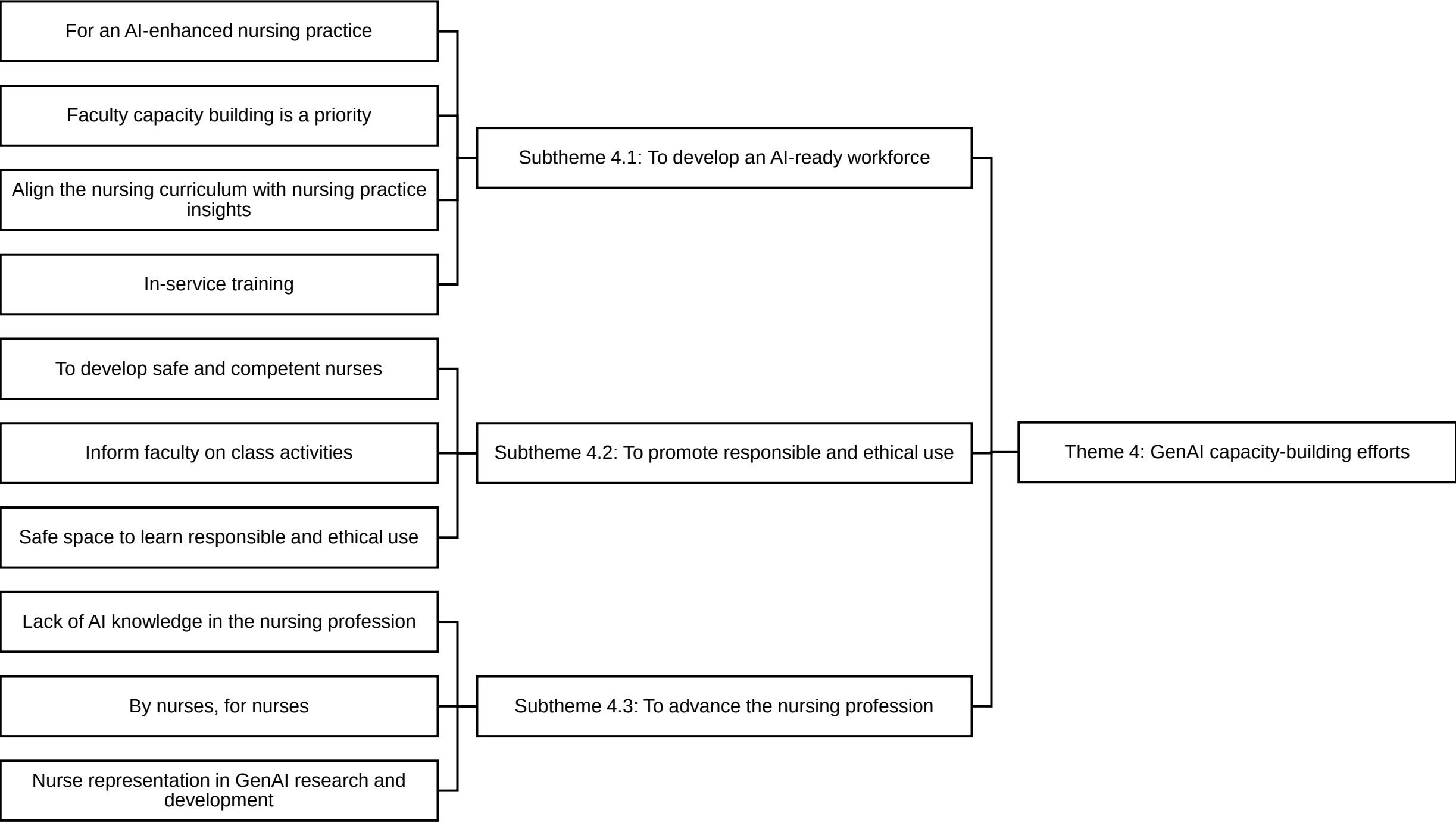
Technical System











Appendix A: Interview guide

Introduction

Good day! Thank you for attending this interview to discuss the risks and opportunities of using generative artificial intelligence (GenAI) in nursing education and practice. My name is [interviewer], and I am an [interviewer's affiliation].

You are here to discuss your perspectives and, if applicable, experiences using GenAI tools. GenAI tools are a type of AI that can create new content, such as text, images, audio, music, and videos. We will focus on text-based GenAI, such as ChatGPT (developed by OpenAI), Bard (developed by Google), and Bing Chat (developed by Microsoft). Insights from this study will help us better understand how GenAI can influence nursing education and practice.

