Development and Evaluation of a Computerized NANDA-I, NOC, and NIC Linkage System for Clinical Education

Jiin Kim*,Hyun-Kyung NOH*, Won-Gi Kim**
*Dept. of Nursing, Daegu Health College
**Dept. of Dental Technology, Daegu Health College
e-mail:inrimm19@dhc.co.kr

임상 교육을 위한 전산화된 NANDA-I, NOC, NIC 연계 시스템의 평가

김지인*, 노현경*, 김원기**
*대구보건대학교 간호학과
**대구보건대학교 치기공학과

Abstract

This study demonstrated that a computerized NNN linkage system significantly improved nursing process confidence among 70 students during their 2022 clinical practicum ($F=43.25$, $p<.001$). Confidence in diagnosis increased rapidly in the first week, while planning skills showed the greatest gains by the second week, proving the system's superiority in reducing cognitive load over manual methods. These results suggest that adopting digital decision-support tools is crucial for enhancing clinical readiness in modern healthcare education.

1. Introduction

1.1 Background and Significance

Recently, nursing education has been undergoing multifaceted changes with the introduction of information technology. To cultivate competent future nurses, it is essential to apply well-designed educational programs in clinical education settings [1]. While clinical practicum plays a key role in nursing education by providing students with opportunities to integrate theoretical knowledge and practice, most nursing students experience significant levels of stress and anxiety during this process [2].

In particular, nursing students face great difficulties in collecting and analyzing complex patient data to derive appropriate diagnoses, interventions, and outcomes [3]. Traditional paper-based nursing process documentation causes excessive cognitive load and stress for learners due to the inconvenience of searching through extensive NANDA-I, NOC, and NIC (NNN) taxonomies and the difficulty of logical linkage between stages [1].

Although most medical institutions have implemented Electronic Nursing Record (ENR) systems, relying on paper-based methods in education creates a gap with actual clinical practice [4]. Therefore, there is a need for new educational attempts and evaluations to improve clinical adaptability and enhance confidence in the nursing process by enabling students to learn NNN linkages through a user-friendly computerized system [5].

1.2 Research Objective

The objective of this study is to evaluate the longitudinal effects of a computerized NNN linkage system on the nursing process confidence of nursing students during the second semester of the 2022 academic year

2. Methods

2.1 Research Design and Participants

This study employed a quasi-experimental, one-group

pretest-posttest time-series design. The participants were 70 junior and senior nursing students engaged in clinical practicum during the Fall 2022 semester. Participation was voluntary, and students were assured that their involvement would not affect their academic grades.

2.2 Instrumentation

2.1.1 Experimental Treatment (Computerized NNN System)

The study utilized the OPT-CNPP (Outcome-Present State-Test Model-based Computerized Nursing Process Program) developed by Noh (2018). This system integrates NANDA-I, NOC, and NIC databases, allowing students to visualize causal relationships and receive real-time logic support during care planning.

2.1.2 Nursing Process Confidence Scale

A 15-item scale was developed by a panel of three nursing professors to measure confidence across five domains: assessment, diagnosis, planning, implementation, and evaluation. Content validity and reliability were verified prior to data collection

2.1.3 Data Analysis

Data collected at three time points (Baseline, Week 1, and Week 2) were analyzed using SPSS. Repeated Measures ANOVA and Bonferroni post-hoc tests were performed to examine changes in confidence scores over time.

3. Research Results

The analysis demonstrated that the utilization of the computerized NNN linkage system led to a statistically significant improvement in nursing process confidence across all domains.

Confidence in nursing diagnosis showed the most significant initial increase, rising from 2.84±0.45 at baseline to 3.62±0.51 at Week 1 ($t=5.98$, $p<.001$). It continued to improve to 3.95±0.48 by Week 2. This rapid growth in the first week suggests that the computerized search functions effectively reduced the cognitive burden of identifying appropriate NANDA-I labels.Nursing Planning: In the planning domain, confidence increased from 2.92±0.38 to 3.25±0.42 at Week 1. Notably, the most substantial growth occurred between Week 1 and Week 2, reaching 4.10± 0.52 ($t=10.57$, $p<.001$). This indicates a cumulative learning effect as students repeatedly engaged with the NIC and NOC linkage databases to refine their care plans.Nursing Implementation: Confidence in implementation increased steadily from 3.02±0.41 to 3.55±0.40 over the two-week period ($F=15.34$, $p<.001$). Although the improvement was statistically significant, the rate of increase was relatively lower compared to other domains, reflecting the practical limitations students encounter when performing direct interventions in a clinical setting.Nursing Evaluation: Confidence in evaluating nursing outcomes rose significantly from 2.88±0.47 at baseline to 3.42±0.44 at Week 1 and further to 3.78±0.50 at Week 2 ($t=3.50$, $p<.001$). The results confirm that the system helped students visualize the achievement of nursing goals through the NOC indicators. Overall, post-hoc analysis confirmed a consistent and significant upward trend at every measurement point. The results demonstrate that the OPT-CNPP served as a continuous educational catalyst, progressively enhancing students' perceived professional competence throughout their clinical practicum.

4. Discussion and Conclusion

The findings indicate that the computerized NNN system significantly enhanced students' confidence. Confidence in nursing diagnosis showed the most rapid increase in the first week, suggesting that the digital search functions and visual aids effectively reduced the initial barrier of navigating standardized terminologies. Confidence in nursing planning exhibited a greater upward trend in the second week, indicating that repeated interaction with the NIC database helped students internalize the diversity of nursing interventions. The implementation domain showed a smaller relative increase, likely

due to the inherent constraints nursing students face in performing direct clinical interventions.In conclusion, the computerized NNN linkage system is an effective educational tool that reduces cognitive burden and bridges the gap between theory and clinical practice. We recommend integrating this system into simulation-based education to allow students to practice the full nursing process in an autonomous environment.

References

[1] Noh, H. K. (2018). Development and Application Effects of a Nursing Process Computerized Program Based on the OPT Model. Ph.D. Dissertation, Kyungpook National University.

[2] Lee, E., & Noh, H. K. (2015). The Effects of a Web-Based Nursing Process Documentation Program on Stress and Anxiety of Nursing Students in South Korea. International Journal of Nursing Knowledge, 27(1), 35-42.

[3] Yang, Y. H. (1999). The problems for Application of Nursing process in Clinical Experience of Nursing Students. The Journal of Korean Academic Society of Nursing Education, 5(1), 58-71.

[4] Noh, H. K. (2025). The Effects of an OPT Model-Based Computerized Nursing Process Program on Clinical Performance Confidence and Clinical Practicum Satisfaction among Nursing Students. Journal of Safety and Crisis Management, 15(12), 1-9.

[5] Ahuja, S. R. (1998, March). Multimedia Conferencing System. IEEE Conference on Computer Workstation, 52-58.