



Development and Evaluation of an Intensive Care Unit Video Series to Educate Staff on Delirium Detection

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ABSTRACT

Background: Delirium affects up to 80% of patients who are mechanically ventilated in the intensive care unit (ICU) but often goes undetected because of incomplete and/or inaccurate clinician evaluation and documentation. A lack of effective, feasible, and sustainable educational methods represents a key barrier to efforts to optimize, scale, and sustain delirium detection competencies. Progress with such barriers may be addressed with asynchronous video-based education.

Objective: To evaluate a novel ICU Delirium Video Series for bedside providers via a knowledge assessment quiz and a feedback questionnaire.

Methods: An interdisciplinary team scripted and filmed an educational ICU Delirium Video Series, providing detailed instruction on delirium detection using the validated CAM-ICU (Confusion Assessment Method for the ICU). A cohort of bedside nurses subsequently viewed and evaluated the ICU Delirium Video Series using a feedback questionnaire and a previously developed knowledge assessment quiz pre- and post-video viewing.

Results: Twenty nurses from four ICUs viewed the ICU Delirium Video Series and completed the pre-post quiz and questionnaire. Ten (50%) respondents had 10 or more years of ICU experience, and seven (35%) reported receiving no CAM-ICU education locally. After video viewing, overall pre-post scores improved significantly (66% vs. 79%; $P < 0.0001$). In addition, after video viewing, more nurses reported comfort in their ability to evaluate and manage patients with delirium.

Conclusion: Viewing the ICU Delirium Video Series resulted in significant improvements in knowledge and yielded valuable feedback. Asynchronous video-based delirium education can improve knowledge surrounding a key bedside competency.

Keywords:

critical care; delirium; intensive care unit; early diagnosis; education

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BACKGROUND

Delirium is a common syndrome affecting up to 80% of patients who are mechanically ventilated in the intensive care unit (ICU) setting (1). Patients experiencing delirium are at risk for several adverse outcomes, including longer ICU and hospital length of stay, long-term cognitive deficits, and early death (2–8). Consequently, delirium is estimated to cost the U.S. healthcare system \$150 billion per year (9, 10).

In its 2018 PADIS (Clinical Practice Guidelines for Pain, Agitation/Sedation, Delirium, Immobility, and Sleep Disruption) in the ICU, the SCCM (Society of Critical Care Medicine) recommended daily delirium screening for all patients who are critically ill using a validated tool, such as the CAM-ICU (Confusion Assessment Method for the ICU) (1). Though validated over 20 years ago, requiring no equipment and taking 2 or fewer minutes to perform, CAM-ICU performance and documentation in real-world settings are inconsistent, with completion rates as low as 38% in usual care settings and as high as 84–95% after rigorous intervention efforts (11–14). Even when documented, delirium is often

underrecognized and/or undiagnosed, particularly in patients with hypoactive delirium or neurological diagnoses (15, 16).

Particularly common are inappropriate “unable-to-assess” responses (19–30% of documented CAM-ICUs) when “unable-to-assess” is documented in a noncomatose (i.e., alert or lightly sedated) patient meeting criteria for a complete CAM-ICU assessment (17, 18).

Despite established guidelines and literature supporting the benefits of delirium screening on outcomes (i.e., fewer patient falls, reduced caregiver burden, and improved staff morale) (19–21), ICUs often struggle to consistently perform daily delirium screening, rendering patients vulnerable to underdiagnosis and potential adverse outcomes (22). Given a lack of available ICU delirium education tools, our interdisciplinary team filled this gap by developing an ICU Delirium Video Series. The objective of this manuscript is to describe the development of this novel ICU Delirium Video Series and evaluate its effectiveness with bedside nurses who viewed the videos and completed a knowledge assessment quiz and a feedback questionnaire.

