ORIGINAL RESEARCH ARTICLE

The Effects of a Delirium Management Application on Critical Care Nurses' Knowledge and Clinical Judgment: A Quasi-Experimental Study

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ABSTRACT

Background: Delirium is a critical condition in critically ill patients. It affects mechanically ventilated patients and leads to increased mortality, prolonged hospitalization, and high healthcare costs. This study aimed to investigate the impact of a delirium management application on nurses' knowledge and clinical judgment in the context of delirium care.

Methodology: A quasi-experimental design was employed over three weeks in a tertiary hospital in Thailand. Twenty-three critical care nurses were recruited using a consecutive sampling method. Data were collected using delirium knowledge and clinical judgment assessment questionnaires. The Wilcoxon Signed-Rank test was used to compare the pre- and post-test scores.

Results: Twenty-three participants were included. The median post-test scores for knowledge and clinical judgment were 47.00 (Interquartile range: IQR 46.00-52.00) and 11.00 (9.00-15.00), respectively, compared to mean pre-test scores of 44.00 (IQR 42.00-45.00) and 8.00 (IQR 7.00-9.00), indicating a significant difference in these outcomes after using the application (z -3.884 and -3.485, p <0.001).

Conclusion: The delirium management application was associated with improvements in critical care nurses' knowledge and clinical judgment regarding delirium management. These preliminary findings suggest that the application may have potential as a supportive digital tool for addressing knowledge and practice gaps in delirium management in the intensive care unit.

Keywords: Critical Care, Delirium Management, Clinical Judgement, Mobile Applications, Nursing Knowledge

ARTICLE INFO

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INTRODUCTION

Delirium is an acute disturbance in attention, awareness, and cognition that develops over a short period and tends to fluctuate in severity throughout the day.[1] In the critical care setting, delirium remains a significant challenge. Meta-analyses show hypoactive delirium is most prevalent in ICU patients (~35%), especially with severe illness or mechanical ventilation. Hyperactive and mixed subtypes, though rarer, increase agitation, safety risks, and care complexity.[2] This condition is associated with numerous adverse outcomes, including an increased duration of mechanical ventilation, higher risk of self-extubation, longer hospitalization, higher healthcare costs, and increased mortality rates.[3,4] Several risk factors contribute to the development of delirium, including infections, metabolic disturbances, and medication side effects, particularly from benzodiazepines and anticholinergic drugs.[5] Additional predisposing factors include advanced age, pre-existing cognitive impairment, chronic illness, alcohol use disorder, and prolonged hospitalization.[6]

Despite its prevalence and clinical significance, delirium remains under-recognized and undertreated in intensive care units (ICUs) worldwide.[7,8] Many studies have identified barriers to effective delirium management, including insufficient knowledge among healthcare providers, misconceptions about assessment tools, high workload, limited experience with delirium assessment instruments, and limited access to evidence-based guidelines.[3,9,10]

The ABCDEF bundle has emerged as an evidence-based, multicomponent approach for the prevention and management of delirium in critical care settings.[3,11] The implementation of this bundle has been associated with reduced delirium incidence and duration, shorter lengths of stay, and improved survival.[3] In addition, critical care nurses play a pivotal role in the early identification and management of delirium. However, previous studies have indicated that nurses' knowledge of delirium management varies considerably, with many reporting only moderate levels of ability to identify and manage this condition.[8,12]

Digital health technologies, particularly mobile applications, have shown promise in addressing knowledge gaps and supporting clinical judgment in various healthcare contexts.[13] The integration of artificial intelligence (AI) capabilities, such as chatbots, into health applications offers additional potential for providing timely, personalized, and evidence-based clinical guidance. Despite the growing adoption of digital tools in healthcare, few studies have specifically examined their effectiveness in supporting delirium care.[14,15]

Therefore, this study aimed to address this gap by evaluating a mobile application designed to improve nurses' knowledge and clinical judgment in delirium management. The primary aim of this study was to assess the effects of the Delirium Management Application (DMA) on nurses' knowledge and clinical judgment in delirium care, and the secondary aim was to evaluate nurses' satisfaction with application.