There are no wrong answers. Please feel free to share your point of view, even if it differs from the majority. Remember that we're just as interested in negative comments as positive ones; sometimes the negative comments are the most helpful.

I will be recording this interview via Zoom because I would like to capture all of your remarks. People often say very helpful things during such interviews, and I can't write fast enough to get them all down.

Please replace your Zoom name with your designated participant number. During the recorded part of the interview, do not mention your name or the name of your workplace. Please be assured that I won't use any details that could identify you in our reports, and transcripts produced from the interview will be de-identified. Again, thank you for participating in this study. Let me know if we can start the interview.

Part 1: Demographics and work background

1. Demographics:
 - Gender
 - Age
 - Race
 - Highest educational attainment
2. Background:
 - Role (student/faculty/practitioner)
 - A brief description of current role

[Start Zoom recording]

Part 2: Familiarity with GenAI in general

3. Please share your familiarity with GenAI programs like ChatGPT, Bard, or Bing Chat?
 - How did you know about it?
4. Have you experienced using any of them?
 - If yes: when?

- If yes: mobile or desktop?
- If yes: what purpose?
- If no: why?

Part 3: GenAI in nursing education

5. What comes to your mind when GenAI is used in nursing education.
 - How can it educate nurses?
 - Explore legal and ethical issues.
 - Explore positive and negative implications.
 - Explore use cases.
6. Should nurses at any level (students or practitioners) be trained in using GenAI programs?
 - Experience of actual training.
 - How should the training look like?
 - What topics?
 - Who are the stakeholders in such training?

Part 4: GenAI in nursing practice

7. What comes to your mind when GenAI is used in nursing practice.
 - How can it enhance nursing practice?
 - Explore legal and ethical issues.
 - Explore positive and negative implications.
 - Explore use cases.
8. To what extent should GenAI programs be used in nursing practice?
 - Explore actual experience of using GenAI to guide nursing practice.
 - Who are the stakeholders in making it part of nursing practice?

Part 5: Concluding questions

9. Do you have any other insights that you want to share with me? Please feel free to share anything.
10. Do you have any comments or suggestions about this interview?

[End of Zoom recording]

Appendix B. Coding tree and quotes

Theme 1: Use cases of GenAI tools for nursing education and practice (RQ1)	Representative quotes
Subtheme 1.1. ChatGPT	
UC1. Improve writing	<i>"I found ChatGPT to be a bit more comprehensive and give better writing feedback."</i> (Faculty 2)
UC2. Generating text (e.g., purpose statements; recommendation letters for students; document summaries; patient care summaries; rubrics)	<i>"With ChatGPT, a lot of what I've done is have it rewrite or analyze content and summarize what that content is. So, I have to write a lot of SBARs. So, the situation, background, assessment, [and] recommendations."</i> (Practitioner 11)
UC3. Developing class activities (e.g., create case studies or test questions)	<i>"I kind of gave ChatGPT a scenario [about] a patient [with], age, sex, and a medical condition, and asked it to create a care plan."</i> (Faculty 2)
UC4. Information seeking (e.g., literature search; asking clinical questions)	<i>"I would ask [ChatGPT] about certain research studies, if I had general questions."</i> (Practitioner 5)
UC5. Virtual assistant (e.g., grading papers and reviewing student work)	<i>"I use ChatGPT to grade papers as well and reviewing student work."</i> (Faculty 3)
Subtheme 1.2. Claude	
UC5. Virtual assistant (e.g., provide mentorship about course topics)	<i>"Generative AI [Claude] kind of helped me learn [Python programming] faster, almost have like a private mentor, and since then, my coursework has aligned with those generative AI models."</i> (Student 5)
Subtheme 1.3. Copilot	
UC1. Improve writing	<i>"I give a lot of writing feedback and that one's the Microsoft Copilot has a character limit on what you can supply. So that makes it a little harder sometimes to use."</i> (Faculty 2)
UC2. Generate text (e.g., meeting summary; drafting recommendation letters for students)	<i>"We record [meetings in Microsoft Teams] and then have [Copilot produce] a summary of the meeting, and have it come up with action items. [Before] we were spending so much time with just trying to capture meeting minutes and action items."</i> (Practitioner 11)
UC4. Information seeking (e.g., asking clinical questions)	<i>"They [nurses in Practitioner 9's] can access Copilot in some contexts. They can open [Microsoft] Bing and Bing will allow them to use a Copilot, and there's nothing stopping them from asking clinical questions."</i> (Practitioner 9)
UC6. Brainstorming (e.g., quiz preparation)	<i>"I asked it [Copilot] some questions. I was studying for one of my exams in nursing school and I asked it like, oh, help me study for a growth and development exam for nursing and it gave me some like prompts and like questions and let me quiz myself on."</i> (Student 3)
Subtheme 1.4. Perplexity	
UC1. Improve writing	<i>"I've used them [ChatGPT and Perplexity] for writing purposes, like purpose statements, just to see like how it would phrase or what ideas it gives."</i> (Faculty 8)
UC3. Developing class activities (e.g., create case studies)	<i>"I've used them to develop case studies. Kind of throw in idea there and seeing what ChatGPT or Perplexity could come up with or help me come up with."</i> (Faculty 8)
UC4. Information seeking	<i>"I have used...Perplexity and I actually like it a fair amount. And one of the reasons that I like it is because it gives you these answers and then it usually gives you related questions that you can look at and then it also provides you with some resources."</i> (Faculty 5)

