Positive Outcomes Following a Multidisciplinary Approach in the Diagnosis and Prevention of Hospital Delirium

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Objectives: To reduce the incidence and duration of delirium among patients in a hospital ward through standardized delirium screening tools and nonpharmacologic interventions. To advance nursing-focused education on delirium-prevention strategies. To measure the efficacy of the interventions with the aim of reproducing best practices.

Background: Delirium is associated with poor patient outcomes but may be preventable in a significant percentage of hospitalized patients.

Methods: Following nursing-focused education to prevent delirium, we prospectively evaluated patient care outcomes in a consecutive series of patients who were admitted to a hospital medical-surgical ward within a 25-week period. All patients who had at least 1 Confusion Assessment Method (CAM) documented by a nurse during hospitalization met our inclusion criteria (N = 353). Standards for Quality Improvement Reporting Excellence guidelines were adhered to.

Results: There were 187 patients in the control group, and 166 in the postintervention group. Compared to the control group, the postintervention group had a significant decrease in the incidence of delirium during hospitalization (14.4% vs 4.2%) and a significant decrease in the mean percentage of tested nursing shifts with 1 or more positive CAM (4.9% vs 1.1%). Significant differences in secondary outcomes between the control and postintervention groups included median length of stay (6 days vs 4 days), mean length of stay (8.5 days vs 5.9 days), and use of an indwelling urinary catheter (9.1% vs 2.4%).

Conclusion: A multimodal strategy involving nursing-focused training and nonpharmacologic interventions to address hospital delirium is associated with improved patient care outcomes and nursing confidence. Nurses play an integral role in the early recognition and prevention of hospital delirium, which directly translates to reducing burdens in both patient functionality and health care costs.

Keywords: delirium; prevention; nurse; nursing; Confusion Assessment Method; hospital; precautions; nonpharmacologic; intervention.

Delirium is a disorder characterized by inattention and acute changes in cognition. It is defined by the American Psychiatric Association's fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* as a disturbance in attention, awareness, and cognition over hours to a few days that is not better explained by a preexisting, established, or other evolving neurocognitive disorder.[1] Delirium is common yet often under-recognized among hospitalized patients, particularly in the elderly. The incidence of delirium in elderly patients on admission is estimated to be 11% to 25%, and an additional 29% to 31% of elderly patients will develop delirium during the hospitalization.[2] Delirium costs the health care system an estimated $38 billion to $152 billion per year.[3] It is associated with negative outcomes, such as increased new placements to nursing homes, increased mortality, increased risk of dementia, and further cognitive deterioration among patients with dementia.[4-6]

Despite its prevalence, delirium may be preventable in a significant percentage of hospitalized patients. Targeted intervention strategies, such as frequent reorientation,


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Table 1. **Order Set for Prevention of Hospital Delirium**

