BRIDGING THE KNOWLEDGE GAP: CAM -ICU EDUCATION FOR ENHANCED DELIRIUM ASSESSMENT IN A PRIVATE HOSPITAL SETTING

Nelly Hamdin, Aini Ahmad, Puziah Yusof
School of Nursing,
KPJ Healthcare University
Corresponding Author's Email: nelly9782@gmail.com

ABSTRACT

Aims and Objectives: *The research explores the effect with regard to an educational program on Intensive Care Nurses' knowledge and skills in utilizing the Confusion Assessment Method for the Intensive Care Unit (CAM-ICU) to evaluate delirium in a private hospital environment.*

Background: *The early identification concerning delirium in the ICU is critical for prompt intervention and better patient outcomes. This research assessed the influence of a structured educational program on nurses' knowledge and competency in utilizing the CAM-ICU.*

Design: *This research was conducted in a private hospital in Malaysia using a mixed-methods approach, featuring a pretest-posttest design with both control and intervention groups, and supported by semi-structured interviews to assess the effectiveness of the educational program.*

Methods: *Fifty (50) nurses were randomly categorized into an intervention group (n = 25) as well as a control group (n = 25). Note that the intervention group was involved in classroom presentations, demonstrations, as well as hands-on practice with the CAM-ICU. Data were gathered pre- and post-intervention utilising the Nurses Knowledge of Delirium Questionnaire (NKD), adapted from Hare et al. (2009) and Devlin et al. (2007), along with semi-structured interviews guided by a researcher-developed tool. Quantitative data were assessed utilising a paired sample t-test, while qualitative data were examined through thematic analysis.*

Results: *The intervention group showed a statistically substantial increase in knowledge scores from pretest to posttest (<.05). Qualitative findings revealed three key themes, which are barriers to the CAM-ICU implementation. This includes the lack of standardized protocols; factors influencing CAM-ICU adoption, such as improved understanding of delirium and its implications; and experiences of implementing CAM-ICU, with nurses reporting increased knowledge, skills, and confidence.*

Conclusion: *This study provides evidence that a structured educational program may effectively enhance nurses' knowledge skills as well as confidence in using CAM-ICU. However, organizational barriers, such as the lack of standardized protocols, need to be addressed to facilitate its successful implementation.*

Keywords: *Delirium, CAM-ICU, educational program, knowledge, skills*

1.0 INTRODUCTION

The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), 2013, stresses delirium as a sudden disturbance in attention as well as awareness, indicating a shift from the patient's baseline mental state. Delirium affects up to 80% with regard to ICU patients on mechanical ventilation and is linked to several adverse outcomes, comprising longer hospital stays, reduced survival rates, and greater cognitive dysfunction. As such, ICU nurses must identify delirium and be able to assess delirium signs consistently, considering ICU delirium is a significant issue impacting critically ill patients, contributing to extend ICU stays, higher mortality, increased morbidity, as well as elevated healthcare costs. The 2013 Clinical Practice Guidelines for Pain, Agitation, and Delirium (PAD) from the American College of Critical Care Medicine (ACCM) and the Society of Critical Care Medicine (SCCM) offer comprehensive, evidence-based recommendations. These guidelines strongly advocate for routine delirium monitoring in ICU patients utilising a validated assessment tool. Following a comprehensive psychometric evaluation of delirium assessment tools, the 2013 PAD guidelines determined that the CAM-ICU, as well as the Intensive Care Delirium Screening Checklist (ICDSC) are the most solid and reliable tools for screening delirium in ICU settings. These guidelines offer detailed information on the significance and practicality of delirium screening in the ICU and outline strategies for implementing and maintaining screening efforts across various critically ill populations. Accurate identification through nursing assessments is crucial as the first step in managing ICU patients with delirium, aiming to minimise its impact.

The 2018 ACCM/SCCM clinical practice guidelines for Pain, Agitation, Delirium, Immobility, and Sleep Disruption (PADIS) suggest that all adult ICU patients be routinely examined for delirium once per shift utilising either the CAM-ICU or the ICDSC. While other organ system dysfunctions often receive more clinical focus, delirium is now considered a substantial factor contributing to ICU morbidity as well as mortality. This underscores the need for all ICU patients to be evaluated with a validated delirium assessment tool. Delirium is associated with longer hospital stays and lower six-month survival rates compared to patients without delirium. The study also indicated that delirium could result in cognitive impairment lasting months or even years post-discharge. Numerous ongoing studies are exploring strategies for preventing and treating ICU delirium (Pařízková, 2019).

This study's main goal is to evaluate nurses' knowledge of delirium and assess the skills of registered ICU nurses in implementing delirium assessments utilising the CAM-ICU screening tool after an interventional program was conducted in the ICU with regard to a private hospital in Johor Bahru, Malaysia.

2.0 PROBLEM STATEMENT

The early recognition and treatment with regard to delirium have been regarded as crucial in enhancing the value of care and better patient outcomes. Despite the importance of delirium assessment, there is a lack of research addressing the knowledge and abilities of registered ICU nurses in assessing delirium utilising the CAM-ICU. Nonetheless, nurses typically provide ongoing care to critically ill patients, which includes the early identification and management of delirium.

2.1 Nurses do not perform delirium assessment

The prompt recognition as well as treatment of delirium are vital to prevent these adverse outcomes. However, current practice in the ICU of private hospitals in Malaysia shows that nurses do not perform delirium assessments. The reason for this practice gap may include a lack of formal education, time constraints, and less awareness of the importance of delirium assessment. Therefore, this study aims to assess the effectiveness with regard to an educational program in enhancing nurses' knowledge as well as skills in delirium assessment using the CAM-ICU tool.

2.2 Knowledge gap

However, studies done by Christensen (2014); Ramoo et al. (2018); Hickin et al. (2017) have shown that ICU nurses have inadequate knowledge and skills about delirium and its assessment, which can lead to underdiagnosis and delayed treatment. The confusion around delirium assessment can lead to negative outcomes, including increased morbidity, mortality rates, and healthcare costs. Therefore, it is crucial to understand the knowledge and skills of ICU nurses in delirium assessment using CAM-ICU to ensure early and timely diagnosis and intervention. This study seeks to fill this gap by offering insights into current practices and identifying potential training needs for ICU nurses in delirium assessment. This makes it crucial to improve the knowledge and skills of ICU nurses concerning delirium assessment using CAM-ICU to ensure timely recognition and appropriate management of delirium. By assessing the current knowledge gap among ICU nurses, interventions such as education and training programs can be developed to enhance their skills and comprehension of delirium assessment through the use of CAM-ICU.