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METHODS

Education Strategy

An ICU nurse educator (F.N.) and clinical nurse specialist (D.P.) teamed with a local ICU physician champion (B.B.K.) to build on ongoing Health System efforts to improve ICU delirium practices. At the time, the usual delirium-related practice in the six Health System ICUs (two medical, two surgical/cardiovascular, one neurological/neurosurgical, and one burn ICU across two hospital campuses) involved a once-per-shift CAM-ICU assessment and written mobility and spontaneous awakening protocols. Reporting of this effort adhered to Standards for Quality Improvement Reporting Excellence (SQUIRE) 2.0 guidelines (23). With a focus on educating providers regarding delirium detection, the initial intention of this effort was to compare traditional in-person and video-based delirium education. However, given the challenge of synchronous learning in busy clinical settings, together with the coronavirus disease (COVID-19) pandemic, which limited face-to-face educational interactions, a virtual delirium education platform was opted for instead. To develop this platform, few effective online CAM-ICU education resources were identified, and virtual learning was therefore chosen, based on other familiar instructional modules for healthcare providers (e.g., the American Heart Association's HeartCode for cardiopulmonary resuscitation training [24]). As this was a quality improvement project intended to improve standard-of-care clinical practice in the ICU, it was deemed as not human subjects research and did not require review by the UCSD (University of California San Diego) Institutional Review Board.

ICU Delirium Video Series

To inform video content, an experienced nurse educator (F.N.), clinical nurse

specialist (D.P.), and physician delirium champion (B.B.K.) shared their own CAM-ICU techniques with each other and subsequently performed the CAM-ICU (25) on a variety of patients in the ICU (including those on ventilators, receiving sedation, and with neurological impairments) while taking notes on techniques, learning points, and nuances that needed to be addressed in the videos. Subsequently, the team wrote video scripts centered around real ICU staff providing end-users with detailed instructions on performing Features 1, 2, 3, and 4 (four videos) of the CAM-ICU, delirium detection tips and tricks (one video), and CAM-ICU scoring (two videos) in a simulated patient who is mechanically ventilated (Table 1). Importantly, each video was designed to be viewed in 5 minutes or less (a total of ~30 min) and focused heavily on evaluating patients sedated and mechanically ventilated for delirium, together with patients with neurological impairments, such as dementia and stroke. With providers (F.N. and D.P.) and a simulated patient (research coordinator J.F.), the videos were filmed over three sessions in healthcare spaces and subsequently edited by a team member (H.M.). All team members were involved in providing iterative feedback during several rounds of video drafts. Finally, the videos (available at <https://vimeo.com/showcase/9768694>) were shared with six external delirium experts (including internationally recognized leaders of critical care and delirium societies, authors of ICU delirium clinical practice guidelines, and developers of validated ICU delirium materials) who provided feedback and confirmed their accuracy and relevancy.

Evaluation Group and Sample Size

For objective and subjective evaluation of the ICU Delirium Video Series, we

Table 1. Intensive care unit delirium video series*

Number	Length (min:s)	Video Title	Key Concepts
1	03:35	CAM-ICU Feature 1 (Acute Change or Fluctuating Course of Mental Status)	<ul style="list-style-type: none"> • Identify the presence of acute/fluctuating mental status changes • On the basis of the Feature 1 score, to determine how to proceed with the CAM-ICU
2 [†]	04:58	CAM-ICU Feature 3 (Level of Consciousness [RASS])	<ul style="list-style-type: none"> • Determine RASS score in sedated and nonsedated patients • On the basis of RASS score, determine how to proceed with the CAM-ICU assessment
3 [†]	03:40	CAM-ICU Feature 2 (Inattention)	<ul style="list-style-type: none"> • Assess a patient for inattention • Become familiar with Feature 2 scoring system
4	03:58	CAM-ICU Feature 4 (Disorganized Thinking)	<ul style="list-style-type: none"> • Assess a patient for disorganized thinking • Become familiar with Feature 4 scoring system
5	01:57	CAM-ICU Pearls and Pitfalls	<ul style="list-style-type: none"> • Recognize when to use the CAM-ICU assessment • Know when to document a CAM-ICU as “Unable to Assess”
6	04:04	Performing the CAM-ICU: Example 1	<ul style="list-style-type: none"> • Evaluate a patient for delirium
7	03:49	Performing the CAM-ICU: Example 2	

Definition of abbreviations: CAM-ICU = Confusion Assessment Method for the Intensive Care Unit; RASS = Richmond Agitation-Sedation Scale.

