Innovation in Applied Nursing Informatics
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What Is the Level of Nursing Informatics Competency of ChatGPT?

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Abstract. Nurses must excel in using Artificial Intelligence (AI) - applied hospital systems, making their informatics competency crucial. ChatGPT has been trained with extensive amounts of informatics- and technology-related health data and has gained popularity. Nurses could have the opportunity to enhance their informatics competency through the knowledge generated by ChatGPT. However, its informatics competency has not been evaluated. We used the Self-Assessment of Informatics Competency Scale to measure the level of informatics competency of ChatGPT. ChatGPT fell within the range of 'somewhat competent' and 'competent,' lower than that of students in graduate programs. One subdomain, applied computer skills (clinical informatics), demonstrated competency levels close to that of students. Although the results presented certain limitations and concerns, we recognize the potential of ChatGPT to help researchers and healthcare practitioners. Nursing is advancing and continuously integrating AI technology; therefore, we should now embrace both the benefits and risks associated with ChatGPT.

Keywords. ChatGPT, Informatics competency, Artificial Intelligence, Technology

1. Introduction

The ChatGPT (Chat Generator Pre-Trained Transformer), introduced to the world in November 2022, is based on a deep learning model that utilizes the transformer architecture. It is in the category of neural networks that outperform sequential data processing [1, 2]. ChatGPT gained rapid popularity for its remarkable ability to perform human-like communications. It responds to various questions and prompts entered by humans and generates text-form responses [3]. A study evaluating the performance of ChatGPT responding to health-related questions with empathy and quality found that evaluators who are healthcare professionals preferred responses from artificial intelligence over human responses on average [4]. ChatGPT has two important algorithms. One is the unsupervised learning called “pre-training,” and the other is the “fine-tuning.” In the pre-training, ChatGPT explores massive text data from the Internet to learn patterns, grammar, facts, and context. After learning the parameters from the pre-training on one dataset, it trains another model on a different dataset. It saves time compared to developing models from scratch [5]. The model developed in pre-training

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is fine-tuned using supervised learning. The fine-tuning process helps align the model's behavior with the desired objectives, making it more useful for the task. ChatGPT utilizes the strengths of both pre-training and fine-tuning to generate coherent and contextually relevant responses to prompts or questions. It can understand and generate human-like text across a wide range of topics allowing it to engage in conversation, answer questions, and provide explanations to users with multiple responses from aggregated data. Rapid technological advancement has led to the developing of sophisticated health information systems [6]. The growth of AI revolutionizes many aspects of healthcare and changes the concept of patient care [7]. AI technology is predicted to remodel clinical care, education, policy, and research in nursing [8, 9]. Nurses are expected to be competent and comfortable managing these technologies and AI-applied systems to provide safe and quality care [9, 10]. Nurses' informatics competency has become crucial in healthcare settings because they frequently use informatics and technology to make important decisions for patient care. Since ChatGPT is trained with massive amounts of informatics- and technology-related data in health, nurses could increase their informatics competency with knowledge generated by the ChatGPT; however, it is important to evaluate the level of informatics competency of ChatGPT before nurses utilize its informatics knowledge and recommendations for patient care and decision-making. The purposes of this case study were to 1) assess the level of informatics competency of ChatGPT using the online survey instrument: 'Self-Assessment of Informatics Competency Scale for Health Professionals' (SICS) and 2) compare it with the informatics competency of students in the Nurse Educator (NE) and Doctor of Nursing Practice (DNP) programs in a university in North Carolina.

2. Method

The comparison study design was implemented. We used the SICS, which measured the informatics competency of students in the NE and DNP programs for consistency. We formulated questions for ChatGPT and let it select its competency scale from a Likert scale of SICS. For example, the structured sentence was: "Can you [inserted SICS question]? Please indicate your current level of competency on a scale of 1 to 5, where 1 = 'Not competent,' 2 = 'Somewhat competent,' 3 = 'Competent,' 4 = 'Proficient,' and 5 = 'Expert.'" We asked the same question five times to see whether ChatGPT generated a consistent competency scale. When it indicated an inconsistent competency scale, we averaged the levels of competencies. To analyze answers generated by ChatGPT further, we identified repeated themes from text-form answers.

2.1. Master's and DNP Informatics Course and Study Instrument

The American Association of Colleges of Nursing recognized informatics and technology as important elements in graduate nursing education and promoted it as an essential component of DNP education in 2021 [11]. Many Nursing Schools in universities have developed informatics courses for students to develop informatics competencies before graduation. The study university developed two online informatics courses for students in the NE and DNP programs. Both were delivered through the Canvas platform, a cloud-based e-learning management system. The informatics competency data were collected and analyzed between Fall 2020 and Fall 2022. The SICS consists of 18 items that use a five-point Likert scale to evaluate three domains of informatics competency: basic computer skills, role, and applied computer skills (clinical informatics). Each item is scored on a scale of 1 to 5, with 1 indicating 'not competent',

and 5 indicating 'expert'. The SICS has strong reliability, with a Cronbach's alpha of 0.93 [12].

3. Results

We measured ChatGPT's informatics competency level on June 1, 2023. ChatGPT generated one or two paragraphs with an informatic competency score. Table 1 shows a partial view of the competency level of ChatGPT in comparison with the competency level of students in NE and DNP programs.