METHODOLOGY

A quasi-experimental, one-group, pretest-posttest design was conducted in the medical intensive care unit (MICU) of a tertiary hospital in northeastern Thailand.

Purposive sampling was used to recruit the participants. Those working as a registered nurse in the MICU for more than six months, using the LINE application on a smartphone, and willingness to participate in the study were included in the study.

This study was designed as a pilot study, and the sample included all available nurses working in a single MICU. Following methodological recommendations for pilot studies by Whitehead et al.[16] (20–40 participants), a formal sample size calculation or power analysis was not performed because of the limited number of critical care nurses in this setting. Therefore, all twenty-three registered nurses working in the MICU of this tertiary hospital were included in the study.

Four instruments were used to collect data in this study. The first part of the questionnaire collected demographic information from the participants, including sex, age, religion, occupation, education, work experience, ICU experience, and experience with health applications.

The Delirium Knowledge Assessment was used to evaluate nurses' understanding of delirium symptoms, risk factors, and management strategies. This instrument was developed by Uppanisakorn et al.[17] It consists of 52 items covering three aspects of delirium management: general knowledge of delirium (23 items), early detection, prevention, and monitoring (14 items), and delirium management (15 items). Each item was scored as correct (1) or incorrect (0), with total possible scores ranging from 0 to 52. High Scores indicate high knowledge. The questionnaire demonstrated good reliability (KR-20 = 0.776).

The Clinical Judgment Assessment is a 15-item multiple-choice test developed by researchers to evaluate clinical judgment skills in delirium care scenarios. Each item presents a clinical situation with four possible responses, with only one correct answer per question. Possible scores ranged from 0 to 15, with higher scores indicating higher clinical judgment ability. The instrument demonstrated good reliability (KR-20 = 0.798).

The Application Satisfaction Questionnaire is a 5-item questionnaire developed by researchers to assess satisfaction with the application, covering ease of use, completeness of content, accuracy of delirium assessment, speed of access, and overall satisfaction.

Each item was rated on a 5-point Likert scale ranging from 1 (needs improvement) to 5 (excellent). The questionnaire demonstrated excellent reliability (Cronbach's α = 0.926).

Intervention: The intervention involved implementing the DMA, called the "Delirium Nursing Care Guide," a LINE platform-based Artificial Intelligence (AI) chatbot application developed specifically for this study, over a period of three weeks. Bloom's revised taxonomy[18] and Tanner's Clinical Judgment Model[19] were used to guide the development and application of this intervention. The application was designed to provide easy access to evidence-based information on delirium assessment, prevention, and management, integrating the ABCDEF (Assess, prevent, and manage pain; Both spontaneous awakening and breathing trials; Choice of analgesia and sedation; Delirium assessment, prevention, and management; Early mobility and exercise; and Family engagement and empowerment) bundle. This application contained four core components: (1) Knowledge Module: Educational content on delirium, including definitions, clinical features, risk factors, severity levels, and prevention strategies, delivered through videos; (2) ABCDEF Bundle Module: Detailed guidelines for implementing each component of the ABCDEF bundle in delirium care, presented through Canva-created visual materials; (3) Assessment Tools for Delirium Module: Interactive versions of validated delirium assessment instruments, including the Richmond Agitation-Sedation Scale (RASS)[20] and the Confusion Assessment Method for the ICU (CAM-ICU),[21,22] and (4) Behavioral Assessment Module: Motor Activity Assessment Scale (MAAS)[23] for evaluating consciousness levels and movement behaviors with the use of restraint devices.

The application was designed for intensive care unit nurses working in a three-shift system (8:00 AM, 4:00 PM, and 12:01 AM). At the start of each shift, bedside nurses were reminded by the nurse in charge and a Line alert notification to assess delirium in their patients using the Delirium Nursing Care Guide application installed on their mobile devices. During initial use, nurses reviewed two embedded educational modules: a general delirium module covering assessment, prevention, and management, and a module on nursing interventions based on the ABCDEF bundle. Each module required approximately three minutes to complete. Nurses then completed delirium assessments using integrated tools (RASS, CAM-ICU, and MASS), entered patient data into the application, and received nursing care recommendations generated by the system. The application also served as a point-of-care reference, allowing nurses to revisit educational content as needed during patient care. Application use was monitored through a secure backend system in which each nurse was assigned a unique user identification, enabling verification of application access and overall usage during the study period.