Notify physician	If patient has been newly screened positive on CAM
	For sleep-promoting vital signs: Consider ordering vital signs to be taken 3 times a day between 7:00 AM and 10:00 PM to promote sleep
	Regarding patient tethers: Encourage early discontinuation of continuous cardiac monitoring, oxygen, urinary catheter, and IV fluids (if tolerating fluids)
	For HCT <24/Hgb
	For low urine output (<400 mL/24 hours, BUN/creatinine ratio >18)
	If bladder scan is >300 mL
	If no bowel movement in past 48 hours
	Temperature >38.4 °C
	Systolic blood pressure <90 mmHg
	Systolic blood pressure >160 mmHg
	Heart rate <50 bpm
	Heart rate >120 bpm
	Respiratory rate <10 breaths/min
	Respiratory rate >30 breaths/min
	Keep oxygen saturation ≥92
Out of bed	Routine: 3 times daily
	Specify: breakfast, lunch, dinner
	Unless on bed rest
Activity: ambulate	Routine: 3 times daily
	Unless on bed rest
Activity: bathroom with assistance	Routine: until discontinued
	Unless on bed rest
	No bedpans following surgery
Perform CAM	Routine: every 12 hours
Measure orthostatic vital signs	Routine: daily
	Patient position: supine, sitting, and standing
Perform bladder scan	Routine: as needed
Encourage by mouth fluids	Routine: until discontinued
	If cleared for by mouth liquids, encourage fluids/oral intake; fluids within reach of patient at all times
Delirium protocol	Routine: until discontinued
	Notify pharmacy for review of medications if concern for American Geriatric Society Beers Criteria medications and/or polypharmacy contributing to delirium
	Reorient patient to location, day, and date during purposeful rounding
	Sensory aids are to be used by patient during waking hours (ie, glasses, hearing aids, dentures)
	Encourage family involvement (ie, bring objects from home, meal assist, conversation)
	Educate family members about delirium
	Daytime: blinds open, prevent napping, no caffeine after 12:00 PM, TV off when not in use
	Nighttime: blinds closed/lights off, offer earplugs/eye mask, TV off, minimize interruptions
	Nonpharmacologic sleep protocol: provide warm noncaffeinated drink, relaxing music
Call to volunteer services assistance	Routine: as needed
	Specify for any of the following:
	• Meal Time Mates: for patients who need assistance, encouragement, or company during meal times
	• Transforming Care at the Bedside volunteer: for patients with minimal visitors. Note: not recommended for patients with hyperactive delirium
	• Other volunteer services: provide patient with therapeutic activities as appropriate for cognitive status (ie, music therapy, pet therapy, activity apron, word games, playing cards, reiki, books)
Consult to clinical dietitian	Routine: 1 time for 1 occurrence
	Reason for consult: nutritional evaluation
Fall precautions	Routine: continuous
Aspiration precautions	Routine: continuous

bpm, beats per minute; BUN, blood urea nitrogen; CAM, Confusion Assessment Method; HCT, hematocrit; Hgb, hemoglobin; IV, intravenous.
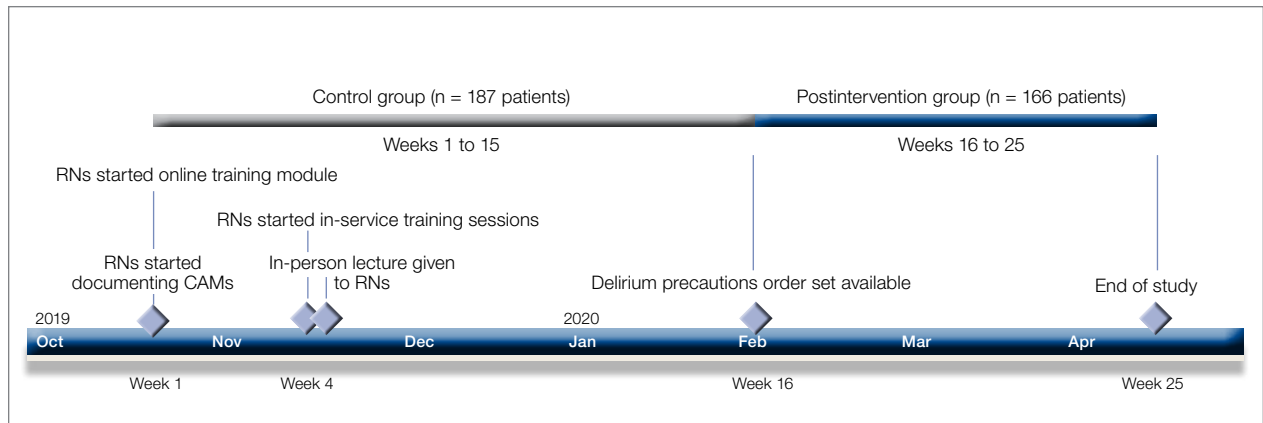
Figure 1. Timeline of study events. The gray bar represents the start of the training program (week 1) until the order set was made available (week 15). Patients admitted within this time period constituted our control group. The blue bar represents the 10 weeks after the completion of the interventions (weeks 16-25). Patients admitted within this time period constituted our postintervention group. Study interventions are marked with diamonds at the respective time course.

CAM, Confusion Assessment Method; RN, registered nurse.

maximizing sleep, early mobilization, restricting use of psychoactive medications, and addressing hearing or vision impairment, have been demonstrated to significantly reduce the incidence of hospital delirium.[7,8] To achieve these goals, we explored the use of a multimodal strategy centered on nursing education. We integrated consistent, standardized delirium screening and nonpharmacologic interventions as part of a preventative protocol to reduce the incidence of delirium in the hospital ward.