UC7. Obtaining feedback (e.g., recommend a journal based on abstract)	<i>"I have utilized another online LLM called Perplexity that accesses the Internet similar to Copilot, and I would put in my abstract. Based on this abstract, what journals would be most likely to be a fit." (Student 5)</i>
Subtheme 1.5. Gemini	
UC1. Improve writing	<i>"Sometimes Chat GPT or Gemini tries to be smart and they start producing hard words. So, when I read something like this, I go back to my Grammarly app or I go back to word and then I try to rewrite it in simpler words using synonyms." (Student 8)</i>
UC4. Information seeking (e.g., literature search; synonym)	<i>"I was doing a research literature review trying to use Gemini. Gemini is a hit or miss. I've actually seen it make up an article and the way you can tell, it's making up an article. It has the journal, the year, and the title, and that's it." (Faculty 9)</i>
Subtheme 1.6. Grammarly	
UC1. Improve writing	<i>"I also use a Grammarly app for my writing. So I kind of check many times that sentence which one is producing more understandable or easy words." (Student 8)</i>
Subtheme 1.7. Hello History	
UC4. Information seeking (e.g., obtaining information from a historical figure like Florence Nightingale)	<i>"I also did the Hello History with them [Traditional BSN students] in the informatics course...I did Florence [Nightingale] and Clara Barton in the population health because they were being tested on historical nurses." (Faculty 7)</i>
Subtheme 1.8. Yoodli	
UC7. Obtaining feedback (e.g., presentation skills)	<i>"It's [YOODLI] an artificial intelligence where you can practice doing a presentation and it will critique you...give suggestions on how to rephrase certain statements. So, I'm having my students do that before an upcoming presentation." (Faculty 7)</i>
Theme 2: Implications of using GenAI tools on nursing education (RQ2)	Representative quotes
Subtheme 2.1. Facing a new pedagogical reality	
It is here to stay	<i>"It is here to stay and we've got to figure out a way to incorporate AI into students and what they're doing." (Faculty 9)</i>
Lack of guidance	<i>"I don't know that we have a policy that says sort of the parameter [of how to use it]. In fact, I don't think we do. We don't have about the use of AI. I'm sure it's coming, but there really isn't anything developed at the moment." (Faculty 4)</i>
In favor of or against it	<i>50% of my colleagues have written a policy and put it in their syllabus. So, it's that 50% is a really interesting line because it's the 50% who are embracing, 50% are not and hate it. It goes hand in hand with the policy. You embrace AI, you have a policy. You hate AI, you're putting your head in the sand (Faculty 9).</i>
Negative effect of policy discrepancy	<i>"Honestly, I feel like it's not currently used in nursing education right now. I guess you can use it like individually but I think that a lot of professors are weary of incorporating it into our learning." (Student 3)</i>
Subtheme 2.2. Negative sentiments on using GenAI tools in nursing education	