This study's outcomes will support the development of educational interventions aimed at improving delirium management as well as outcomes in critically ill patients. There are numerous contributing theories of delirium, its pathophysiology remains poorly understood. Registered nurses usually focus on upholding a safe environment and providing education for nurses to understand ICU delirium. Effective communication with patients and their families is essential, as well as improving sleep quality during hospitalization and closely monitoring the patients' conditions. Nurses spend more time with ICU patients than other healthcare professionals in the ICU; therefore, they are deemed to be easily monitoring changes in patients' conditions. As a result, ICU registered nurses play a critical role in obtaining enhanced delirium outcomes with regard to patients. Given its high incidence rate, ICU delirium warrants significant attention from both physicians and nurses. Early detection, diagnosis, and treatment of delirium are essential to potentially enhance patient outcomes as well as minimize the severity and complications of any underlying conditions (Fan et al., 2012).

Numerous modifiable as well as non-modifiable risk factors with regard to delirium in the ICU have been identified, though they remain understudied. Modifiable factors include lifestyle choices such as smoking, alcohol abuse, and malnutrition. Non-modifiable factors include age, visual and hearing impairments, renal disease, baseline cognitive impairment, liver failure, hypertension, as well as the use of sedatives. Acute illness factors, for example, metabolic disturbances, hypoxemia, sepsis, as well as acute respiratory distress syndrome, also contribute to the risk. Given this wide range of risk factors, nearly all ICU patients are at risk for delirium. In the past, using varied descriptive and diagnostic terms for acute cognitive impairments has made diagnosing and routinely assessing delirium in the ICU more challenging (Christensen, 2014).

2.3 CAM-ICU tool for delirium assessment

The CAM-ICU was established by Dr E. Wesley Ely in 2001, and his colleagues based on psychiatric expert and delirium definitions of the DSM-III (Inouye, 1994). This method is used to assess delirium by non-psychiatrists (Luetz et al., 2010). The CAM is easy to use, valid, as well as reliable, initially introduced in the early 1990s. It assesses four key features: (a) acute onset or fluctuating changes with regard to mental status, (b) inattention, (c) disorganized thinking, as well as (d) altered levels of consciousness. However, its utility in the ICU was initially limited due to its ineffectiveness with nonverbal or mechanically ventilated patients. With adequate training, ICU bedside nurses, even without formal psychiatric training, may reliably detect delirium in mechanically ventilated patients using the CAM-ICU, possessing high sensitivity as well as specificity. This tool is quick and simple to use, and integrating it into clinical practice and future research could provide a deeper understanding of delirium's occurrence, outcomes, and predictors in critically ill patients (Ely et al., 2001).

The CAM-ICU adapted the validated CAM with regard to nonverbal patients by utilizing objective, nonverbal instruments. Here, the CAM-ICU process begins with an arousal and sedation assessment, integrating the validated Richmond Agitation and Sedation Scale (RASS). If patients are determined to be deeply sedated or unconscious (RASS scores of −4 and −5), delirium assessment is

postponed until the patient responds to voice, as these levels (known as coma or stupor) make delirium assessment challenging due to unresponsiveness. Nevertheless, at lighter levels of consciousness (RASS −3 to +4), patients show some degree of meaningful responsiveness, allowing CAM-ICU to be used for delirium assessment (Nelson, 2009). A range of motion exercises, early mobilization as well as, nonpharmacologic sleep protocol, prompt removal with regard to catheters and physical restraints, use of visual aids like magnifying lenses or eyeglasses, hearing aids, and early correction concerning dehydration can all contribute to ensuring comprehensive care (Pařízková, 2019). However, researchers have yet to find any delirium assessment tool in place at the ICU where the study was conducted.

3.0 LITERATURE REVIEW

ICU delirium is independently linked to higher patient mortality, longer ICU stays, as well as increased healthcare costs (Devlin et al., 2008). Additionally, delirium is a condition that demands active interventions from caregivers, with studies showing it is often underdiagnosed (Lafi & Salem, 2018). Up to 80% of critically ill ICU patients experience delirium, caused by underlying medical or surgical conditions, medications, recent procedures, or various noxious stimuli, for example, psychological factors, patient care interactions, light, noise, mechanical ventilation, as well as drug-induced sleep disturbances or deprivation (Pařízková, 2019). Delirium is linked to prolonged mechanical ventilation, an elevated risk of death, disability, as well as long-term cognitive impairment (Spronk et al., 2009). Consequently, early detection of delirium is essential, and ICU staff should maintain vigilance in observing its symptoms, as well as focusing on prevention and management (Park & Lee, 2019).

A study done by Kenzo Ishi et al. (2022) in Japan found that all institutions utilised delirium assessment tools with regard to the ICU, in which most patients underwent delirium assessments. The prevalence with respect to delirium was 17.9%, with two-thirds of patients recovering by ICU discharge. The successful implementation concerning routine delirium assessment in the ICU requires institutional recognition of its importance, the involvement of physicians and nurse leaders as delirium experts as well as resources, educational instruction, bedside demonstrations, case-based scenarios, adaptations to fit the patient population (for example, visuals, questions, as well as language utilised during assessment), and ongoing education and training.

In Malaysia context, research by Ramoo et al. (2018), found delirium assessments need educational programs and hands-on practices. There were substantial differences with regard to the pre- and post-intervention knowledge scores in their study. The two most frequently perceived barriers to adopting the ICU delirium assessment tool were, "physicians did not use nurses' delirium assessment in decision-making" and "difficult to interpret delirium in intubated patients." This suggests that a follow-up study is necessary to evaluate the nurses' skills in greater depth, and the actual challenges faced in utilising the tools in Malaysia for ICU patients. However, it is unknown if delirium assessment had been a standard practice in ICUs in Malaysia. Research conducted in Singapore by the Advanced Practice Nurse group concludes that despite the nurses' increased knowledge and strong competency following the training program, and delirium screening documentation after three months, the outcome is weak or poor. However, screening documentation subsequently improved when measured in the tenth month, following further intervention and education continuously emphasized by the senior nursing staff (Lieow et al., 2019). Dos Santos et al. (2022) identified the challenges present in the application of the CAM-ICU, it was found that nurses lack sufficient academic education on delirium and require proper training for the accurate and consistent use with regard to the CAM-ICU.