Methods

We evaluated a consecutive series of patients who were admitted to a designated hospital medical-surgical ward within a 25-week period between October 2019 and April 2020. All patients during this period who had at least 1 Confusion Assessment Method (CAM) documented by a nurse during hospitalization met our inclusion criteria. Patients who did not have a CAM documented were excluded from the analysis. Delirium was defined according to the CAM diagnostic algorithm.[9]

Core nursing staff regularly assigned to the ward completed a multimodal training program designed to improve recognition, documentation, and prevention of hospital delirium. Prior to the training, the nurses completed a 5-point Likert scale survey assessing their level of confidence with recognizing delirium risk factors, preventing delirium, addressing delirium, utilizing the

CAM tool, and educating others about delirium. Nurses completed the same survey after the study period ended.

The training curriculum for nurses began with an online module reviewing the epidemiology and risk factors for delirium. Nurses then participated in a series of in-service training sessions led by a team of physicians, during which the CAM and nonpharmacologic delirium prevention measures were reviewed then practiced first-hand. Nursing staff attended an in-person lecture reviewing the current body of literature on delirium risk factors and effective nursing interventions. After formal training was completed, nurses were instructed to document CAM screens for each patient under their care at least once every 12-hour shift for the remainder of the study. An order set, reflected in **Table 1**, was made available to physicians and floor nurses to assist with implementing the educational components.

Patients admitted to the hospital unit from the start of the training program (week 1) until the order set was made available (week 15) constituted our control group. The postintervention study group consisted of patients admitted for 10 weeks after the completion of the interventions (weeks 16-25). A timeline of the study events is shown in **Figure 1**.

Patient demographics and hospital-stay metrics determined a priori were attained via the Cedars-Sinai Enterprise Information Services core. Age, sex, medical

Table 2. **Patient Demographics in Control and Postintervention Groups**

Patient demographic	Control (n = 187)	Postintervention (n = 166)
Median age (IQR), y	82.0 (87.0-74.5)	81.0 (86.8-71.0)
Male, n (%)	74 (39.6)	89 (53.6)
Charlson Comorbidity Index, median (IQR)	6.0 (8.0-5.0)	6.0 (8.0-5.0)
Surgery with anesthesia, n (%)	24 (12.8)	27 (16.3)
IQR, interquartile range.		

history, and incidence of surgery with anesthesia during hospitalization were recorded. The Charlson Comorbidity Index was calculated from patients' listed diagnoses following discharge. Primary outcomes included incidence of patients with delirium during hospitalization, percentage of tested shifts with positive CAM screens, length of hospital stay, and survival. Secondary outcomes included measures associated with delirium, including the use of chemical restraints, physical restraints, sitters, indwelling urinary catheters, and new psychiatry and neurology consults. Chemical restraints were defined as administration of a new antipsychotic medication or benzodiazepine for the specific indication of hyperactive delirium or agitation.

Statistical analysis was conducted by a statistician, using R version 3.6.3.[10] *P* values of < .05 were considered significant. Categorical variables were analyzed using Fisher's exact test. Continuous variables were analyzed with Welch's *t*-test or, for highly skewed continuous variables, with Wilcoxon rank-sum test or Mood's median test. All patient data were anonymized and stored securely in accordance with institutional guidelines.

Our project was deemed to represent nonhuman subject research and therefore did not require Institutional Review Board (IRB) approval upon review by our institution's IRB committee and Office of Research Compliance and Quality Improvement. Standards for Quality Improvement Reporting Excellence (SQUIRE 2.0) guidelines were adhered to (Supplementary File can be found at mdedge.com/jcomjournal).

Results

We evaluated 353 patients who met our inclusion criteria: 187 in the control group, and 166 in the postintervention group. Ten patients were readmitted to the ward after their initial discharge; only the initial admission encounters were included in our analysis. Median age, sex, median Charlson Comorbidity Index, and incidence of surgery with anesthesia during hospitalization were comparable between the control and postintervention groups and are summarized in **Table 2**. In the control group, 1572 CAMs were performed, with 74 positive CAMs recorded among 27 patients with delirium. In the postintervention group, 1298 CAMs were performed, with 12 positive CAMs recorded among 7 patients with delirium (**Figure 2**). Primary and secondary outcomes, as well as CAM compliance measures, are summarized in **Table 3**.