The content validity of both the Clinical Judgment Assessment and Satisfaction Questionnaire was evaluated by three experts in adult and geriatric nursing, resulting in Content Validity Index values of 1.00 and 0.92, respectively. The content validity of the application was reviewed by three experts in critical care nursing and mobile health applications, yielding an Item-Objective Congruence Index of 0.81. All instruments were pilot tested with 15 surgical ICU nurses at the same hospital.

Ethical Considerations: This study was approved by the Human Research Ethics Committee of the Ubon Ratchathani Provincial Public Health Office (SSJ.UB 12.009, Dated: December 27, 2024). Written informed consent was obtained from all study participants. The study procedures, potential risks, and benefits were explained to all participants, and confidentiality and privacy were ensured. Participants were informed of their right to withdraw from the study at any time.

To measure the effectiveness of the DMA, demographic data, delirium knowledge, clinical judgment assessments, and satisfaction were collected before and after the intervention using a Google survey platform, which took approximately 20-30 minutes. The data were collected from January to February 2025.

The data was analyzed using the Statistical Package for the Social Sciences (SPSS) ver 25.0. Descriptive statistics (frequency, percentage, mean, and standard deviation) were used to evaluate the demographic characteristics and satisfaction scores. The Shapiro-Wilk test was used to assess normality, and the data was found to be non-normally distributed. Thus, the Wilcoxon Signed-Rank Test was used to compare pre- and post-knowledge and clinical judgment scores. Statistical significance was set at $P < 0.05$.

RESULTS

Demographic information: Twenty-three nurses in the MICU participated in the study. The majority were female (91.30%). Ages ranged from 23 to 44 years, with a median age of 25 years and an interquartile range (IQR) of 10. All participants held bachelor's degrees and were Buddhists. Nursing experience ranged from 6 months to 20 years, with a median of 2 years (IQR 10). ICU experience ranged from 6 months to 12 years, with a median of 2 years (IQR 8). Most participants (65.22%) had not completed 4 months of specialized critical care training. Additionally, more than half (56.52%) had prior experience using other health-related applications.

Delirium Knowledge and Clinical Judgment: After completing the program, post-test scores for delirium knowledge and clinical judgment showed a statistically significant improvement compared to the pre-test scores (Table 1). All participants demonstrated improved delirium knowledge, and 19 of 23 participants (82.6%) also showed improvement in clinical judgment after using the DMA.

Table 1: Pre and Posttest Scores of Knowledges and Clinical Judgment (n=23)

Variables	Pre-test		Post-test		Median difference (95% CI)	P-value
	Median	IQR	Median	IQR		
Knowledge	44.0	42.0-45.0	47.0	46.0-52.0	6 (3, 10)	<.001
General knowledge of delirium (23 items)	19.0	18.0-20.0	20.0	19.0-23.0	12 (11,14)	<.001
Early detection, prevention, & monitoring (14 items)	12.0	11.0-12.0	14.0	14.0-14.0	4 (3,4)	<.001
Delirium management (15 items)	12.0	10.0-12.0	13.0	13.0-15.0	2 (1, 3)	<.001
Clinical Judgement	8.0	7.0-9.0	11.0	9.0-15.0	3 (1, 8)	<.001

IQR: interquartile range; statistically significant at P <0.05; CI: confidence interval; CIs were calculated using the Hodges–Lehmann method.[25]

Table 2: Satisfaction with the DMA (n=23)