*Videos available at <https://vimeo.com/showcase/9768694>.

[†]CAM-ICU Feature 3 (Level of Consciousness [RASS]) listed before Feature 2 (Inattention) on the basis of the practice of completing RASS assessment before Features 2 and 4 (Disorganized Thinking) of the CAM-ICU.

recruited critical care nurses from our institution, given their role as frontline providers of delirium care, including bedside detection. An objective evaluation was performed using an established 28-question multiple-choice CAM-ICU quiz. This quiz (a resource for acute respiratory failure funded by the National Heart, Lung, and Blood Institute of the

National Institutes of Health [R24 HL111895]), though not yet validated, was chosen as it was publicly available and used as part of training and quality assurance activities for CAM-ICU administration in clinical research studies (26–30). Qualtrics was used to embed the videos between the before and after video quizzes (identical except for randomization

of question order). In addition to demographic and work information (i.e., years of ICU experience), before taking the before video quiz, respondents provided ratings regarding their comfort in performing the CAM-ICU (1 to 4 Likert scale; 1 = “Not Comfortable” and 4 = “Very Comfortable”), their delirium knowledge (1 to 7 Likert scale; 1 = “Not at All Knowledgeable” and 7 = “Extremely Knowledgeable”), and their ability to evaluate and manage patients with delirium (1 = “Completely Unable” and 7 = “Completely Able”). After before-video quiz completion, participants received their scores without information regarding incorrect and correct responses. Subsequently, participants viewed the educational videos and immediately completed an after-video quiz (same as the before-video quiz; open book optional), after which the correct answers were displayed. After the postvideo quiz, respondents reevaluated their delirium knowledge and evaluation and management abilities (on the same 1–7 Likert scales as detailed above) and completed free-text questions regarding the educational value of the videos.

To calculate a sample size, our nurse educator (F.N.) and clinical nurse specialist (D.P.) completed the quiz before and after viewing the video series, and on the basis of their average pre–post score improvement of 20% ($64\% \pm 5$ to $84\% \pm 7\%$) we estimated an evaluation group before-video quiz score of 50% (14 of 28 correct with an estimated standard deviation of 20%) and after-video quiz score increase of 20% ($50\% \pm 20$ to $70\% \pm 20\%$). Using a power of 0.90 and a *P* value of 0.05, we calculated a sample size of 13 nurses to comprise the evaluation group. Assuming a 75% noncompletion rate because of busy clinical duties

during the COVID-19 pandemic, 50 nurses were planned for recruitment. These calculations were on the basis of those used for a recent survey-based project (31) and reviewed for correctness with an experienced biostatistician. Nurse volunteers were given a cloth facemask in return for their participation.

Data Analysis

Continuous variables were summarized using means and standard deviations, and categorical variables using proportions. Quiz results were evaluated in aggregate and by CAM-ICU topic (i.e., Features 1–4, overall scoring). Paired Student's *t* tests were used to compare nurses' before- and after-video quiz results. Statistical significance was defined as a two-sided $P < 0.05$. Two raters (J.F. and B.B.K.) independently reviewed and categorized written subjective comments into themes; this analysis adhered to Braun and Clarke's thematic analysis approach (32).

RESULTS

Evaluation Group

The nurse educators (F.N. and S.A.C.) initially recruited 46 nurses to participate in the evaluation, with 20 subsequently completing the quiz–video–quiz sequence and included in the analysis. All respondents accessed the survey via an email link or quick response code. Four different ICUs within the Health System were represented, including 10 (50%) from the Medical ICU. The respondents included 10 (50%) nurses who were 31–40 years old, 14 (70%) women, 10 (50%) with more than 10 years of ICU nursing experience, and 12 (60%) who primarily worked during the day shift (Table 2).

