

Evaluating the efficacy of a delirium educational program for medical-surgical nurses

Shedeen Stephens-Bacon

Department of Nursing, University of Saint Joseph, West Hartford, USA

Abstract

The prevalence of delirium in general medical settings varies between 23% and 42%. The populations at significant risk for delirium include hospitalized adults aged 65 years and older. Delirium is associated with falls, functional decline, cognitive impairment, and high medical costs. A SWOT (strengths, weaknesses, opportunities, and threats) analysis of Vassar Brothers Medical Center's strengths included adopting the Short-CAM delirium screening tool for patients aged 18 years and older. However, delirium remained underrecognized. Nurses have a significantly higher rate of patient interaction than any other healthcare professional. A literature review found that nurses lacked theoretical knowledge of delirium, and multimodal education effectively increased knowledge. The Iowa model framework was used due to its practicality and adaptability in the clinical setting. A practice change project consisting of a pre-and post-assessment method for 30 seasoned and novice nurses in the 30-bed neuroscience medical-surgical unit was developed. It included a 50-minute web-based module sent *via* email and eight 10-minute in-person sessions. The expected outcomes were to improve nurses' knowledge of delirium and improve nurses' recognition of delirium risk factors by 20% within 5 weeks. There was a statistically significant increase in mean percentage scores from the pre-assessment to the post-assessment surveys ($z=-3.77$, $p\leq 0.001$). Nurses' post-assessment scores increased in knowledge of delirium, tools used for delirium assessments, and recognition of delirium risk factors. There was a limitation in the small sample size of 22. Delirium education should be part of the annual education of nurses and should be available to new nurses during orientation.

Key words: delirium education, nurses, nursing knowledge, non-critical care, multi-modal education.

Correspondence to: Shedeen Stephens-Bacon, Department of Nursing, University of Saint Joseph, West Hartford, USA. E-mail: shedeens3@gmail.com

Introduction

Delirium in hospital settings varies across different clinical environments and may be present on admission or develop as a complication during hospitalization. According to the Diagnostic and Statistical Manual of Mental Disorders, delirium is defined as an acute, fluctuating disturbance in attention and awareness due to the physiological effects of a medical condition, substance, or medication.¹ Among hospitalized older adults, the incidence rate ranges from 14% to 24%, increasing to 6% to 56% within 1 to 2 days of admission.²⁻⁴

Populations at highest risk include hospitalized adults aged 65 years and older, individuals with dementia, and critically ill patients.^{2,4,5} In medical settings, delirium affects 23% to 42% of hospitalized older adults.⁵⁻⁸ Patients with neurological disorders are also at increased risk, with delirium occurring in 14% to 25% of hospitalized stroke patients.^{9,10}

Contributing factors

Multiple studies identify gaps in nursing knowledge as a significant contributor to delirium underrecognition.¹¹⁻¹⁴ Thomas *et al.*

attributed this gap to the absence of formal education and mandatory in-service training,¹⁴ while Ewens *et al.* emphasized that insufficient hospital-based education limits nurses' ability to recognize early manifestations of delirium.¹²

Nurses must be able to identify delirium presentations, particularly hypoactive and mixed subtypes, which are frequently overlooked.¹⁵ Approximately 60% of delirium cases remain unrecognized, delaying treatment and management.^{16,17} Additional contributors to underdiagnosis include limited understanding of delirium, avoidance of challenging patient behaviors, and misattribution of symptoms to dementia, sundowning, or psychiatric conditions.^{18,19} Inconsistent use of the Confusion Assessment Method (CAM) further contributes to underrecognition, as limited training reduces effective bedside screening.²⁰ Frailty is also an independent risk factor for delirium, increasing delirium risk by 66% compared to non-frail patients.²¹ Early identification of frailty may support individualized care planning and reduce adverse outcomes.

Dementia remains the strongest predisposing factor, with delirium and dementia frequently coexisting.²² Dementia, delirium, and depression are commonly confused due to their presentation of cognitive impairment. However, they differ in onset, course, attention, consciousness, and reversibility. Dementia is characterized by a chronic and progressive decline in cognitive functions, whereas

depression primarily affects the individual's mood and may mimic cognitive impairment. In contrast, delirium results from an underlying medical condition and presents with an acute onset and fluctuating disturbances in attention and awareness.^{1,23}

Impact of the problem

Delirium imposes a substantial economic burden on the healthcare system. In 2020, delirium-related healthcare costs ranged from \$1532 to \$22,269 per patient.²⁴ Kinchin *et al.* reported inpatient delirium costs ranging from \$806 to \$24,509 after adjusting for currency and inflation.²⁵ Annual hospital costs exceed \$11 billion, while posthospital costs surpass \$153 billion due to rehospitalization, emergency department visits, institutionalization, rehabilitation, and home care services.²⁶