Items	Score (Mean ± SD)
Domain 1: Understanding of Application Use	4.09 ± 0.08
I understand how to use the Delirium Nursing Care Guide application after reading the instructions or watching the instructional video.	4.17 ± 0.64
The Delirium Nursing Care Guide application is aligned with its intended objectives and applies to clinical practice.	4.04 ± 0.75
The explanations of the application's functions are clear.	4.04 ± 0.62
Domain 2: Visual Design and Aesthetics of the Application	4.28 ± 0.09
The overall design of the application is visually appealing and modern.	4.17 ± 0.58
The color scheme used in the application is visually comfortable and appropriate for the type of application.	4.30 ± 0.69
The layout of graphics, menus, and functions is well organized and easy to use.	4.35 ± 0.63
Domain 3: Usability of the Delirium Nursing Care Guide Application	4.28 ± 0.09
The Delirium Nursing Care Guide application is easy to use and not complex.	4.17 ± 0.56
The application can accurately process information or assess delirium.	4.30 ± 0.69
The Delirium Nursing Care Guide application performs assessments of delirium on time.	4.35 ± 0.63
Domain 4: Overall Evaluation of the Delirium Nursing Care Guide Application	4.05 ± 0.12
The Delirium Nursing Care Guide application is safe for patients.	4.22 ± 0.72
I am satisfied with using the Delirium Nursing Care Guide application.	4.04 ± 0.69
The Delirium Nursing Care Guide application supports delirium assessment and assists users in making appropriate clinical judgments.	3.91 ± 0.72
The Delirium Nursing Care Guide application is useful for nursing practice in the intensive care unit and should be implemented to improve the quality of nursing care.	4.04 ± 0.75
Total score	4.16 ± 0.14

However, one participant (4.30%) showed no change, and three participants (13.00%) exhibited worsening clinical judgment scores. Both knowledge and clinical judgment showed large effect sizes (r = -0.81 and r = -0.73, respectively), according to Cohen's criteria for interpreting effect sizes.[24]

Satisfaction: Participants reported high overall satisfaction with the application (mean 4.16, SD 0.14). The highest satisfaction ratings were for the graphical design elements (mean 4.28, SD 0.09) and ease of use (mean 4.28, SD 0.09). Participants also rated the application highly for ease of understanding (mean 4.09, SD 0.08). Slightly lower but still positive ratings were given for judgment in delirium assessment and management (mean 3.91, SD 0.72). Importantly, participants strongly agreed that the application would benefit nursing practice in critical care and should be implemented more widely to improve the quality of care (Table 2).

DISCUSSION

This study evaluated the effectiveness of a mobile application in enhancing the knowledge and clinical judgment of critical care nurses regarding delirium management. The findings demonstrated significant improvements in both outcomes following a three-week implementation period, with participants expressing high satisfaction with the app.

Delirium Knowledge: Participants demonstrated a significant improvement in knowledge scores after using the application, consistent with previous studies reporting the effectiveness of mobile-based educational interventions in nursing practice. Similar improvements in nurses' delirium-related knowledge have been reported in mobile-supported education programs.[26,27] The observed knowledge gains may be attributable to the application's continuous accessibility and integration of interactive learning features. In addition, the AI chatbot may have supported just-in-time learning by providing immediate responses to user queries, which has been shown to enhance knowledge retention in technology-enhanced education.[12]

Clinical Judgment: Participants showed higher clinical decision-making scores after the intervention, indicating improved clinical judgment. This finding aligns with previous research highlighting the chal-

lenge of translating delirium-related knowledge into clinical practice and the value of interventions that address this gap.[9] Integrating validated assessment tools with the ABCDEF bundle may have contributed to improved clinical judgment by supporting a more systematic approach to delirium assessment and management. Similar improvements in clinical reasoning have been reported in simulation-based delirium education[28], suggesting that well-designed mobile applications may offer comparable benefits, especially in settings with limited access to simulation resources.

Satisfaction: Participants reported high satisfaction with the application, particularly its accessibility, usability, and perceived clinical usefulness. Positive feedback on design and organization highlights the importance of user experience in educational technology for healthcare professionals.[29] Perceived usefulness, a key factor influencing technology adoption[30], was reflected in participants' strong support for wider implementation. Lower ratings for processing speed and assessment accuracy indicate areas for improvement. Consistent with prior findings that clinicians prioritize efficiency and accuracy in decision support tools[31], further refinement of these features may enhance the application's clinical value.