Compared to the control group, the postintervention group had a significant decrease in the incidence of delirium during hospitalization (14.4% vs 4.2%, *P* = .002) and a significant decrease in the mean percentage of tested nursing shifts with 1 or more positive CAM (4.9% vs 1.1%, *P* = .002). Significant differences in secondary outcomes between the control and postintervention groups included median length of stay (6 days vs 4 days, *P* = .004), mean length of stay (8.5 days vs 5.9 days, *P* = .003), and use of an indwelling urinary catheter (9.1% vs 2.4%, *P* = .012). There was a trend towards decreased incidence of chemical restraints and psychiatry consults, which did not reach statistical significance. Differences in mortality during hospitalization, physical restraint use, and sitter use could not be assessed due to low incidence.

Compliance with nursing CAM assessments was evaluated. Compared to the control group, the postintervention group saw a significant increase in the percentage of shifts with a CAM performed (54.7% vs 69.1%, *P* < .001). The median and mean number of CAMs performed per
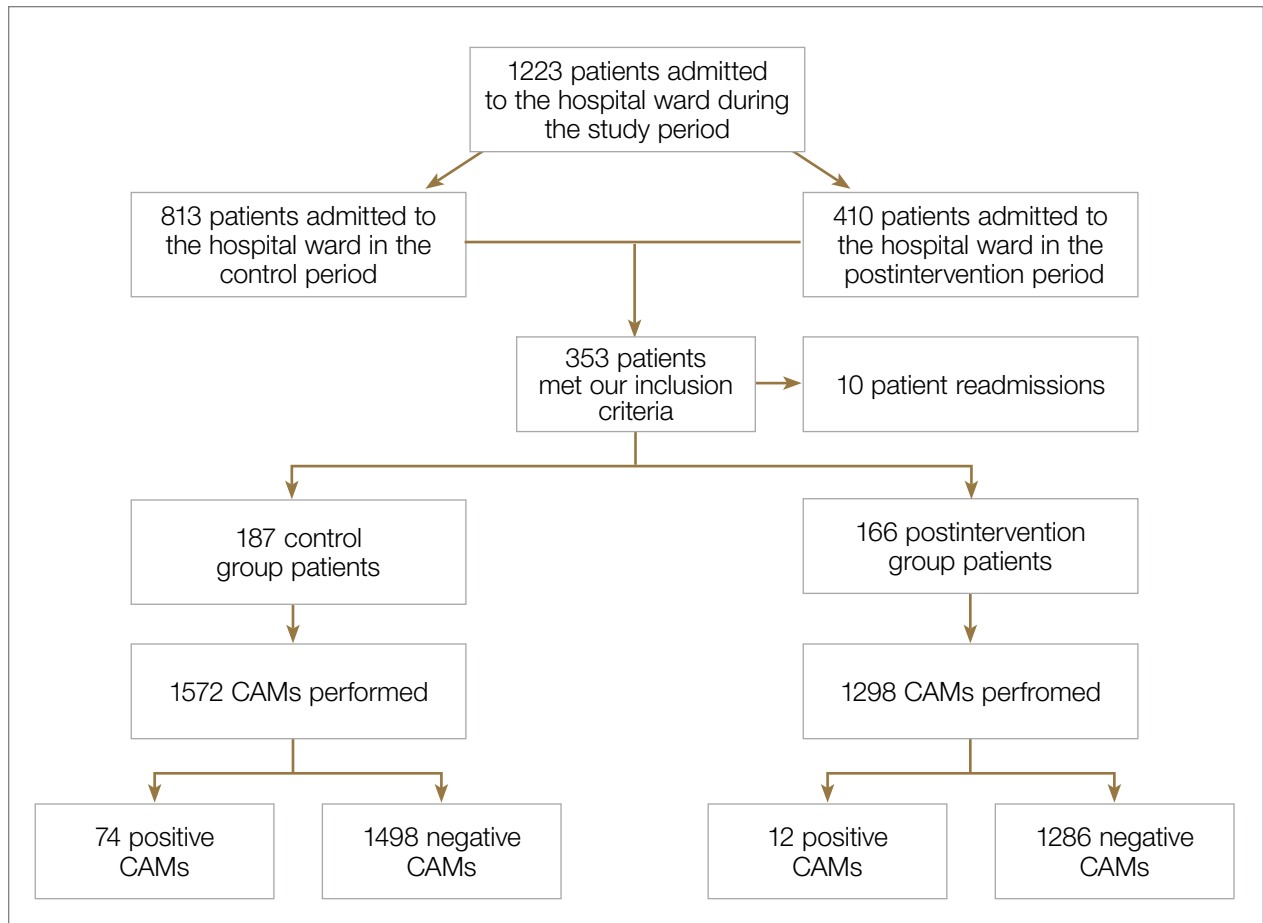
Figure 2. Flowchart of included patients and CAMs performed. The number of patients admitted to the hospital ward and who met our inclusion criteria are separated into control and postintervention groups. The number of CAMs performed and CAM results in each group are listed.
CAM, Confusion Assessment Method.