Delirium also causes emotional distress for patients and families. Many patients report lasting psychological effects and fear of future hospitalizations.²⁷ Older adults with delirium, particularly those with dementia or hypoactive delirium, experience accelerated functional decline, longer hospital stays, increased readmissions, premature nursing home placement, and higher mortality rates.^{25,28} Hospital stays range from 2.5 to 10.4 days, and mortality risk is one to three times higher than in patients without delirium.^{24,27}

Nurses interact with patients more frequently than any other healthcare professional, placing them in a critical role for early delirium recognition. Including nurses in the development and implementation of an evidence-based multi-modal delirium educational program may improve empowerment, clinical confidence, and practice ownership.²⁸ Given the high proportion of older adults and the incidence of delirium among hospitalized stroke patients, implementing a delirium educational intervention for nurses on the neuroscience medical-surgical unit represents an appropriate and timely practice change. As shown in *Supplementary Figure 1*, the SWOT analysis summarizes the organization's strengths, weaknesses, opportunities, and threat relevant to the project.

The clinical question

The clinical question for this Doctor of Nursing Practice scholarly project was: what is the efficacy of a multi-modal delirium educational program in increasing neuroscience medical-surgical nurses' general delirium knowledge and recognition of delirium risk factors within 5 weeks?

Review of the Literature

A comprehensive literature search was conducted using ProQuest, CINAHL, Google Scholar, and PubMed. Medical subject headings (MeSH) included "delirium education", "nurses" or "nursing knowledge", and "multimodal training". Boolean operators "OR" and "AND" combined concepts, while "NOT" excluded studies focused on critical care settings. The initial search yielded 60 articles.

Articles were narrowed using the inclusion criteria of the English language and peer-reviewed studies published between 2018 and 2023. After excluding duplicates and intensive care unit studies, 35 articles remained. Following an abstract review, 20 studies met the inclusion criteria due to their applicability to delirium education in the hospital setting.

Literature findings

The 20 studies included in this review reflect growing recognition of the importance of delirium education for medical-surgical nurses. Earlier delirium research focused primarily on critical care settings; however, recent studies emphasize delirium knowledge, recognition, and interventions in medical-surgical units.^{7,12,29-45}

Several researchers identified significant deficits in nurses' theoretical knowledge of delirium, which hinder the ability to differentiate delirium from dementia, depression, and other acute medical conditions.^{16,41,44} In contrast, evidence consistently supports multimodal educational interventions in improving nurses' knowledge, awareness, and recognition of delirium and associated risk factors.^{11,12,29-35,38-47} These findings highlight the need for structural educational strategies to strengthen nursing competence and improve patient outcomes.

Best practices

Current best practice emphasizes early recognition and modification of delirium risk factors through continuous nursing delirium education. Organizations such as the American Nurses Association/American Delirium Society recommend extensive delirium education during orientation and annual updates that include interprofessional learning and simulation-based training. Nurses should consistently administer all elements of a validated delirium assessment tool to improve screening accuracy.⁴⁷

Multi-modal educational programs are a practical learning intervention consisting of learning modules, reflective exercises, and simulation.³¹ In addition, researchers in their quasi-experimental study demonstrated that a pre-and post-education questionnaire effectively measures improvements in nurses' delirium knowledge, recognition, and confidence.^{12,31,35} Lastly, Coyle *et al.* concluded that education strategies should include managers and be interactive in style.³²

Materials and Methods

Project design and method

A practice change design guided by the Iowa model framework was used (*Supplementary Figure 2*).⁴⁸ The Iowa model was selected because it supports the implementation of evidence-based practice for complex clinical problems such as delirium. The framework consists of seven steps used as structured strategies to guide practice change.⁴⁸

Participants and setting

A total of 30 seasoned and novice bedside nurses employed on the 30-bed neuroscience medical-surgical unit were invited to participate. Float pool registered nurses and nurses who did not complete the survey in the allocated timeframe were excluded from participation. The project setting was the neuroscience medical-surgical unit at an academic medical center in upstate New York.

Intervention

The intervention consisted of two parts. The first was an on-demand 50-minute web-based delirium education module distributed through staff emails. Content included delirium knowledge,

risk factors, non-pharmacological management, screening tools, and case studies.

The second component included eight 10-minute in-person educational sessions, during which nurses received delirium educational resources and 2023 AGS Beers Criteria cards.