Theoretical Implications: Our findings provide empirical evidence supporting the integration of Bloom's revised taxonomy[18] and Tanner's Clinical Judgment Model[19] in developing digital tools for nursing education. The DMA significantly improved both knowledge and clinical judgment. These results suggest that the application effectively engages multiple cognitive domains and supports the complex processes involved in clinical judgment.

This study also contributes to the growing body of evidence on AI applications in nursing education and practice, demonstrating that chatbot technology can effectively deliver educational content and support clinical judgment in specialized areas, especially in delirium care.

Nursing Practice Implications: This study presents a feasible and scalable approach to improving delirium care skills in critical care settings. The LINE platform-based delivery method uses a widely adopted communication tool; potentially lowering adoption barriers and implementation costs compared with standalone applications.

For nursing education, the findings highlight the potential of mobile learning to supplement traditional educational methods, especially for complex clinical topics such as delirium, which require both theoretical knowledge and practical judgment.

For healthcare organizations, this study indicates that investing in mobile learning solutions may enhance nursing knowledge and clinical judgment, which could lead to better patient outcomes. High user satisfaction ratings also suggest that such tools may be readily accepted by the nursing staff.

LIMITATIONS

Several limitations should be considered when interpreting these findings. The single-group pretest/post-test design without a control group limits causal inferences about the application's effectiveness. The small sample size from a single ICU in one hospital restricts the generalizability of the results to other settings or populations. Construct or criterion validity was not examined in this study. Given the complex and multidimensional nature of clinical judgment, this omission is a limitation that may reduce confidence in the outcome measures. The short three-week intervention period may not have captured long-term knowledge retention or changes in clinical practice. Additionally, self-reported measures are subject to social desirability bias, and the absence of direct observation of clinical practice prevents confirmation that improved knowledge and judgment translate into changed behaviors at the bedside. Moreover, non-parametric statistics were used in this study, which may affect the power analysis.

An important limitation of this study is the limited controllability and standardization of AI-generated responses. The chatbot provided adaptive, user-contingent interactions, which likely resulted in variability between participants in the type and intensity of intervention exposure. Although this adaptability reflects real-world deployment of AI chatbots, prior research suggests that such flexibility may introduce uncontrolled heterogeneity in intervention content and dose, posing a potential threat to internal validity.[32,33]

CONCLUSION

This pilot study demonstrated an association between the use of a delirium management mobile application and improvements in nurses' knowledge and clinical judgment, as well as high user satisfaction. These findings suggest the potential value of mobile learning applications, particularly those with AI-based features, in supporting nursing competencies in complex clinical areas such as delirium care. By providing accessible, evidence-based information at the point of care, such applications may help improve the recognition and management of delirium in critical care settings. However, given the single-group pretest–posttest design, these findings should be considered preliminary. Further controlled studies with larger samples are needed to confirm effectiveness and establish causal relationships.

RECOMMENDATIONS

Future studies should employ more robust designs, such as randomized controlled trials with larger and more diverse samples across multiple sites. Longitudinal investigations would help determine the dura-

bility of knowledge and skill improvement. Studies incorporating objective measures of clinical practice, such as direct observation or chart review, would strengthen the evidence regarding the application's impact on actual delirium care behaviors.

Research examining patient outcomes (e.g., delirium incidence, duration, and complications) following the implementation of this application would provide valuable insights into its clinical effectiveness. Further investigation of specific application features (e.g., AI chatbots vs. educational content) would help identify the most effective components for future refinement.

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Availability of Data: The data presented in this study are available from the corresponding author upon reasonable request, due to privacy and ethical restrictions.

Declaration of Non-use of Generative AI Tools: This article was prepared without the use of generative AI tools for content creation, analysis, or data generation. All findings and interpretations are based solely on the authors independent work and expertise. AI was used only for grammar checking.

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