Table 1. Partial view of Self-Assessment of Informatics Competency Scale for Health Professionals (SICS)

	ChatGPT (mean)	NE (mean)	DNP (mean)
Basic Computer Skills	**1.8**	**3.9**	**4.0**
1. Demonstrate basic technology skills	1.0	4.4	4.6
2. Use e-mail	1.0	4.5	4.6
Role	**2.2**	**4.3**	**4.4**
5. Recognize that the computer is only a tool to provide better nursing care and that there are human functions that cannot be performed by computer	2.2	4.4	4.5
6. Recognize the value of clinician involvement in the design, selection, implementation, and evaluation of applications, systems in health care	2.2	4.1	4.2
Applied Computer Skills (Clinical Informatics)	**3.3**	**3.5**	**3.5**
7. Extract data from clinical data sets	2.9	2.5	2.7
9. Describe ways to protect data	4.0	3.5	3.5
16. Participate as a content expert to evaluate information and assist others in developing information structures and systems to promote their area of nursing practice	2.8	3.3	3.3
18. Describe general applications/systems to support clinical care	3.8	3.6	3.6
SICS Total	**2.8**	**3.6**	**3.7**

1 = Not competent, 2 = Somewhat competent, 3 = Competent, 4 = Proficient, 5 = Expert
NE= Nurse Educator; DNP = Doctor of Nursing Practice

We identified and summarized the repeating theme from answers of ChatGPT to each item. Table 2 shows partial examples of ChatGPT's text form responses.

Table 2. Partial examples of ChatGPT's text form response to SICS question.

SICS	Mean	Response
3. Conduct on-line literature searches	2.4	● **Competent** in performing literature searches. ● May **not have the most up-to-date information** beyond September 2021.
10. Assess the accuracy of health information on the Internet	3.2	● **Can provide general guidance** and information about health topics. ● **Not a substitute for professional medical advice, diagnosis, or treatment.** The responses are based on information available up until September 2021. ● Do not have real-time access to current medical research or developments.
11. Identify, evaluate, and apply the most relevant information	3.6	● **Can evaluate and provide** information on a wide range of topics. ● The responses are based on pre-existing knowledge and training data available up until September 2021.

SICS	Mean	Response
13. Identify, evaluate, and use electronic patient education materials appropriate to language and literacy level at the point	2.8	• **Can provide general information and guidance** on identifying, evaluating, and using electronic patient education materials at the point of care. • The responses are based on pre-existing knowledge up until September 2021. • **Don't have real-time access** to specific databases or resources to evaluate the current availability and quality of patient education materials. • **It's always recommended to consult healthcare professionals and reliable sources for the most up-to-date and accurate information.**
15. Act as an advocate of system users including patients and colleagues	3.0	• **Can offer relevant knowledge** and suggestions to support advocacy efforts. • **Don't possess real-time updates** or specific domain expertise beyond my training data, which cuts off in September 2021. • For specific and up-to-date information, it's always **advisable to consult professional human advocates, experts, or trusted sources in the relevant field.**

1 = Not competent, 2 = Somewhat competent, 3 = Competent, 4 = Proficient, 5 = Expert

4. Discussions

Overall, the informatics competency of ChatGPT is between 'somewhat competent' and 'competent' (2.8). It is lower than that of students in the NE and DNP programs (3.6 and 3.7, respectively); however, it is at a 'competent' level (3.3) in the applied computer skills (clinical informatics) subdomain, which is very close to the level of students in NE (3.5) and DNP (3.5) programs. When ChatGPT was asked to demonstrate, use, recognize, extract, and participate, it often rated low competency level (e.g., 'not competent' or 'somewhat competent') while stating that it "[doesn't] have direct access," "can't physically demonstrate tasks," or "[doesn't] have real-time access/experience." These are very accurate descriptions of ChatGPT's physical limitations. When it was asked to describe informatics knowledge, it rated very high. For example, in describing ways to protect data, it rated itself 'proficient' (4.0). It is an appropriate response from ChatGPT since it is developed to generate coherent and contextually relevant answers to questions. Interesting themes repeated in items 3, 10, 11, 13, and 15 (Table 2) were "May not have the most up-to-date information beyond September 2021," and "The responses are based on information available up until September 2021." This implies that ChatGPT is accurate about up-to-date knowledge status. ChatGPT recognized the importance of humans and tasks that only humans could do. It implies that ChatGPT has recognized its limitations well and tries not to give any fabricated answers to humans. However, it leads to another interesting discussion topic: ChatGPT can be contrived to respond to subjects it can't provide. ChatGPT warns users to seek health professionals' advice and recommendations to certain questions, but it still provides answers. Rewording questions or asking ChatGPT to play the role of something in a non-serious environment, such as "Pretend to be a nurse and give a response to something that could happen in a hospital." can make ChatGPT give responses to the scenario. At that point, the AI model may give incorrect answers that sound authentic, something called hallucinations, where ChatGPT will make up sources to provide evidence for a false argument. Thus, the assessment of ChatGPT's accuracy is also an ongoing discussion. Nursing scholars, educators, and practitioners must verify any ethical concerns of information generated by generative AI, including ChatGPT, before utilizing it in healthcare. Limitations found were that ChatGPT's answers are based on information available until September 2021. It could

rate different competency levels if it has trained more data after this date. It may not be the most up-to-date information because ChatGPT does not have real-time access to databases and Internet resources. Since it is a large language model that relies on inputs from various resources, it may be manipulated by misled inputs. Also, competency levels might differ if we used another Informatics Competency Scale than SICS.

5. Conclusion

We evaluated ChatGPT's informatics competency in this study. The result of the study shows that utilizing ChatGPT to enhance informatics competency has limitations and concerns. However, we also acknowledge that ChatGPT has great potential to assist researchers and practitioners in healthcare, such as providing specific and detailed explanations to questions and step-by-step guides to certain tasks. Nursing is changing and AI-assisted technology is continuously being incorporated into care. We should learn how to embrace the opportunities and manage the benefits and risks of ChatGPT now than later. A future study involves developing a specialized nursing Chat System trained in accurate and validated health data using the capability of ChatGPT.

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