Skepticism that students would use it responsibly	<i>"I don't know how it can be used or integrated successfully and beneficially and I just really don't know a whole lot about it except that I've heard it has not been really great." (Faculty 10)</i>
Violations of academic integrity	<i>"What faculty are going through now is they can't trust anything students submit. They feel like if there's a discussion question or a short essay... students are always going to use ChatGPT because it works well, students are time-constrained, and it's a shortcut. I know faculty have gone back to like handwritten essays and handwritten tests" (Practitioner 9)</i>
Reduced critical thinking, creativity, and skills	<i>"Being dependent on the information that will be given... if they [nursing students] are not going to be careful, it's going to be... absorbing everything that the AI gives them. So, it may curb their creativity" (Faculty 1).</i>
Subtheme 2.3. Opportunities to improve nursing education with GenAI tools	
Facilitating efficiency	<i>"I type in the key concepts that the students mentioned throughout the week and then it [ChatGPT] generates a nice summary. That takes 30 seconds and about 5 minutes to edit it. In the past, it would take me about 15 minutes to generate those kinds of summaries." (Faculty 9)</i>
Advancing accessibility	<i>"a wealth of information for us to be able to tap into that we really don't have easy access to right now." (Faculty 4)</i>
Improving learning	<i>"I think generative AI as a mentor to help you understand information at all hours is really valuable. You can take an abstract and really difficult-to-understand ideas and subjects and break them down into digestible information." (Student 5)</i>
Theme 3. Implications of using GenAI tools on nursing practice (RQ3)	Representative quotes
Subtheme 3.1. Embedding in patient care	
An anticipated future	<i>"We need to be current, and we need to be adaptable. Our patients are using this technology [GenAI tools]. We need to know how they're using it, why they're using it, and how we can serve our patients better through it." (Practitioner 2)</i>
Development of care plans and discharge instructions	<i>"I do see generative AI being one of the underlying software in avatars that patients will speak to in a digital setting, whether through video chats, phone calls, or texts, in which we offload some of the more time-intensive and repetitive conversations that nurses have." (Practitioner 8)</i>
Generating patient education materials and locating community resources	<i>"I think it [GenAI tools] would be helpful with finding community resources to bring to our clients during home visits." (Practitioner 5)</i>
Cautious or skeptical	<i>"I want to make sure that the answers formulated by these AI search engines were evidence-based and not just pulling from Web MD or sources that aren't trustworthy." (Practitioner 6)</i>
Subtheme 3.2. Nursing workflow integration	
Decision-making	<i>"Generative AI [can] make those suggestions much quicker than it would be for us to run all of that data ourselves manually. [It can] analyze a large amount of data and then be able to kind of spit out a suggestion of what's the best way to target a specific pattern or disease process." (Practitioner 4)</i>

Information seeking	<i>"I really see a potential for these [AI] tools to be utilized that can produce an actionable result with the best practice in mind. I love Copilot because it references the actual articles and I'd like to see it pull in more scholarly articles."</i>
Documentation	<i>"One of the most difficult parts about being in a hospital for your first time is learning charting. I think [Generative] AI could [help and] potentially in the future have a positive impact on helping people navigate the chart so that we're using it to its full potential." (Student 4)</i>
Subtheme 3.3. Organizational support	
Organization allowing use	<i>"In our nursing Leadership Group, another nursing practice leader shared that our hospital had acquired Copilot and gave a brief overview of our login ability." (Practitioner 3)</i>
Copilot in academic medical centers	<i>"We have a major medical system. That is part of our university. I think our university has made Microsoft Copilot available [for staff of the medical system]." (Faculty 2)</i>
Future support in public health	<i>"We're connected through Google, but we are going to be moving to Microsoft pretty soon, so I can imagine there is that potential that we would be using Copilot" (Practitioner 4)</i>
In-house GenAI development	<i>"There's two parts. There's using the off the shelf tools like ChatGPT and Bing chat [now Copilot]. [Another] it's around the development of generative AI tools using our own institutional data." (Practitioner 11)</i>
Research support	<i>My workplace is very vocal about wanting to be the number one global leader for digital health. For example, I got a \$1,000,000 grant to work on this" (Practitioner 8)</i>

Theme 4. GenAI capacity-building efforts (RQ4)	Representative quotes
Subtheme 4.1. To develop an AI-ready workforce	
For an AI-enhanced nursing practice	<i>"I don't think in five years from now that the way that we practice today will be the way that we practice tomorrow... new nurses coming need to have a baseline understanding of how to prompt these [GenAI] systems to get an output that would be helpful in a clinical environment." (Practitioner 11)</i>
Faculty capacity building is a priority	<i>If we are going to want to educate students and nurses, we first have to educate the educators. We have to make sure that the faculty who are tasked with teaching this first understand it to be able to teach that" (Faculty 5)</i>
Align the nursing curriculum with nursing practice insights	<i>"Foundational knowledge about how generative AI tools work and critically understanding their limitations and how we might respond to those must be integrated into nursing and other health profession education because their integration into clinical practice is inevitable and coming very soon." (Practitioner 8)</i>
In-service training	<i>"If they (students) weren't trained in nursing education [about GenAI], which they most likely won't be... and nurses take forever to incorporate new stuff in their education, I think orientation or during a [nursing] residency is the best way to get nurses up to speed until nursing education can get a new grad up to speed" (Faculty 9)</i>
Subtheme 4.2. To promote responsible and ethical use	
To develop safe and competent nurses	<i>"I think what faculty, students, and academic administrators have to negotiate is what is [the] appropriate use [of GenAI tools]... figuring out how to make assignments so that students..."</i>