Project instruments

For this scholarly project, I adapted the Nurses' Delirium Knowledge Assessment (NDKA) tool, developed by Hare *et al.*,⁴⁹ to evaluate nurses' knowledge of delirium and recognition of delirium risk factors. The publishing company granted permission to use the tool. I chose the questionnaire after carefully reviewing the literature and based on the tool's adaptability in delirium knowledge research. In addition, Hare *et al.* developed the questionnaire for their study "A Questionnaire to Determine Nurses' Knowledge of Delirium and its Risk Factor".⁴⁹

The questionnaire includes three sections. The first section of the questionnaire consisted of demographic information collected for age, gender, length of time in the current position, number of years in nursing, hours worked per pay period, education level, and primary unit. The second section asked about the definition of delirium and comprised four multiple-choice questions. The third section consists of seven commonly used delirium assessment scales, with the option to identify the scales used to identify delirium, dementia, depression, or none. Of the 36 questions, the remaining 28 required either *agree*, *disagree*, or *unsure* responses. These 28 questions are divided into 14 questions on general knowledge of delirium and 14 on delirium risk factors. Finally, the questionnaire has three subscales: knowledge about delirium, tools for identifying delirium, and delirium risk factors.

I built the questionnaire into Microsoft Forms for electronic data collection. Microsoft Forms is a secure application used to develop and manage surveys. I embedded the link to the NDKA questionnaire in the participation letter, on poster boards around the unit, and in the educational intervention. The nurses were asked to provide the last five digits of their phone numbers but no personal identifiers to match their pre- and post-assessment surveys while maintaining confidentiality. Electronic submission reduced manual data entry and improved accessibility.

Planned data analysis

With the aid of a statistician and the use of the Statistical Package for the Social Sciences (SPSS, IBM, Armonk, NY, USA), descriptive statistics were used to summarize participants' demographics. I demonstrated the Wilcoxon signed-rank test used to evaluate statistical significance between the pre- and post-assessment surveys. Analysis focused on delirium definition, identification tools, delirium knowledge, and risk factors. Box plots were used to display score distribution.

Project procedure

After approval from the hospital's leadership, the Iowa Model guided project implementation. Nurse managers and educators were informed of the project and implementation timeline. Institutional Review Board (IRB) approval was obtained from both the hospital in upstate New York and the University of Saint Joseph before implementation began on November 6, 2023 (*Supplementary Figure 3* for project timeline).

The NDKA pre-assessment questionnaire by Hare *et al.* was distributed electronically one week before the educational intervention. Participants received an implied consent statement explaining that survey completion indicated consent to participate.

Results

Characteristics of participants

A total of 30 nurses completed the educational module and in-person session: 26 completed the pre-assessment survey; however, 4 did not complete the post-assessment, resulting in a final sample of 22 nurses.

Among participants, 86.4% (n=19) were women, and 13.6% (n=3) were men. The largest age group that completed the pre- and post-assessment survey was between the ages of 20 and 30 (40.9%, n=9), while the smallest was 51 or more (13.6%, n=3). Most participants had 5 or fewer years of nursing experience (40.9%, n=9), followed by those with 6 to 12 years (22.7%, n=5), then 13 to 20 years (22.7%, n=5), and lastly more than 20 years (13.6%, n=3). The majority worked in their current position for more than 12 months (63.6%, n=14), 6 months or less (9.1%, n=2), and between 6 and 12 months (27.3%, n=6). Most participants held a Bachelor of Science in Nursing (72.7%, n=16). In contrast, Associate in Nursing (13.6%, n=3), and Master of Science in Nursing (13.6%, n=3). Table 1 presents the demographic data.⁴⁹

Nurse's Delirium Knowledge Assessment results

Pre-intervention assessment results

The mean pre-assessment score for general delirium knowledge was 80.5%, while recognition of delirium risk factors averaged 58.3%. Detailed results can be found in Tables 2 and 3.⁴⁹ In the pre-assessment, 73.1% of the nurses correctly identified the CAM as a tool used for delirium assessment, whereas 26.9% incorrectly identified it as a dementia tool. Only 53.8% of the nurses correctly identified the definition of delirium.

Post-intervention assessment results

Post-assessment results demonstrated improvement in nurses' delirium knowledge. Mean scores increased to 85.3% for general knowledge of delirium and 72.1% for delirium risk factor recognition. Nurses' correct identification of the delirium definition increased to 68.2% (Table 4).⁴⁹

Knowledge of assessment tools also improved, with 81.8% of nurses correctly identifying the CAM as a delirium assessment tool. Fewer nurses (13.6%) misidentified the CAM as a dementia tool, and 4.5% identified it as a tool used for neither delirium nor dementia (Tables 4 and 5).⁴⁹

As shown in Table 5, the NDKA also assessed knowledge of tools including the Mini-Mental State Examination, Glasgow Coma Scale, Delirium Rating Scale, Clinical Institute Withdrawal Assessment of Alcohol, CAM, Beck's Depression Inventory, and Braden Scale.