patient were similar between the control and postintervention groups.

Results of nursing surveys completed before and after the training program are listed in **Table 4**. After training, nurses had a greater level of confidence with recognizing delirium risk factors, preventing delirium, addressing delirium, utilizing the CAM tool, and educating others about delirium.

Discussion

Our study utilized a standardized delirium assessment tool to compare patient cohorts before and after nurse-targeted training interventions on delirium recognition and prevention. Our interventions emphasized

nonpharmacologic intervention strategies, which are recommended as first-line in the management of patients with delirium.[11] Patients were not excluded from the analysis based on preexisting medical conditions or recent surgery with anesthesia, to allow for conditions that are representative of community hospitals. We also did not use an inclusion criterion based on age; however, the majority of our patients were greater than 70 years old, representing those at highest risk for delirium.[2] Significant outcomes among patients in the postintervention group include decreased incidence of delirium, lower average length of stay, decreased indwelling urinary catheter use, and increased compliance with delirium screening by nursing staff.

Table 3. **Statistical Results of Primary Outcome, Secondary Outcome, and CAM Compliance Measures Among Control and Postintervention Groups**

Primary outcomes	Control (n = 187)	Postintervention (n = 166)	*P* value	Statistical test performed
Incidence of patients with delirium during hospitalization, n (%)	27 (14.4)	7 (4.2)	.002	Fisher's exact test
Percentage of tested shifts with ≥1 positive CAM, mean (SD)	4.9 (16.3)	1.1 (6.0)	.002	Wilcoxon rank sum test
Secondary outcomes				
Median length of stay (IQR), d	6 (9.0-3.0)	4 (7.0-3.0)	.004	Mood's median test
Mean length of stay (SD), d	8.5 (10.7)	5.9 (5.6)	.003	Welch's two sample *t*-test
Mortality during hospitalization, n (%)	2 (1)	0 (0)	NA	NA
Chemical restraint, n (%)	28 (15.0)	17 (10.2)	.20	Fisher's exact test
Physical restraints, n (%)	2 (1.1)	0 (0)	NA	NA
Sitter use, n (%)	0 (0)	1 (0.6)	NA	NA
Indwelling urinary catheter use, n (%)	17 (9.1)	4 (2.4)	.01	Fisher's exact test
Psych consult, n (%)	16 (8.6)	8 (4.8)	.20	Fisher's exact test
Neuro consult, n (%)	74 (39.6)	74 (44.6)	.39	Fisher's exact test
CAM compliance measures				
Percentage of shifts ≥6 hours in length with a CAM performed (SD)	54.7 (27.7)	69.1 (29.4)	<.001	Welch's two sample *t*-test
Number of CAMs performed per patient, median (IQR)	6.0 (11.0-3.0)	6.0 (10.0-3.0)	NA	NA
Number of CAMs performed per patient, mean (SD)	8.4 (13.3)	7.8 (6.9)	NA	NA

IQR, interquartile range; NA, not applicable.