Inform faculty on class activities	<i>understand responsible use. Also, when to use it and not in a clinical context because it could produce dangerous results.” (Practitioner 9)</i>
Safe space to learn responsible and ethical use	<i>“What we need to do is use them well and teach people how to use them... there's the ethical component of it that we still need to continue to grapple with. But, I definitely am on the pro-AI [side]. I think we should explore it and start playing with it. I think there's great potential there to optimize how nurses operate within the clinical setting.” (Practitioner 11)</i>
Subtheme 4.3. To advance the nursing profession	<i>“Students may go down the route of leaning on generative AI as the pilot, and not know that they're doing [it] wrong or not know that they are not learning the [nursing] skills that they need.” (Student 5)</i>
Lack of AI knowledge in the nursing profession	<i>“I've been in nursing education recently. I don't think they're [faculty] as familiar [with GenAI]. Potentially, some of the gap between generative AI being implemented into nursing practice, [there is a] lack of understanding of how it works. There's a large lack of knowledge [among] many nurses in nursing as a whole.” (Practitioner 4)</i>
By nurses, for nurses	<i>“I think they [nursing students and practitioners] do need to be part of that and be aware of how it's being used currently in practice, and maybe they generate an idea of how it could be used in nursing, specifically for nurses.” (Faculty 7).</i>
Nurse representation in GenAI research and development	<i>“Without that level of competency, nurses are inevitably going to be victims of the decisions made about us without us.” (Practitioner 8)</i>

COREQ (CONsolidated criteria for REporting Qualitative research) Checklist

A checklist of items that should be included in reports of qualitative research. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A.

Topic	Item No.	Guide Questions/Description	Reported on Page No.
Domain 1: Research team and reflexivity			
<i>Personal characteristics</i>			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	
Credentials	2	What were the researcher's credentials? E.g. PhD, MD	
Occupation	3	What was their occupation at the time of the study?	
Gender	4	Was the researcher male or female?	
Experience and training	5	What experience or training did the researcher have?	
<i>Relationship with participants</i>			
Relationship established	6	Was a relationship established prior to study commencement?	
Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	
Interviewer characteristics	8	What characteristics were reported about the inter viewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	
Domain 2: Study design			
<i>Theoretical framework</i>			
Methodological orientation and Theory	9	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	
<i>Participant selection</i>			
Sampling	10	How were participants selected? e.g. purposive, convenience, consecutive, snowball	
Method of approach	11	How were participants approached? e.g. face-to-face, telephone, mail, email	
Sample size	12	How many participants were in the study?	
Non-participation	13	How many people refused to participate or dropped out? Reasons?	
<i>Setting</i>			
Setting of data collection	14	Where was the data collected? e.g. home, clinic, workplace	
Presence of non-participants	15	Was anyone else present besides the participants and researchers?	
Description of sample	16	What are the important characteristics of the sample? e.g. demographic data, date	
<i>Data collection</i>			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	
Repeat interviews	18	Were repeat inter views carried out? If yes, how many?	
Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	
Field notes	20	Were field notes made during and/or after the inter view or focus group?	
Duration	21	What was the duration of the inter views or focus group?	
Data saturation	22	Was data saturation discussed?	
Transcripts returned	23	Were transcripts returned to participants for comment and/or	

Topic	Item No.	Guide Questions/Description	Reported on Page No.
		correction?	
Domain 3: analysis and findings			
<i>Data analysis</i>			
Number of data coders	24	How many data coders coded the data?	
Description of the coding tree	25	Did authors provide a description of the coding tree?	
Derivation of themes	26	Were themes identified in advance or derived from the data?	
Software	27	What software, if applicable, was used to manage the data?	
Participant checking	28	Did participants provide feedback on the findings?	
<i>Reporting</i>			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	
Data and findings consistent	30	Was there consistency between the data presented and the findings?	
Clarity of major themes	31	Were major themes clearly presented in the findings?	
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

Once you have completed this checklist, please save a copy and upload it as part of your submission. DO NOT include this checklist as part of the main manuscript document. It must be uploaded as a separate file.