After 6 weeks, statistical analysis demonstrated a significance between the pre- and post-assessment survey scores ($z=-3.77$, $p\leq 0.001$), indicating overall improvement in nurses' delirium knowledge (*Supplementary Figures 4 and 5*).

Table 1. Participants demographics. Modified from: Hare *et al.* (2008).

Baseline characteristic	Pre-assessment		Post-assessment	
	n	%	n	%
Gender				
Male	3	11.5	3	13.6
Female	23	88.5	19	86.4
Age				
20-30	10	38.5	9	40.9
31-40	5	19.2	5	22.7
41-50	6	23.1	5	22.7
51+	5	19.2	3	13.6
Education level				
Associate's degree	2	7.7	3	13.6
Bachelor's degree	21	80.8	16	72.7
Master's degree	3	11.5	3	13.6
Length of time in position				
Less than 6 months	3	11.5	2	9.1
6-12 months	4	15.4	6	27.3
More than 12 months	19	73.1	14	63.3
Number of years in nursing				
5 or less years	10	38.5	9	40.9
6 to 12 years	5	19.2	5	22.7
13 to 20 years	7	26.9	5	22.7
More than 20 years	4	15.4	3	13.6

Table 2. Results of the nurse's pre- and post-questionnaire for delirium knowledge scores. Modified from: Hare *et al.* (2008).

Knowledge questions	Pre-assessment scores					
	Post-assessment scores					
	Agree		Disagree		Unsure	
	n	%	n	%	n	%
Fluctuation between orientation and disorientation is not typical of delirium	3	11.5	21*	80.8*	2	7.7
	7	31.8	15*	62.2*	0	0.0
Symptoms of depression may mimic delirium	19*	73.1*	4	15.4	3	11.5
	20*	90.9*	2	9.1	0	0.0
Treatment for delirium always includes sedation	0	0.0	23*	88.5*	3	11.5
	3	13.6	19*	86.4*	0	0.0
Patients never remember episodes of delirium	3	11.5	18*	69.2*	5	19.2
	2	9.1	20*	90.2*	0	0.0
A Mini-Mental Status Examination (MMSE) is the best way to diagnose delirium	3	11.5	15*	57.7*	8	30.8
	3	13.6	17*	77.3*	2	9.1
Delirium never lasts for more than a few hours (disagree)	1	3.8	25*	96.2*	0	0.0
	5	22.7	17*	77.3*	0	0.0
A patient who is lethargic and difficult to rouse does not have delirium	3	11.5	22*	84.6*	1	3.8
	3	13.6	18*	81.8*	1	4.5
Patients with delirium are always physically and/or verbally aggressive	3	11.5	23*	88.5*	0	0.0
	1	4.5	20*	90.9*	1	4.5
Delirium is generally caused by alcohol withdrawal	6	24.0	17*	68.0*	2	8.0
	2	9.1	20*	90.9*	0	0.0
Patients with delirium have a higher mortality rate	20*	80.0*	1	4.0	4	16.0
	21*	95.5*	0	0.0	1	4.5
Behavioral changes in the course of the day are typical of delirium	16*	66.7*	3	12.5	5	20.8
	16*	72.7*	5	22.7	1	4.5
A patient with delirium is likely to be easily distracted and/or have difficulty following a conversation	22*	91.7*	2	8.3	0	0.0
	21*	95.5*	1	4.5	0	0.0
Patients with delirium will often experience perpetual disturbances	20*	83.3*	2	8.3	2	8.3
	18*	81.8*	3	13.6	1	4.5
Altered sleep/wake cycle may be a symptom of delirium	24*	100*	0	0.0	0	0.0
	22*	100*	0	0.0	0	0.0

This table demonstrates the participants' percentage scores in the delirium knowledge section of the pre-and post-assessment survey. In the pre-assessment, 26 participants completed the survey. In the assessment, 22 participants completed the survey, representing the final number of participants. The asterisk (*) reflects the number and percentage of nurses answering "correct" to the question.

Table 3. Results of the nurse's pre- and post-questionnaire for delirium risk factor scores. Modified from: Hare *et al.* (2008).