While the study's focus was primarily on delirium prevention rather than treatment, these strategies may also have conferred the benefit of reversing delirium symptoms. In addition to measuring incidence of delirium, our primary outcome of percentage of tested shifts with 1 or more positive CAM was intended to assess the overall duration in which patients had delirium during their hospitalization. The reduction in shifts with positive CAMs observed in the postintervention group is notable, given that a significant percentage of patients with hospital delirium have the potential for symptom reversibility.[12]

Multiple studies have shown that admitted patients who develop delirium experience prolonged hospital stays, often up to 5 to 10 days longer.[12-14] The decreased incidence and duration of delirium in our postintervention group is a reasonable explanation for the observed decrease in average length of stay. Our study is in line with previously documented initiatives that show that nonpharmacologic interventions can effectively address downstream health and fiscal sequelae of hospital delirium. For example, a volunteer-based initiative named the Hospital Elder Life Program, from which elements in our order set were modeled after, demonstrated significant reductions in delirium incidence, length of stay, and health care costs.[14-16] Other initiatives that focused on educational training for nurses to assess and prevent delirium have also demonstrated similar positive results.[17-19] Our study provides a model for effective nursing-focused education that can be reproduced in the hospital setting.

Unlike some other studies, which identified delirium based only on physician assessments, our initiative utilized the CAM performed by floor nurses to identify delirium. While this method may have affected the sensitivity and specificity of the CAMs, it also conferred the advantage of recognizing,

Table 4. **Results of Likert Scale Survey Questions Completed by Nurses Before and After Training, With Standard Error**

	Before training (n=28)	Standard error	After training (n=29)	Standard error
A. I can recognize patients who are at risk for delirium.	3.89	0.12	4.31	0.12
B. I have adequate skills and knowledge to intervene to prevent or mitigate delirium.	3.79	0.16	4.28	0.11
C. I have adequate skills and knowledge in caring for patients with delirium.	3.86	0.13	4.17	0.15
D. I know how to assess patients for delirium using the CAM tool included in the electronic medical record.	3.11	0.20	4.45	0.11
E. I feel comfortable educating family members about delirium and how they can help the patient.	3.64	0.19	4.28	0.15

1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree

documenting, and intervening on delirium in real time, given that bedside nurses are often the first to encounter delirium. Furthermore, nurses were instructed to notify a physician if a patient had a new positive CAM, as reflected in Table 1.

Our study demonstrated an increase in the overall compliance with the CAM screening during the postintervention period, which is significant given the under-recognition of delirium by health care professionals.[20] We attribute this increase to greater realized importance and a higher level of confidence from nursing staff in recognizing and addressing delirium, as supported by survey data. While the increased screening of patients should be considered a positive outcome, it also poses the possibility that the observed decrease in delirium incidence in the postintervention group was in fact due to more CAMs performed on patients without delirium. Likewise, nurses may have become more adept at recognizing true delirium, as opposed to delirium mimics, in the latter period of the study.

Perhaps the greatest limitation of our study is the variability in performing and recording CAMs, as some patients had multiple CAMs recorded while others did not have any CAMs recorded. This may have been affected in part by the increase in COVID-19 cases in our hospital towards the latter half of the study, which resulted in changes in nursing assignments as well as patient comorbidities in ways that cannot be easily quantified. Given the limited size of our patient cohorts, certain outcomes, such as the use of sitters, physical restraints, and in-hospital mortality, were unable to be assessed for changes statistically. Causative relationships between our interventions and associated outcome measures are necessarily limited in a binary comparison between control and postintervention groups.

Within these limitations, our study demonstrates promising results in core dimensions of patient care. We anticipate further quality improvement initiatives involving greater numbers of nursing staff and patients to better quantify the impact of nonpharmacologic nursing-centered interventions for preventing hospital delirium.

Conclusion

A multimodal strategy involving nursing-focused training and nonpharmacologic interventions to address hospital delirium is associated with improved patient care outcomes and nursing confidence. Nurses play an integral role in the early recognition and prevention of hospital delirium, which directly translates to reducing burdens in both patient functionality and health care costs. Education and tools to equip nurses to perform standardized delirium screening and interventions should be prioritized.

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