Table 2. Nurse respondent demographics, $N = 20$

Characteristic	<i>n</i> (%)
Age, yr	
20–30	2 (10)
31–40	10 (50)
41–50	4 (20)
51–60	4 (20)
Female sex	14 (70)
Primarily work on day shift	12 (60)
Work experience in the ICU, yr	
<5	5 (25)
5–10	5 (25)
>10	10 (50)
Primary ICU work setting	
Surgical/burn/trauma	4 (20)
Medical	10 (50)
Cardiovascular/cardiothoracic surgery	4 (20)
Neurological/neurosurgical	2 (10)

Definition of abbreviation: ICU = intensive care unit.

CAM-ICU Education and Comfort

Regarding prior training, 11 (55%) nurses reported that they learned the CAM-ICU from didactic training, among whom 7 (64%) had greater than 10 years of ICU experience. Seven (35%) nurses reported no CAM-ICU teaching at their local institution, of whom 4 (57%) had fewer than 5 years of ICU experience.

Regarding comfort performing the CAM-ICU, nearly all (19 [95%]) felt comfortable or very comfortable evaluating alert patients for delirium, whereas only 10 (50%) and 8 (40%) felt comfortable evaluating patients with encephalopathy and dementia, respectively.

Quiz Results

During the before-video quiz, the 20 participants scored a mean \pm standard deviation of $66\% \pm 12\%$ (average of 18.5 of 28 questions correct), which improved to $79\% \pm 12\%$ (average of 22.1 correct; $P < 0.0001$ for the pre–post difference) after video viewing (Table 3). In total, 17 (85%) respondents experienced a pre–post score improvement. By topic, the participants had the greatest pre–post improvements in knowledge regarding CAM-ICU Features 1, 2, and 4, whereas there were no significant improvements in Feature 3 or CAM-ICU scoring (Table 3). Notably, there were no significant between-ICU differences in pre–post score improvements.

Table 3. CAM-ICU quiz performance, *N* = 20

Question Topic	Questions, <i>n</i>	Mean % Correct (SD)		Pre-Post Difference % (SD)	<i>P</i> Value*
		Before Video	After Video		
Feature 1: Acute change in mental status	5	69 (22)	88 (12)	19 (21)	0.0007
Feature 2: Inattention	10	69 (14)	81 (19)	13 (21)	0.015
Feature 3: Level of consciousness (RASS)	6	65 (26)	68 (15)	3 (29)	0.60
Feature 4: Disorganized thinking	6	60 (17)	79 (19)	19 (19)	0.0002
Overall CAM-ICU scoring	1	60 (50)	70 (47)	10 (64)	0.50
Entire exam	28	66 (12)	79 (12)	13 (10)	<0.0001

Definition of abbreviations: CAM-ICU = Confusion Assessment Method for the Intensive Care Unit; RASS = Richmond Agitation-Sedation Scale; SD = standard deviation.

*Calculated using paired Student's *t* test.

After-video Quiz Delirium Self-Assessment and Participant Feedback

After video viewing, the number of respondents giving a rating of 5, 6, or 7 (out of 7) on their ability to accurately evaluate patients with delirium rose from 13 (65%) to 18 (90%), and to manage patients with delirium rose from 13 (65%) to 15 (75%) (Table 4).

Of the 20 individuals who completed the survey, 12 provided free-text comments about the video series. Several key themes emerged, including comments regarding the length and structure of the video series (i.e., “too lengthy” and “short” and “succinct”) and clinical relevance (e.g., “applicable to my job” and “encourage RNs to perform CAM-ICU”). Additional themes included those surrounding video content (e.g., “wasn't much information on the management of a patient with delirium”) and wording (e.g., “some of the questions ... hard to understand”) (Table 5).

DISCUSSION

Delirium detection in the ICU is vital for optimizing patient outcomes and maintaining patient safety. A focus on education and training new staff, as well as reinforcing the importance of delirium detection and prevention to existing staff, may be beneficial to improve bedside practices. This ICU Delirium Video Series was developed and evaluated with the goal of improving nurse competence and comfort regarding standard-of-care delirium practices. Viewing of the video series by ICU nurses of all degrees of experience resulted in significant pre-post improvements in a knowledge assessment quiz, revealing previously unrecognized educational gaps and yielding valuable feedback regarding the educational needs of bedside providers.