Risk questions	Pre-assessment scores					
	Post-assessment scores					
	Agree		Disagree		Unsure	
	n	%	n	%	n	%
A patient having a repair of a fractured neck femur has the same risk for delirium as a patient having an elective hip replacement	24	92.3	2*	7.7*	0	0.0
	14	63.6	8*	36.4*	0	0.0
The risk for delirium increases with age	23*	92.0*	1	4.0	1	4.0
	22*	100*	0	0.0	0	0.0
A patient with impaired vision is at increased risk of delirium	19*	73.1*	5	19.2	2	7.7
	20*	90.9*	2	9.1	0	0.0
The greater the number of medications a patient is taking, the greater their risk of delirium	24*	92.3*	1	3.8	1	3.8
	22*	100*	0	0.0	0	0.0
A urinary catheter in situ reduces the risk of delirium	7	26.9	17*	65.4*	2	7.7
	10	45.5	12*	54.5*	0	0.0
Gender has no effect on the development of delirium	9	34.6	10*	38.5*	7	26.9
	4	18.2	17*	77.3*	1	4.5
Poor nutrition increases the risk of delirium	23*	88.5*	0	0.0	3	11.5
	20*	90.9*	1	4.5	1	4.5
Dementia is the greatest risk factor for delirium	17*	64.5*	5	19.2	4	15.4
	15*	68.2*	6	27.3	1	4.5
Males are more at risk for delirium than females	9*	34.6*	3	11.5	14	53.8
	17*	77.3*	4	18.2	1	4.5
Diabetes is a high risk for delirium	13	50.0	3*	11.5*	10	38.5
	12	54.5	8*	36.4*	2	9.1
Dehydration can be a risk factor for delirium	25*	96.2*	0	0.0	1	3.8
	21*	95.5*	1	4.5	0	0.0
Hearing impairment increases the risk of delirium	20*	76.9*	3	11.5	3	11.5
	19*	86.4*	3	13.6	0	0.0
Obesity is a risk factor for delirium	7	26.9	12*	46.2*	7	26.9
	8	36.4	12*	54.5*	2	9.1
A family history of dementia predisposes a patient to delirium	12	48.0	7*	28.0*	6	24.0
	12	54.5	9*	40.9*	1	4.5

This table demonstrates the participants' percentage scores in the delirium risk factors section of the pre- and post-assessment survey. In the pre-assessment, 26 participants completed the survey. In the assessment, 22 participants completed the survey, representing the final number of participants. The asterisk (*) reflects the number and percentage of nurses answering "correct" to the question.

Table 4. Results of nurse's overall pre- and post-delirium assessment scores. Modified from: Hare *et al.* (2008).

	Pre-assessment mean percentage scores	Post-assessment mean percentage scores
Definition of delirium	53.8	68.2
General delirium knowledge statements	80.5	85.3
Delirium risk factor statements	58.3	72.1

This result summarizes the subscales in the delirium knowledge questionnaire, except for the tools used for identifying delirium.

Table 5. Results of nurse's knowledge of delirium assessment scales and tools scores. Modified from: Hare *et al.* (2008).

Scales and tools	Delirium n (%)	Dementia n (%)	Depression n (%)	None n (%)
Mini-Mental State Exam				
Pre	5 (19.2)	15 (57.5)*	4 (15.4)	2 (7.7)
Post	4 (18.2)	15 (68.2)*	3 (13.6)	0 (0.0)
Glasgow Coma Scale				
Pre	7 (26.9)	2 (7.7)	1 (3.8)	16 (61.5)*
Post	3 (13.6)	2 (9.1)	2 (9.1)	15 (68.2)*
Delirium Rating Scale				
Pre	25 (96.2)*	1 (3.8)	0 (0.0)	0 (0.0)
Post	21 (95.5)*	0 (0.0)	0 (0.0)	1 (4.5)
Alcohol Withdrawal Scale				
Pre	11 (42.3)*	1 (3.8)	0 (0.0)	14 (53.8)
Post	9 (40.9)*	2 (9.1)	0 (0.0)	11 (50.0)
Confusion Assessment Method				
Pre	19 (73.1)*	7 (26.9)	0 (0.0)	0 (0.0)
Post	18 (81.8)*	3 (13.6)	0 (0.0)	1 (4.5)
Beck's Depression Inventory				
Pre	1 (3.8)	1 (3.8)	22 (84.6)*	2 (7.7)
Post	1 (4.5)	0 (0.0)	20 (90.9)*	1 (4.5)
Braden Scale				
Pre	3 (11.5)	2 (7.7)	1 (3.8)	20 (76.9)*
Post	1 (4.5)	1 (4.5)	1 (4.5)	19 (86.4)*

26 was the number of nurses who completed the pre-assessment. However, 22 was the total number of nurses who completed the pre- and post-assessment. The asterisk (*) reflects the number and percentage of nurses answering "correct" to the question.