A study conducted by Homood A. Alharbi (2019) investigated the perceptions, barriers, as well as delirium assessment practices of ICU nurses. The study reveals that specific participant characteristics, perceptions, barriers, delirium education, as well as assessment practices, are substantially linked to how frequently ICU nurses assess patients for delirium during a typical 12-hour shift. There is a gap among nurses in delirium assessment practices, perceptions, and education; but it is deemed to be manageable. ICU nurses require educational interventions and support mechanisms to boost their confidence and skills in delirium assessment (Alharbi, 2019). However, this research revealed that ICU nurses recognized the presence of a sedation protocol outlining the frequency of delirium assessments. Christensen's 2014 research showed that registered nurses' knowledge levels in detecting and managing delirium affected their ability to assess its signs, risk factors, symptoms, as well

as negative outcomes. Notably, only 63% of nurses in that study were familiar with delirium-related signs, symptoms, and risk factors, while a concerning 37% had poor knowledge (Christensen, 2014). A study done by Fulya et al. (2020) determined that providing delirium education to intensive care nurses had a positive impact on the care of patients with delirium. Other than that, it was determined that by using the CAM-ICU, nurses could identify delirium and deliver necessary care to at-risk patients. Similarly, the study by Sinvani L et al. (2021) concluded that multicomponent education and training programs implementing a TTT model were well-received and contributed to enhanced CAM-ICU knowledge and increased delirium detection.

4.0 METHODOLOGY

This study was performed in Malaysia at a private hospital. The research protocol received approval from the Research Ethical Committee KPJUC/RMC/SON/EC/COC4/495. Formal permission to perform the research was granted by the Director of Nursing at each respective hospital. Participants provided written informed consent concerning collection and an explanatory sequential mixed methods design was used. It is prioritizing quantitative data collection and analysis in Phase 1. The Interventional Program took place in Phase 2. Subsequently, it followed by qualitative data collection in Phase 3 which involved analysis to offer deeper insights into the quantitative findings.

In Phase 1, a total of 51 registered nurses from two (2) ICUs of a private hospital participated and completed the pre-intervention questionnaire or pretest to have their knowledge and skills with regard to general delirium knowledge and delirium assessment evaluated. From the data analysis of the pretest questionnaire, the research team randomly selected participants to participate in the group receiving the educational intervention. Phase 2 included a face-to-face session of Educational Intervention. There are 26, however, the staff was withdrawing from the study due to no longer working in the ICU. A total of 25 nurses were involved in the intervention group. They participated in a structured educational program focused on delirium assessment utilising the CAM-ICU tool with two hours of allocation time for two days a week, which are Tuesdays and Thursdays, for one month. The educational program involved: a PowerPoint presentation for Introduction: ICU delirium, Tool for assessment CAM-ICU, Video show, Role play, and Competency simulation. After the intervention, both the intervention group and the initial randomly selected group classified as the control group completed a post-intervention questionnaire to assess changes in knowledge and skills. Next, in Phase 3, semi-structured interviews were held with six participants from the intervention group. The interview explored participant experiences with the educational program and their perspective on delirium assessment practices.

4.1 Theoretical Framework: Kolb's Experiential Learning Theory

The theoretical framework, Theory Kolb's Experiential Learning (ELT) applied in this study. The Experiential Learning Theory (ELT) (Kolb et al., 2014) stresses the knowledge gained through a practical learning experience. It highlights learning as a process in which knowledge is acquired through the transformation of experience. For the Interventional Program, the participants engaged in a new learning experience that focused on CAM-ICU as a tool for assessing delirium with regard to the ICU. This approach is called concrete experience. During the educational program, the participants can reflect on the experience and form new ideas or adapt existing concepts based on the reflection. In the clinical area, the participant was able to apply the new ideas and observe the outcome.

Chart 1: **Kolb's Experiential Learning Theory**
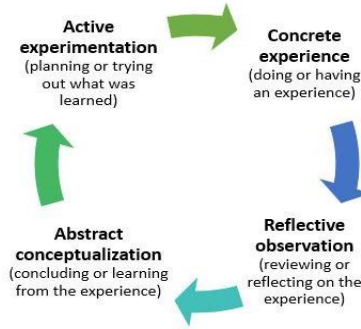
5.0 RESULTS AND DISCUSSION

ANALYSIS:

Table 1: Description of participants

Questionnaires 1 to 5, which consist of the demographic data of the participants.

Variable Category		Total n	%
Gender	Male	6	12
	Female	44	88
Age	20-25	9	18
	26-30	12	24
	31-35	12	24
	36-40	9	18
	>40	8	88
Experience	Less than 5 years	18	18
	5-10 years	18	88
	11-15years	11	11
	15-25years	8	8
ICU trained	Yes		76
	No		24
Shifts	Day only	2	4
	Night Only	0	0
	Day and Night	47	96

Table 1 shows that the majority of the nurses in ICU are female (88%). For age, the majority of the participants are aged between 26 and 35 years (24%), followed by those aged between 36 and 40 years (18%). Fewer than half of the participants (36%) had between 1 to 5 years of experience in critical care units, while 22% (11 participants) had 11 to 15 years of experience. Meanwhile, 96% of the participants were working three (3) rotating shifts. Only two (2) were working office hours, and none had a permanent night shift.

Table 2: Delirium Knowledge Questionnaire Results

Questionnaire 6 consists of 37 items, True–False answer.

The table below presents the results of the Delirium Knowledge Questionnaire given to nurses both prior to and following an educational intervention. The pretest scores represent the percentage of correct answers given by the nurses before the intervention, while the post-test scores indicate the percentage of correct responses after the intervention. The data show a significant improvement in knowledge across most statements, indicating the effectiveness of the educational program.