Although many ICUs require delirium to be evaluated at least once per shift by nurses, such assessments often go undocumented or are performed

Table 4. Before- and after-quiz delirium knowledge and competencies*

Rating	All Respondents Pre/Post, n (%)	Years of ICU Training		
		<5 (n = 5)	5–10 (n = 5)	10+ (n = 10)
Level of knowledge working with delirium				
3–4	5 (25)/3 (15)	1 (20)/1 (20)	2 (40)/2 (40)	3 (30)/0 (0)
5–6	14 (70)/15 (75)	4 (80)/3 (60)	3 (60)/3 (60)	5 (50)/9 (90)
7 (extremely knowledgeable)	1 (5)/2 (10)	0 (0)/1 (20)	0 (0)/0 (0)	1 (10)/1 (10)
Ability to accurately evaluate patients in the ICU with delirium				
3–4	7 (35)/2 (10)	3 (60)/1 (20)	2 (40)/1 (20)	2 (20)/0 (0)
5–6	12 (60)/15 (75)	2 (40)/3 (60)	3 (60)/3 (60)	7 (70)/9 (90)
7 (completely able)	1 (5)/3 (15)	0 (0)/1 (20)	0 (0)/1 (20)	1 (10)/1 (10)
Ability to manage patients in the ICU with delirium				
2–4	7 (35)/4 (20)	2 (40)/1 (20)	2 (40)/2 (40)	3 (30)/1 (10)
5–6	12 (60)/11 (55)	3 (60)/3 (60)	3 (60)/2 (40)	6 (60)/6 (60)
7 (completely able)	1 (5)/4 (20)	0 (0)/1 (20)	0 (0)/1 (20)	1 (10)/2 (20)

Definition of abbreviation: ICU = intensive care unit.

*All ratings provided on a seven-point Likert scale, ranging from one (not at all knowledgeable/completely unable) to seven (extremely knowledgeable/completely able). On before- and after-video quiz assessments, there were no responses equaling one (not at all knowledgeable/completely unable).

incorrectly (33). Several barriers contribute to this phenomenon, including the absence of local champions to encourage delirium assessments, inadequate education, lack of audit-and-feedback mechanisms, and misconceptions regarding the importance of delirium. Various efforts have attempted to address the delirium knowledge gap, including those involving interdisciplinary teams (34, 35), one-time lectures (34–38), paper-based self-learning (35), small group sessions (38, 39), bedside simulations (36, 38), and immersive full-day workshops (38). However, these delirium efforts focused on small nurse subsets (34, 35, 37–39), detection but not prevention (37, 39), and/or failed to employ established

methods necessary to deliver competencies in a sustainable and scalable platform (34, 35, 39).

Among the 20 nurses completing the CAM-ICU quiz, the majority (85%) posted a pre-post score improvement after viewing the educational videos. More nurses reported comfort with evaluating their patients for delirium after video viewing, with respondents revealing that they received limited prior training on screening patients for delirium. Notably, respondents posted a minimal pre-post improvement on questions pertaining to CAM-ICU Feature 3, which focuses on evaluating the degree of patient consciousness using the Richmond Agitation-Sedation Scale (RASS) (40).

Table 5. Qualitative analysis: participant feedback by theme

Theme
Length and structure
"Short and succinct"
"Concise and straight to the point"
"Clear and concise"
Utility
"Very helpful and relatable"
"Wow! Super helpful!"
"I really learned some valuable information"
"A great course, and I hope to see it as one of our learning modules"
"Informative and educational"
"I think it's a great program"
Clinical relevance
"Will encourage RNs to ... perform the CAM-ICU correctly"
"Valuable information regarding properly conducting the CAM-ICU"
"Very applicable to my job in ICU"
Content
"Wasn't much information on management of a patient with delirium"
"More info on patients with neurological deficits would be helpful"
"Gave me an opportunity to see what I really did not know"
"Provides immediate feedback and allows for more effective learning"
"Very [good] information to take the pre-quiz and compare that to my post-quiz"
Wording
"Some of the questions on the quiz ... I found to be hard to understand"
"Reference ... what Feature 1-4 are referring to"
"State feature's name (inattention, disorganized thinking, etc.) instead of Feature 1, 2, and 3"

Definition of abbreviations: CAM-ICU = Confusion Assessment Method for the Intensive Care Unit; ICU = intensive care unit; RN = registered nurse.