Discussion

The key findings of this project support previous studies by Johnson and Martinze *et al.* in their systematic review and quantitative review studies, which demonstrated that nurses in the acute care setting often have deficits in delirium knowledge, affecting recognition, attitudes, and patient care.^{36,38} This is also known as theoretical knowledge deficits, which include limited understanding of delirium definition, symptoms, assessment tools, and risk factors.⁴⁵

This project contributes to nursing knowledge by demonstrating that a multimodal educational intervention can significantly improve nurses' understanding of delirium and recognition of delirium risk factors in a neuroscience medical-surgical setting. Improved knowledge may strengthen early identification, assessment, and timely intervention, ultimately supporting patient safety and quality care.

The improvement in the post-intervention scores suggests that targeted education effectively addresses existing knowledge gaps and enhances nurses' confidence in delirium recognition and assessment.

Limitations

Several limitations were identified. The project was limited to one neuroscience medical-surgical unit and used a convenience sample with a small participant size (n=30). Although participation increased after extending the implementation period by one week, the final sample included only 22 nurses who completed both assessments.

Limited engagement with email-based education also affected participation, as some nurses reported not routinely checking

emails. Nurses appeared more receptive to the brief in-person educational sessions. Additional barriers included lack of protected educational time, staffing shortage, patient acuity, and sick calls.

Some participants also found the 36-item NDKA lengthy and time-consuming, which may have contributed to incomplete surveys. Although the tool has been used in similar studies, a shorter validated version may improve participation in future research.

Implications for nursing

The findings suggest that multimodal delirium education enhances nurses' ability to recognize delirium early, supporting timely interventions and improved patient safety. Despite increasing awareness and funding for delirium research, delirium education remains underemphasized in many health care settings.⁵⁰ Further implications indicate the need to refocus resources on delirium and education in various medical settings and educational institutions.

This project also supports the use of pre- and post-assessment surveys to evaluate educational effectiveness. Although the NDKA provided a comprehensive assessment, its length may reduce engagement. Future research should focus on developing a shorter validated version that maintains reliability while improving usability in busy clinical settings.

The project further contributes to nursing research, highlighting the potential relationship between improved nursing knowledge and patient outcomes. Enhancing nurses' recognition of delirium risk factors may reduce complications, hospital length of stay, health costs, falls, and inappropriate use of restraints or antipsychotics. Additional research is needed to evaluate the direct relationship between educational interventions and patient-centered clinical outcomes.

Sustainability

A delirium educational program continued during the annual educational sessions for nurses on the medical-surgical unit. Nurses received a handbook containing delirium educational materials and a PowerPoint presentation.

Conclusions

A combined web-based module and brief educational sessions improve nurse knowledge of delirium over 6 weeks by reinforcing key concepts and supporting translation into clinical practice. This multimodal approach improved delirium recognition and risk factor identification, contributing to safer, higher-quality patient care. Continued education and institutional support are necessary to sustain these improvements and strengthen patient outcomes.