Delirium Knowledge Questionnaire

Statement	Pretest (%)	Posttest (%)
1. Restless, agitation – Hyperactive delirium	76	100
2. Inactivity, sluggishness, drowsiness, apathy – Hypoactive delirium	69	92
3. Mini-Mental State Examination (MMSE)	28	88
4. Glasgow Coma Scale (GCS)	63	92
5. Delirium Rating Scale (DRS)	84	80
6. Alcohol Withdrawal Scale (AWS)	67	84
7. Confusion Assessment Method (CAM)	84	100
8. Beck's Depression Inventory	53	88
9. Braden Scale	67	92
10. Fluctuation that exists between disorientation, as well as orientation, is not typical of delirium	48	100
11. Symptoms with regard to depression may mimic delirium	84	100
12. Treatment concerning delirium always includes sedation	40	84
13. Patients never remember delirium episodes	9	88
14. A Mini-Mental Status Examination (MMSE) is the appropriate method to diagnose delirium	26	92
15. A patient having a repair of a fractured neck of femur possesses the same risk for delirium as a patient having an elective hip replacement	61	100
16. Delirium never lasts for more than a few hours	61	92
17. The risk with regard to delirium increases with age	84	96
18. A patient with impaired vision is at increased risk with respect to delirium	44	96
19. The greater the number of medications a patient is taking, the greater their risk of contracting delirium	67	92
20. A urinary catheter in situ minimises the risk of delirium	78	96
21. Gender does not influence the development of delirium	48	92
22. Poor nutrition increases the risk of delirium	65	92
23. Dementia is the greatest risk factor for delirium	94	92
24. Males are more at risk for delirium in comparison to females	53	88
25. Diabetes is known as a high-risk factor for delirium	34	88

26. Dehydration may be a risk factor for delirium	67	100
27. Hearing impairment increases the risk concerning delirium	57	96
28. Obesity is a risk factor with regard to delirium	71	96
29. A patient who is difficult to rouse as well as lethargic does not have delirium	65	96
30. Patients with delirium are always verbally aggressive and/or physically	26	84
31. Delirium is generally triggered by alcohol withdrawal	57	92
32. Patients with delirium possess a higher mortality rate	51	100
33. A family history of dementia predisposes a patient to delirium	15	96
34. Behavioral changes in the day are typical of delirium	84	100
35. A patient with delirium tends to be easily distracted and/or have difficulty following a conversation	98	96
36. Patients with delirium will often experience perceptual disturbances	90	100
37. Altered sleep/wake cycle may be a symptom with regard to delirium	94	92

Explanation of pretest and posttest data

The table above presents the results of the Delirium Knowledge Questionnaire administered to ICU nurses both before and after an educational intervention. The pre-test scores reflect the percentage of correct responses given by the nurses before the intervention. The post-test scores show the percentage of correct answers after the intervention. Significant improvement is shown in the data. Knowledge is improved as revealed in most statements, indicating the effectiveness of the educational program.

For example, Statement Number 1: "Restless, agitation – Hyperactive delirium," pretest score is 76%. This indicates that 76% of the nurses accurately identified this statement before the intervention. For the posttest, the same statement of, "Restless, agitation – Hyperactive delirium" scored 100%, demonstrating that after the intervention, all the nurses correctly recognized this statement.

Improvement in knowledge:

Increasing in percentages from the pretest to the posttest shows an improvement in the nurses' knowledge about delirium. For example, Statement Number 2 of "Inactivity, sluggishness, drowsiness, apathy – Hypoactive delirium" shows an increase from 69% at the pretest to 92% at the posttest. This suggested a significant improvement in understanding this view of delirium.

The data also suggest that the educational intervention successfully enhanced the nurses' knowledge about delirium. The statements show a demonstrated increase in the percentage of correct answers, indicating that the nurses discovered and recalled the information provided during the intervention program.

Areas of Significant Change:

Several statements show an intense improvement in correct responses. For example, questionnaire number 10, "Fluctuation between orientation and disorientation is not typical of delirium" increased from 48% to 100%, demonstrating a significant improvement in recognizing this mistaken belief. Likewise, "Symptoms of depression may mimic delirium" question number 11, increased from 84% to 100%, showing that the educational intervention assisted in clarifying this important feature.

Some statements maintained high pretest scores that remained high or improved slightly in the post-test. For example, statement number 23, "Dementia is the greatest risk factor for delirium" achieved a pretest score of 94% and a post-test score of 92%, indicating that the nurses were already knowledgeable about this aspect before the educational intervention program.

Table 3.1: Descriptive statistics

Group	N	Mean	Variance	Std. Deviation	Std. Error Mean
Control Pre-test	25	62.70	69.84	8.36	1.67
Control Post-test	25	70.05	31.47	5.61	1.12
Intervention Pre-test	25	88.76	33.32	5.78	1.16
Intervention Post-test	25	92.76	33.29	5.77	1.15

Table 3.2 *t* test Result

Comparison	t-value	df	p-value	95% CI (Lower)	95% CI (Upper)
Control Pre vs Post	3.81	48	< 0.001	4.00	10.70
Intervention Pre vs Post	11.87	49	< 0.001	21.00	30.11

Explanation for data in Table 3.1 Descriptive Statistic:

Control Pre-test: The mean score was 62.70, having a Standard Deviation (SD) of 8.36, demonstrating a moderate variability in the pre-test scores.

Control Post-test: The mean score increased to 70.05, having a lower SD of 5.61. It shows an improvement and less variability in post-test scores.

Intervention Pre-test: The mean score was 88.76, having an SD of 5.78, indicating higher initial knowledge levels.

Intervention Post-test: The mean score further increased to 92.76, with a similar SD showing a significant improvement.

Explanation for data in Table 3.2

t-test results – paired *t*-test

The purpose with regard to the paired *t* test in this research was to examine the impact of the educational intervention on nurses' delirium knowledge. It was utilised to compare the pre-test as well as post-test scores within both the control and intervention groups. Note that this statistical method is suitable for

identifying whether there is a substantial difference that exists between the means of two related groups, if any. By comparing the pretest and post-test scores, the researcher intended to determine whether the intervention had directed a statistically substantial increase in knowledge.

Comparison of two groups

Control Group:

The control group indicated a statistically substantial increase in knowledge scores, improving from the pre-test (M = 62.70, SD = 8.36) to the post-test (M = 70.05, SD = 5.61), t (24) = 3.81, $p < 0.001$. This indicates that the control group experienced a notable increase in knowledge about delirium, even without the targeted educational intervention.

Intervention Group:

The intervention group demonstrated a highly substantial increase in knowledge scores, rising from the pre-test (M = 88.76, SD = 5.78) to the post-test (M = 92.76, SD = 5.77), t (24) = 11.87, $p < 0.001$. This substantial improvement suggests that the educational intervention was highly effective in enhancing the nurses' understanding of delirium.