Although unclear wording (multiple response options, negative wording, and trap wording) may have contributed to incorrect responses on three of the six RASS questions, the responses provided valuable information to enhance our

Feature 3 video moving forward. Moreover, observations and experiences gained from administering this CAM-ICU quiz will aid in the design of a newer quiz, whose questions will mirror key video education topics and undergo a rigorous

validation process to ensure appropriateness, relevance, and clarity. As respondent feedback included requests for education on delirium management, we are now producing a “My Patient is Delirious, Now What?” video that highlights reversible delirium risk factors (e.g., benzodiazepine infusions), consequences of delirium (e.g., long-term cognitive impairments), and guideline-promoted preventive interventions (e.g., early mobilization). This video and corresponding quiz questions will be added to subsequent versions of the ICU Delirium Video Series and, if disseminated effectively, has the potential to positively impact unit (e.g., CAM-ICU documentation and accuracy) and patient (e.g., sedative administration) outcomes while providing a valuable foundation to motivate larger improvement efforts (e.g., sedation protocols).

Limitations

Despite the ability of the ICU Delirium Video Series to fill knowledge gaps for bedside providers, it is important to acknowledge several limitations. First, this effort lacked clinical data to affirm the effectiveness of the teaching and associated bedside practice changes. Although quiz scores improved after video viewing, chart audits were not performed to confirm that CAM-ICU assessment competency improved. Ongoing efforts to improve standard-of-care delirium practices can include patient and unit clinical data to evaluate competencies and associated clinical outcomes. Second, despite the marked improvement in quiz scores after video viewing, the average score posted on the after-video quiz (79%) was far below scores seen in similar competency training (e.g., cardiopulmonary resuscitation). This finding was likely not because of a lack of knowledge acquired from the videos but rather from the use of

a nonvalidated quiz whose questions did not align directly with the educational video objectives. To address this issue, a new quiz is under development which will align directly with the video objectives, address evaluator feedback, and undergo a rigorous validation process. Third, achieving competence in a bedside practice often includes a hands-on component with a real or simulated patient and/or bedside educator; however, the team was unable to provide such teaching during this video-based effort. Rules imposed by the COVID-19 pandemic rendered such hands-on teaching infeasible, potentially unsafe, and irresponsible, given shortages of personal protective equipment that overlapped with this educational effort. However, rising vaccination rates and personal protective equipment availability have improved staffing, including the presence of bedside educators, which will aid in the design of future delirium efforts, including the consideration of hands-on reinforcement combined with video-based learning. Fourth, evaluator feedback included requests for education on delirium prevention and comments that videos were too lengthy. To address this feedback, we are adding a “My Patient is Delirious, Now What?” component (*see above*) and are trimming videos down for future versions of the ICU Delirium Video Series. Finally, because the participants were volunteers, there may have been a bias as only the most motivated and/or delirium-focused nurses may have been willing to complete the video and quiz module. Although this bias may have positively skewed the quiz scores, the before- (66%) and after-video (79%) scores may have highlighted the previously unrecognized presence of knowledge gaps among motivated bedside nursing staff. Conversely, this willingness was advantageous as it aided in the procurement of

feedback and effectiveness data in a relatively short amount of time, information that will be vital in developing future versions of the ICU Delirium Video Series. Future efforts involving the ICU Delirium Video Series will include large-scale dissemination in busy ICU settings with ongoing evaluation of barriers to implementation and its impact on clinically important outcomes.

Conclusions

These findings highlight the effectiveness of an asynchronous video series in

improving CAM-ICU knowledge of bedside ICU nurses. Delirium detection education is important and may encourage beneficial prevention efforts for patients at risk for adverse delirium-associated outcomes.

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