References

1. American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 5th ed., text rev. Arlington (VA), USA: American Psychiatric Association; 2022.
2. National Institute for Health and Care Excellence. Delirium: prevention, diagnosis and management in hospital and long-term care (NICE Clinical Guideline CG103). London, UK: National Institute for Health and Care Excellence (NICE); 2023.
3. Dixon M. Assessment and management of older patients with delirium in acute settings. *Nurs Older People* 2018;30:35-42.
4. Bennett C. Caring for patients with delirium. *Nursing* 2019;49:17-20.
5. Wilson JE, Mart MF, Cunningham C, et al. Delirium. *Nat Rev Dis Primers* 2020;6:90.
6. Bauernfreund Y, Butler M, Ragavan S, Sampson EL. TIME to think about delirium: improving detection and management in the acute medical unit. *BMJ Open Qual* 2018;7:e000200.
7. Gibb K, Seeley A, Quinn T, et al. The consistent burden in published estimates of delirium occurrence in medical inpatients over four decades: a systematic review and meta-analysis study. *Age Ageing* 2020;49:352-60.
8. Thom RP, Levy-Carrick NC, Bui M, Silbersweig D. Delirium. *Am J Psychiatry* 2019;176:785-93.
9. Qu J, Chen Y, Luo G, et al. Delirium in the acute phase of ischemic stroke: incidence, risk factors, and effects on functional outcome. *J Stroke Cerebrovasc Dis* 2018;27:2641-7.
10. Shaw RC, Walker G, Elliott E, Quinn TJ. Occurrence rate of delirium in acute stroke settings: systematic review and meta-analysis. *Stroke* 2019;50:3028-36.
11. Byrnes T. Impact of delirium education on medical-surgical nurses' knowledge. *J Nurs Care Qual* 2021;36:291-3.
12. Ewens B, Seaman K, Whitehead L, et al. A delirium prevalence audit and a pre- and post-evaluation of an interprofessional education intervention to increase staff knowledge about delirium in older adults. *BMC Nurs* 2021;20:202.
13. Francisco MA, Gesell T, Meletis S, et al. Nurse-driven assessment, prevention, and management of delirium on an acute inpatient neurology unit. *J Nurs Care Qual* 2022;37:334-41.
14. Thomas N, Coleman M, Terry D. Nurses' experience of caring for patients with delirium: systematic review and qualitative evidence synthesis. *Nurs Rep* 2021;11:164-74.
15. Hasemann W, Tolson D, Godwin J, et al. Nurses' recognition of hospitalized older patients with delirium and cognitive impairment using the delirium observation screening scale: a prospective comparison study. *J Gerontol Nurs* 2018;44:35-43.
16. Mulkey MA, Olson DM, Misrahi S, Hardin SR. Delirium screening of patients on a neuroscience step-down unit. *Medsurg Nurs* 2021;30:414-8.
17. Oh ES, Fong TG, Hsieh TT, Inouye SK. Delirium in older persons: advances in diagnosis and treatment. *JAMA* 2017;318:1161-74.
18. Eeles EM, England R, Armstrong A, et al. Understanding our patients better will lead to better recognition of delirium: an opinion piece. *Australas J Ageing* 2018;37:241-2.
19. Fick DM, Shrestha P. Delirium in persons with dementia: integrating the 4Ms of age-friendly care as a set into the care of older people. *J Gerontol Nurs* 2022;48:3-6.
20. Wong EK, Lee JY, Surendran AS, et al. Nursing perspectives on the confusion assessment method: a qualitative focus group study. *Age Ageing* 2018;47:880-6.
21. Cechinel C, Lenardt MH, Rodrigues JAM, et al. Frailty and delirium in hospitalized older adults: a systematic review with meta-analysis. *Rev Lat Am Enfermagem* 2022;30:e3687.
22. Inouye SK, van Dyck CH, Alessi CA, et al. Clarifying confusion: the confusion assessment method. A new method for detection of delirium. *Ann Intern Med* 1990;113:941-8.
23. Edwards N. Differentiating the three D's: delirium, dementia, and depression. *Medsurg Nurs* 2003;12:347-57.
24. van Lieshout C, Schuit E, Hermes C, et al. Hospitalization costs and health-related quality of life in delirious patients: a scoping review. *Health Econ* 2022;169:28-38.
25. Kinchin I, Mitchell E, Agar M, Trépel D. The economic cost of delirium: a systematic review and quality assessment. *Alzheimers Dement* 2021;17:1026-41.
26. American Geriatrics Society. What is delirium? 2019. Available from: https://help.agscocare.org/what_is_help
27. Weir E, O'Brien AJ. Don't go there—it's not a nice place: older adults' experiences of delirium. *Int J Ment Health Nurs* 2019;28:582-91.
28. Solberg LM, Campbell CS, Jones K, et al. Training hospital inpatient nursing to know (THINK) delirium: a nursing educational program. *Geriatr Nursing* 2021;42:16-20.
29. Ching J, Darwish S, Siegel K, et al. Positive outcomes following a multidisciplinary approach in the diagnosis and prevention of hospital delirium. *J Clin Outcomes Manag* 2021;28:272-6.
30. Carey E, Furlong E, Smith R. The management of delirium in the older adult in advanced nursing practice. *Br J Nurs* 2022;31:76-84.
31. Choi M, DeGennaro R, Blevins C. Multi-modal education program to improve nurses' knowledge and confidence on delirium recognition in a surgical-trauma intermediate-care setting. *J Doctoral Nurs Pract* 2020;13:31-41.
32. Coyle MA, Chang HC, Burns P, Traynor V. Impact of interactive education on health care practitioners and older adults at risk of delirium: a literature review. *J Gerontol Nurs* 2018;44:41-8.
33. Detroyer E, Dobbels F, Teodorczuk A, et al. Effect of an interactive e-learning tool for delirium on patient and nursing outcomes in a geriatric hospital setting: findings of a before-after study. *BMC Geriatr* 2018;18:19.
34. Grealish L, Todd JA, Krug M, Teodorczuk A. Education for delirium prevention: knowing, meaning, and doing. *Nurse Educ Pract* 2019;40:102622.
35. Herrera E, Rutherford W, Plume T, et al. Evaluation of education