Results of the paired t-tests indicate that the control as well as intervention groups proved significant improvements in their knowledge scores. However, the intervention group demonstrated a more obvious increase, emphasizing the success of the educational program in enhancing nurses' knowledge with regard to delirium.

Table 4: Questionnaire using the Likert scale:

Questionnaire Number 7 with eight (8) components. The participants were allowed to choose from a range of answer options: Strongly agree, Agree, Neutral, Disagree, as well as Strongly disagree.

The response is displayed in the bar chart.

1.	Delirium is under-diagnosed (7A):
2.	Delirium is a common response to the ICU environment (7B):
3.	Delirium requires active interventions by caregivers (7C):
4.	Delirium is associated with higher patient mortality (7D):
5.	ICU patients with delirium are rarely agitated (7E):
6.	Initiation of antipsychotic therapy should be the initial intervention for all patients with delirium (7F):
7.	Delirium is challenging to assess in ICU patients (7G):
8.	Patients with delirium usually have symptoms that are consistent over the entire nursing shift (7H)
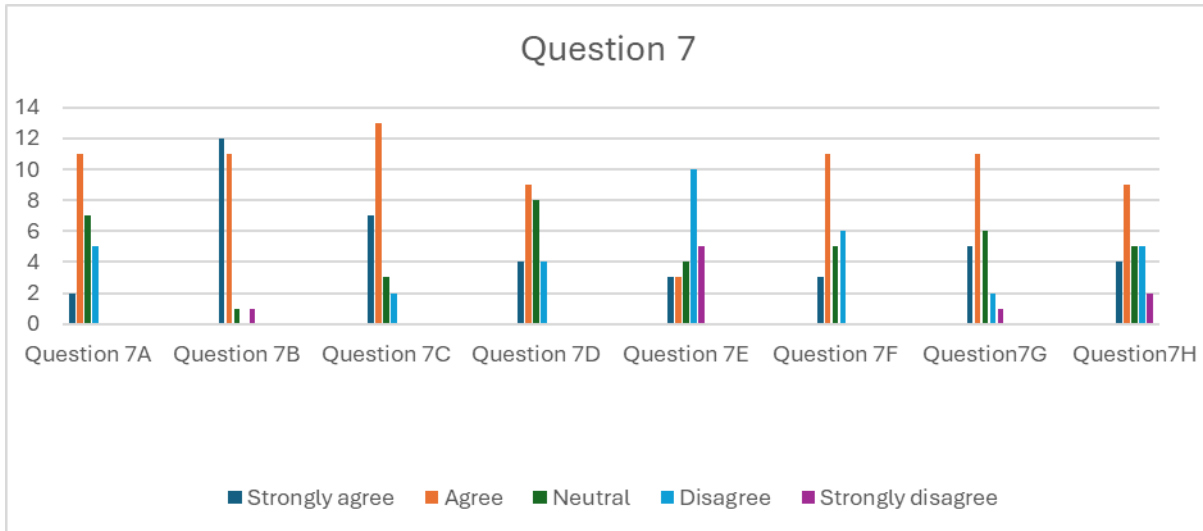
For Question 7A, the majority of respondents answered with either an "Agree" or a "Strongly agree", showing a common perception that delirium is often missed in ICU settings. For Question 7B, most respondents answered "Agree" or "Strongly agree," suggesting that nurses recognize the ICU environment as a key contributor to the development with regard to delirium. A high figure of respondents "Agree" or "Strongly agree," showing an understanding that proactive measures are necessary to manage delirium effectively for question 7C. The majority of respondents chose "Agree" or "Strongly agree," indicating recognition of the severe impact of delirium on patient outcomes, particularly its association with an increased mortality rate (Question 7D). Participants' responses are more varied, with a mix of "Agree," "Neutral," and "Disagree," thus reflecting the differing views on the presentation of delirium symptoms for Question 7E. For Question 7F, more respondents answered with a "Disagree" or a "Strongly disagree," suggesting that nurses are aware that antipsychotics are not always the first line of treatment for delirium. For Question 7G, the participant responded with a significant number of "Agree" or "Strongly agree," highlighting the perception that assessing delirium is challenging in the ICU. In Question H, the majority of the participants responded with a "Disagree" or a "Strongly disagree," which demonstrates an understanding that delirium symptoms can fluctuate throughout the day.

From the responses of participants, common awareness and knowledge gaps among ICU nurses regarding delirium are valuable for shaping future educational interventions focusing on delirium assessment using CAM-ICU as the standard assessment tool.

Phase 3 of this study employed a qualitative method involving semi-structured phone interviews with six participants (N1-N6) to explore their experiences.

Table 5: Themes and Subthemes from Qualitative Analysis

Theme	Subtheme	Description
1. Initial Perceptions and Impact of Educational Intervention		Nurses' initial perceptions of delirium assessment and the effects with regard to the educational intervention on their knowledge as well as confidence.

	1.1 Barriers to Delirium Assessment	High workloads and persistent stress as significant barriers to performing comprehensive delirium assessments.
	1.2 Communication Strategies	Commitment to finding effective communication strategies to enhance delirium assessment, including using visual aids, engaging family members, and creating a calm environment.
2. Sustaining Competency through Continuous Professional Development		Importance of continuous professional development in maintaining and enhancing delirium assessment skills.
	2.1 Simulation Training	Simulation training is a valuable tool for practicing delirium assessment in realistic scenarios.
	2.2 Recommendations for Sustainability	Integrating delirium education into annual competency assessments, providing access to learning modules, and establishing mentorship programs.
3. Elevating Delirium Care through a Targeted Educational Program		The significant impact of the structured educational program on enhancing nurses' knowledge as well as skills in delirium care.
	3.1 Increased Confidence and Competency	Nurses feel more confident in recognizing delirium signs and using the CAM-ICU tool.
	3.2 Improved Patient Outcomes	Noticeable increase in understanding delirium, decrease in time to diagnosis, higher rate of appropriate referrals, and empowerment to advocate for patients.

Explanation of Themes and Subthemes

Theme 1: Initial Perceptions and Impact of Educational Intervention
Barriers to Delirium Assessment:

Participants identified high workloads and persistent stress as significant barriers. For example, N2 mentioned, "When you're managing many things at once and every alarm is going off, it's easy to miss the subtle signs of delirium."

Communication Strategies:
Despite challenges, nurses demonstrated a commitment to finding effective communication strategies. N3 shared, "I have to meet the patient where they are sometimes using drawings, sometimes speaking slowly and simply, and sometimes just being present and letting them know you're listening."

Theme 2: Sustaining Competency through Continuous Professional Development

Simulation Training: Participant N4 highlighted the value of simulation training, stating, "The simulation training where we had to assess a 'patient' exhibiting signs of delirium was incredibly helpful."

Recommendations for Sustainability: Nurses recommended integrating delirium education into annual competency assessments, providing access to learning modules, and establishing mentorship programs.

Theme 3: Elevating Delirium Care Through Targeted Educational Program

Increased Confidence and Competency: All participants reported increased confidence in recognizing delirium signs and using the CAM-ICU tool. For instance, participants mentioned, "Before attending the program, I felt unsure about delirium. Now I feel much more confident in my ability to recognize the signs and use the CAM-ICU as a tool for delirium assessment."

Improved Patient Outcomes: The educational intervention led to a noticeable increase in understanding delirium, a decrease in time to diagnosis, higher rates of appropriate referrals, and empowerment to advocate for patients.

Discussion on thematic analysis:

It revealed three key themes related to nurses' initial perceptions of delirium assessment and the effects with regard to the educational intervention on their knowledge as well as confidence. At the same time, it is perceived benefits and challenges of integrating the CAM-ICU into their daily practice. Participants identified high workloads and persistent stress as significant barriers to performing comprehensive delirium assessments. This complex work environment not only contributes to nurse burnout but also raises concerns about the potential for missed or delayed delirium diagnoses, which can have serious consequences for patients. Despite the challenges, nurses demonstrated a commitment to finding effective communication strategies to enhance delirium assessment. In addition, using visual aids or communication boards, nurses emphasized the importance of engaging the family members to provide context about the patient's baseline mental state. Creating a calm and reassuring environment can reduce anxiety or engaging active listening techniques to build rapport and trust. The structured format of the CAM-ICU, with its emphasis on clear questions and observational assessments, also provided a valuable framework for communication, particularly when verbal exchanges were limited. One interesting subtheme discovered from the interview is, sustaining competency through continuous professional development. Nurses consistently emphasized the importance of continuous professional development in maintaining and enhancing their delirium assessment skills. Participant N4 shared, "The simulation training where we had to assess a 'patient' exhibiting signs of delirium was incredibly helpful. It allowed us to practice using the CAM-ICU in a realistic scenario." These ongoing learning opportunities fostered a sense of confidence and competency among nurses, enabling them to more readily identify signs of delirium, feel more comfortable using the CAM-ICU tool, or promote early interventions. To maintain sustainability, all the nurses in the interview recommended such as integrating delirium education into annual competency assessments and providing access to offline and online learning modules. They also suggest establishing delirium assessment in a mentorship program for new nurses. Another theme is elevating delirium care through an educational program. The introduction of a structured delirium education program resulted in a significant impact on ICU delirium assessment, with a significant impact on nurses' knowledge, and skills related to delirium care. All participants mentioned in the interview session that, "Before attending the program, I felt unsure about delirium. Now I feel much more confident in my ability to recognize the signs and use the CAM-ICU as a tool for delirium assessment." The educational intervention resulted in a substantial improvement in the understanding with regard to delirium basically and CAM-ICU assessments, a decrease in the time to delirium diagnosis, or a higher rate of appropriate referrals to management teams example team Doctors. Furthermore, nurses reported feeling more empowered to advocate for patients with delirium or being more engaged in implementing delirium prevention strategies.

6.0 CONCLUSION

This study demonstrates that an educational intervention significantly improves ICU nurses' knowledge and skills in delirium assessment utilizing the CAM-ICU. By empowering nurses with this essential knowledge and skills, can promote earlier delirium detection, facilitate timely interventions, and eventually improve patient outcomes within the ICU environment. Although this study benefits from the inclusion of two ICUs of private hospitals, it generally may be constrained by the small sample size and the particular characteristics of the private healthcare setting. Future research having a larger as well as more representative sample is necessary to examine these outcomes and investigate differences in delirium knowledge and assessment practices among ICU nurses across diverse healthcare settings within Malaysia. Future studies may also explore the long-term effects of programs and their impact on nurses' practices and patient outcomes.

CONFLICT OF INTEREST

The manuscript is not published elsewhere and is not under consideration by other journals. All authors have approved the review, agreed with its submission, and declared no interest conflict in the manuscript.

7.0 REFERENCES

Alharbi, H. A. (2019). Critical Care Nurses' Practices and Perceptions of Delirium Assessment in Saudi Arabia. *Annals of Medical & Health Sciences Research*, *9*(5), 684–690. http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=140347501&site=ehost-live

Aparanji, K., Kulkarni, S., Metzke, M., Schmudde, Y., White, P., & Jaeger, C. (2018). Quality improvement of delirium status communication and documentation for intensive care unit patients during daily multidisciplinary rounds. *BMJ Open Quality*, *7*(2). https://doi.org/10.1136/bmjoq-2017-000239

Barr, J., & Pandharipande, P. P. (2013). The pain, agitation, and delirium care bundle: Synergistic benefits of implementing the 2013 pain, agitation, and delirium guidelines in an integrated and interdisciplinary fashion. *Critical Care Medicine*, *41*(9 SUPPL.1), 99–115. https://doi.org/10.1097/CCM.0b013e3182a16ff0

Boltz, M., Tate, B. J. a, & Happ, M. B. (2012). *The Confusion Assessment Method for the ICU (CAM-ICU) Table 1. The Confusion Assessment Method for the Intensive Care Unit (CAM-ICU). 184*(25).