- and patient screening for delirium among patients with stroke: knowledge, confidence, and patient outcomes. *J Contin Educ Nurs* 2023;54:61-70.
36. Johnson CB. Evidence-based practice initiative: the educational reinforcement on delirium assessment. *Medsurg Nurs* 2021;30:383-8.
 37. Jones L, Taylor T. Identifying acute delirium in acute care units. *Medsurg Nurs*. 2019;28:172-5.
 38. Martínez-García M, Sánchez-López E, Fernández-Trinidad M. Managing delirium in acute inpatient units: a cross-sectional study of nursing teams' knowledge and perceived limitations. *Nurs Open* 2023;10:2213-21.
 39. Papaioannou M, Papastavrou E, Kouta C, et al. Investigating nurses' knowledge and attitudes about delirium in older persons: a cross-sectional study. *BMC Nurs* 2023;22:10.
 40. Reppas-Rindlisbacher C, Siddhpuria S, Wong EK, et al. Implementation of a multicomponent intervention sign to reduce delirium in orthopaedic inpatients (MIND-ORIENT): a quality improvement project. *BMJ Open Qual* 2021;10:e001186.
 41. Rohatgi N, Weng Y, Bentley J, et al. Initiative for prevention and early identification of delirium in medical-surgical units: lessons learned in the past five years. *Am J Med* 2019;132:1421-30.e8.
 42. Schnitker L, Nović A, Arendts G, et al. Prevention of delirium in older adults with dementia: a systematic literature review. *J Gerontol Nurs* 2020;46:43-54.
 43. Travers C, Henderson A, Graham F, Beattie E. Turning education into action: impact of a collective social education approach to improve nurses' ability to recognize and accurately assess delirium in hospitalized older patients. *Nurse Educ Today* 2018;62:91-7.
 44. van Velthuisen EL, Zwakhalen SMG, Warnier RMJ, et al. Can education improve clinical practice concerning delirium in older hospitalised patients? Results of a pre-test post-test study on an educational intervention for nursing staff. *BMC Med Educ* 2018;18:59.
 45. Vannes C, Tofthagen C. Impacting outcomes in the hospitalized oncology patient: evidence-informed quality and safety project to implement routine screening for delirium. *Patient Saf* 2022;4:20-9.
 46. Byrnes T, McMillan-Queen T, Weaver KJ, et al. Leveraging e-learning to improve nurses' knowledge of delirium assessment. *Medsurg Nurs* 2023;32:57-61.
 47. American Nurses Association/American Delirium Society. Delirium prevention strategies. 2016. Available from: <https://www.nursingworld.org/practice-policy/work-environment/health-safety/delirium/>
 48. Iowa Model Collaborative. Iowa model of evidence-based practice: Revisions and validation. *Worldviews Evid Based Nurs* 2017;14:175-82.
 49. Hare M, Wynaden D, McGowan S, et al. A questionnaire to determine nurses' knowledge of delirium and its risk factors. *Contemp Nurs* 2008;29:23-31.
 50. Khachaturian AS, Hayden KM, Devlin JW, et al. International drive to illuminate delirium: a developing public health blueprint for action. *Alzheimers Dement* 2020;16:711-25.

Online supplementary material:

Supplementary Figure 1. SWOT analysis.

Supplementary Figure 2. Iowa Model Evidence-Based Practice. Reproduced from Iowa Model Collaborative (2017), with permission from the University of Iowa Hospitals and Clinics.

Supplementary Figure 3. Gantt chart of timeline.

Supplementary Figure 4. Wilcoxon-signed-ranked test.

Supplementary Figure 5. Box-plot graph.

Received: 21 January 2026; Accepted: 15 June 2026.

Conflict of interest: the author declares that they have no competing interests.

Ethics approval and consent to participate: this study was approved by the University of Saint Joseph (Approval No. 23-038) and Brany IRB (Approval No. 23-12-667-337). Written informed consent was obtained from all participants prior to enrollment in the study.

Informed consent: written informed consent was obtained from all participants prior to their enrollment in the study. Participants were informed about the purpose of the study, the study procedures, the voluntary nature of participation, their right to withdraw at any time without penalty, and the measures taken to ensure the confidentiality of their data.

Patient consent for publication: consent for publication of anonymized data and images was obtained from all participants where applicable.

Availability of data and materials: the datasets generated and analyzed during the current study are available from the corresponding author on reasonable request.

Acknowledgments: the author wishes to thank all the members of the team for their support in conducting this study.

Declaration of generative artificial intelligence and artificial intelligence-assisted technologies in the writing process: during the preparation of this manuscript, the author used generative artificial intelligence (AI) to improve language, grammar, and readability. The author carefully reviewed and edited the output and take full responsibility for the content of this publication.

Publisher's note: all claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article or claim that may be made by its manufacturer is not guaranteed or endorsed by the publisher.

This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License (CC BY-NC 4.0).