Brummel, N. E., Vasilevskis, E. E., Han, J. H., Boehm, L., Pun, B. T., & Ely, E. W. (2013). Implementing delirium screening in the ICU: Secrets to success. *Critical Care Medicine*, *41*(9), 2196–2208. https://doi.org/10.1097/CCM.0b013e31829a6f1e

Chen, T. J., Chung, Y. W., Chang, H. R., Chen, P. Y., Wu, C. R., Hsieh, S. H., & Chiu, H. Y. (2021). Diagnostic accuracy of the CAM-ICU and ICDSC in detecting intensive care unit delirium: A bivariate meta-analysis. International journal of nursing studies, 113, 103782. https://doi.org/10.1016/j.ijnurstu.2020.103782

Chen, K., Lu, Z., Xin, Y. C., Cai, Y., Chen, Y., & Pan, S. M. (2015). Alpha-2 agonists for long-term sedation during mechanical ventilation in critically ill patients. https://doi.org/10.1002/14651858.CD010269.pub2

Chiche, S. (2016). Dsm-5. In *Troubles mentaux et psychothérapies*. https://doi.org/10.3917/sh.marmi.2016.01.0038

Christensen, M. (2014). An exploratory study of staff nurses' knowledge of delirium in the medical ICU: An Asian perspective. *Intensive and Critical Care Nursing*, *30*(1), 54–60. https://doi.org/10.1016/j.iccn.2013.08.004

Creswell, J. W., & Plano Clark, V. L. (2011). Designing and conducting mixed methods research (2nd ed.). Thousand Oaks, CA: Sage Publicaitons

Desai, S., Chau, T., & George, L. (2013). Intensive care unit delirium. Critical Care Nursing Quarterly, 36(4), 370-389. https://doi.org/10.1097/CNQ.0b013e3182a10e8e

Djaiani, G., Silverton, N., Fedorko, L., Carroll, J., Styra, R., Rao, V., & Katznelson, R. (2016). Dexmedetomidine versus Propofol Sedation Reduces Delirium after Cardiac Surgery: A Randomized Controlled Trial. Anesthesiology, 124(2), 362–368. https://doi.org/10.1097/ALN.0000000000000951

Devlin, J. W., Fong, J. J., Howard, E. P., Skrobik, Y., McCoy, N., Yasuda, C., & Marshall, J. (2008). Assessment of delirium in the intensive care unit: Nursing practices and perceptions. *American Journal of Critical Care*, *17*(6), 555–565. https://doi.org/10.4037/ajcc2008.17.6.555

Devlin, J. W., Fong, J. J., Schumaker, G., O'Connor, H., Ruthazer, R., & Garpestad, E. (2007). The use of a validated delirium assessment tool improves the ability of physicians to identify delirium in medical intensive care unit patients. *Critical Care Medicine*, *35*(12), 2721–2724. https://doi.org/10.1097/01.CCM.0000292011.93074.82

Dos Santos, F. C. M., Rêgo, A. S., Montenegro, W. S., de Carvalho, S. T. R. F., Cutrim, R. C., Júnior, A. A. M., Pereira, F. H. F., Dibai-Filho, A. V., & Bassi-Dibai, D. (2022). Delirium in the intensive care unit: identifying difficulties in applying the Confusion Assessment Method for the Intensive Care Unit (CAM-ICU). BMC Nursing, 21(1), 323. https://doi.org/10.1186/s12912-022-01103-w

Elliott, S. R. (2014). ICU delirium: A survey into nursing and medical staff knowledge of current practices and perceived barriers towards ICU delirium in the intensive care unit. *Intensive and Critical Care Nursing*, *30*(6), 333–338. https://doi.org/10.1016/j.iccn.2014.06.004

Ely, E. W., Inouye, S. K., Bernard, G. R., Gordon, S., Francis, J., May, L., Truman, B., Margolin, R., Hart, R. P., & Dittus, R. (2001). Delirium in Mechanically Ventilated Patients. *JAMA: The Journal of the American Medical Association*, *286*(21), 2745–2746. http://jama.ama-assn.org/cgi/doi/10.1001/jama.286.21.2745

Ely, E. W., Stephens et. (2004). Current opinions regarding the importance, diagnosis, and management of delirium in the intensive care unit: A survey of 912 healthcare professionals. *Critical Care Medicine*, *32*(1), 106–112. https://doi.org/10.1097/01.CCM.0000098033.94737.84

Fan, Y., Guo, Y., Li, Q., & Zhu, X. (2012). A review: Nursing of intensive care unit delirium. *Journal of Neuroscience Nursing*, *44*(6), 307–316. https://doi.org/10.1097/JNN.0b013e3182682f7f

Geurink, K. R. (2020). ICU Delirium. *Journal of Graduate Medical Education*, *12*(1), 115–116. https://doi.org/10.4300/JGME-D-19-00523.1

Girard, T.D., Pandharipande, P.P. & Ely, E.W. Delirium in the intensive care unit. *Crit Care* **12** (Suppl 3), S3 (2008). https://doi.org/10.1186/cc6149

Golafshani, N. (2003). Understanding reliability and validity in qualitative research. The qualitative report, 8(4), 597-607. Retrieved from: http://nsuworks.nova.edu/tqr/vol8/iss4/6

Hayhurst, C. J., Pandharipande, P. P., & Hughes, C. G. (2016). Intensive Care Unit Delirium: A Review of Diagnosis, Prevention, and Treatment. Anesthesiology, 125(6), 1229–1241. https://doi.org/10.1097/ALN.0000000000001378

Hare, M., Wynaden, D., McGowan, S., Landsborough, I., & Speed, G. (2008). A questionnaire to determine nurses' knowledge of delirium and its risk factors. Contemporary Nurse, 29(1), 23-31. https://doi.org/10.5172/conu.673.29.1.23

Hickin, S. L., White, S., & Knopp-Sihota, J. (2017a). Nurses' knowledge and perception of delirium screening and assessment in the intensive care unit: Long-term effectiveness of an education-based knowledge translation intervention. *Intensive and Critical Care Nursing*, *41*, 43–49. https://doi.org/10.1016/j.iccn.2017.03.010

Https://www.icudelirium.org

Ista, E., Ponssen, H. H., Jeannette, F., Schreiner, F., Verbrugge, S. J., Bakker, J., & Jagt, M. Van Der. (n.d.). *Chapter 3 concerns a survey among intensive care units*. 22(3), 133–140.

Kamdar, B. B., Niessen, T., Colantuoni, E., King, L. M., Neufeld, K. J., Bienvenu, O. J., Rowden, A. M., Collop, N. A., & Needham, D. M. (2015). Delirium transitions in the medical ICU: exploring the role of sleep quality and other factors. Critical care medicine, 43(1), 135–141. https://doi.org/10.1097/CCM.0000000000000610

Karthick, S., Madhavi, S., & Selvaraj, N. (2023). Effectiveness of Delirium Prevention Bundle among Critically Ill Patients. *TNNMC Journal of Medical & Surgical Nursing*, *11*(1), 30-35.

Kotfis, K., Marra, A., & Wesley Ely, E. (2018). ICU delirium ' A diagnostic and therapeutic challenge in the intensive care unit. In *Anaesthesiology Intensive Therapy* (Vol. 50, Issue 2). https://doi.org/10.5603/AIT.a2018.0011

Kram, S. L., DiBartolo, M. C., Hinderer, K., & Jones, R. A. (2015). Implementation of the ABCDE bundle to improve patient outcomes in the intensive care unit in a rural community hospital. Dimensions of Critical Care Nursing, 34(5), 250-258. https://doi.org/10.1097/DCC.0000000000000129

Lafi, K., & Salem, A. H. (2018). *Nurses ' Perceptions & Practices towards Delirium in the Intensive Care Units*. *7*(2). https://doi.org/10.9790/1959-0702013646

Lieow, J. L. M., Chen, F. S. M., Song, G., Tang, P. S., Kowitlawakul, Y., & Mukhopadhyay, A. (2019). Effectiveness of an advanced practice nurse-led delirium education and training program. *International Nursing Review*, *66*(4), 506–513. https://doi.org/10.1111/inr.12519

Luetz, A., Heymann, A., Radtke, F. M., Chenitir, C., Neuhaus, U., Nachtigall, I., Von Dossow, V., Marz, S., Eggers, V., Heinz, A., Wernecke, K. D., & Spies, C. D. (2010). Different assessment tools for intensive care unit delirium: Which score to use? *Critical Care Medicine*, *38*(2), 409–418. https://doi.org/10.1097/CCM.0b013e3181cabb42

Milbrandt, E. B., Deppen, S., Harrison, P. L., Shintani, A. K., Speroff, T., Stiles, R. A., Truman, B., Bernard, G. R., Dittus, R. S., & Ely, E. W. (2004). Costs associated with delirium in mechanically ventilated patients. *Critical Care Medicine*, *32*(4), 955–962. https://doi.org/10.1097/01.CCM.0000119429.16055.92

Nelson, L. S. (2009). Teaching staff nurses the CAM-ICU for delirium screening. *Critical Care Nursing Quarterly*, *32*(2), 137–143. https://doi.org/10.1097/CNQ.0b013e3181a27ee0

Nydahl, P., Jeitziner, M. M., Vater, V., Sivarajah, S., Howroyd, F., McWilliams, D., & Osterbrink, J. (2023). Early mobilisation for prevention and treatment of delirium in critically ill patients: Systematic review and meta-analysis. *Intensive and Critical Care Nursing* , *74*, Article 103334. Advance online publication. https://doi.org/10.1016/j.iccn.2022.103334

Oxenbøll-Collet, M., Egerod, I., Christensen, V., Jensen, J., & Thomsen, T. (2018). Nurses' and physicians' perceptions of Confusion Assessment Method for the intensive care unit for delirium detection: focus group study. *Nursing in Critical Care*, *23*(1), 16–22. https://doi.org/10.1111/nicc.12254

Pařízková, R. Č. (2019). Delirium in the intensive care unit. *Vnitrni Lekarstvi*, *65*(6), 433–439. https://doi.org/10.5005/jp/books/13067_9

Park, S. Y., & Lee, H. B. (2019). Prevention and management of delirium in critically ill adult patients in the intensive care unit: A review based on the 2018 PADIS guidelines. *Acute and Critical Care*, *34*(2), 117–125. https://doi.org/10.4266/acc.2019.00451

Patel, R. P., Gambrell, M., Speroff, T., Scott, T. A., Pun, B. T., Takahashi, J., Strength, C.,

Pandharipande, P., Girard, T. D., Burgess, H., Dittus, R. S., Bernard, G. R., & Ely, E. W. (2009). Delirium and sedation in the intensive care unit: Survey of behaviors and attitudes of 1384 healthcare professionals. *Critical Care Medicine*, *37*(3), 825–832. https://doi.org/10.1097/CCM.0b013e31819b8608

Peterson, J. F., Pun, B. T., Dittus, R. S., Thomason, J. W. W., Jackson, J. C., Shintani, A. K., & Ely, E. (2006). Delirium and its motoric subtypes: A study of 614 critically ill patients. *Journal of the American Geriatrics Society*, *54*(3), 479–484. https://doi.org/10.1111/j.1532-5415.2005.00621.x

Philip et al., (2023) Characteristics of delirium and its association with sedation and in-hospital mortality in patients with COVID-19 on veno-venous extracorporeal membrane oxygenation (www.frontiersin.org)

Polit, D. F., & Beck, C. T. (2014). Essentials of Nursing Research Seventh Edition Appraising Evidence for Nursing Practice. In *Lippincott Williams & Wilkins*.

Ramoo, V., Abu, H., Rai, V., Surat Singh, S. K., Baharudin, A. A., Danaee, M., & Thinagaran, R. R. R. (2018). Educational intervention on delirium assessment using confusion assessment method-ICU (CAM-ICU) in a general intensive care unit. *Journal of Clinical Nursing*, *27*(21–22), 4028–4039. https://doi.org/10.1111/jocn.14525

Sinvani L, Delle Site C,Laumenede T, et al. Improving delirium detection in intensive care units: Multicomponent education and training program. *J Am Geriatr Soc. 2021;19.*doi:10.1111/jgs.17419

Society of Critical Care Medicine.. *PADIS guidelines: Pain, agitation/sedation, delirium, immobility, and sleep disruption*. Retrieved from https://www.sccm.org/Clinical-Resources/Guidelines

Spronk, P. E., Riekerk, B., Hofhuis, J., & Rommes, J. H. (2009). The occurrence of delirium is severely underestimated in the ICU during daily care. *Intensive Care Medicine*, *35*(7), 1276–1280. https://doi.org/10.1007/s00134-009-1466-8

Wisdom, J. P., Cavaleri, M. A., Onwuegbuzie, A. J., & Green, C. A. (2012). Methodological reporting in qualitative, quantitative, and mixed methods health services research articles. Health Services Research, 47(2), 721–745. https://doi.org/10.1111/j.1475-6773.2011.01344.x

Yildmm, F., Tiirkle, S., & Duru, H. A. (2020). The effect of an educational program on delirium assessment using CAM-ICU among registered nurses in intensive care unit. *Journal of Nursing Education and Practice, 10(9), 1-8.* https://doi.org/10.5430/jnep.v10n9p1

Zhang, W., & Creswell, J. (2013). The use of "mixing" procedure of mixed methods in health services research Medical Care,51(8),e51–e57. https://doi.org/10.1097/MLR.0b013e31824642fd