

Satomi Mori<sup>1</sup>, Kelly Iuriko Kashiba<sup>2</sup>, Daniela Veruska da Silva<sup>3</sup>, Suelly Sueko Viski Zanei<sup>4</sup>, Iveth Yamaguchi Whitaker<sup>5</sup>

## Confusion assessment method to analyze delirium in intensive care unit. Literature review

*Confusion assessment method para analisar delirium em unidade de terapia intensiva. Revisão de literatura*

1. Nurse, Professor at the Escola Paulista de Enfermagem of the Universidade Federal de São Paulo – UNIFESP - São Paulo (SP), Brazil.

2. Nurse of the Emergency Mobile Care Service - SAMU 192 - São Paulo (SP), Brazil.

3. Nurse of the Adult Intensive Care Unit of the Hospital Nove de Julho – São Paulo (SP), Brazil.

4. PhD, Coordinator of the Specialization Course in Intensive Care Nursing – Escola Paulista de Enfermagem of the Universidade Federal de São Paulo – UNIFESP - São Paulo (SP), Brazil.

5. PhD, Adjunct Professor and Coordinator of the Specialization Course in Intensive Care Nursing - Escola Paulista de Medicina of the Universidade Federal de São Paulo – UNIFESP - São Paulo (SP), Brazil.

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### Author for correspondence

Satomi Mori  
Departamento de Enfermagem - UNIFESP  
Rua Napoleão de Barros, 754  
CEP: 04024-002 - São Paulo (SP), Brazil.  
Phone: (11) 5576 - 4421  
E-mail: satomi.mori@unifesp.br

### ABSTRACT

Delirium is frequently observed in intensive care unit patients and its occurrence is related to increased morbidity and mortality, length of stay, functional decline and high costs. The Confusion Assessment Method for Intensive Care Unit is a tool that facilitates early identification and occurrence of delirium among intubated patients. Objective: To verify the aspects of delirium studied by means of the Confusion Assessment Method for Intensive Care Unit. A literature review was conducted in the LILACS, MedLine, PubMed and CINAHL databases, from 2001, when the Confusion Assessment Method for Intensive Care Unit was validated, to 2008. Descriptors used for LILACS, MedLine and PubMed were delirium

and intensive care unit, while for the CINAHL database, delirium and intensive care were used. From 293 articles, 35 were selected. The aspects analyzed disclosed, different types of delirium in different intensive care units. Variation in sensitivity was of 93% to 100% and variation in specificity, 89% to 100% of the Confusion Assessment Method for Intensive Care Unit, an important tool for detection, characterization and control of delirium and its impact. The aspects of delirium studied by means of the Confusion Assessment Method for Intensive Care Unit were: the performance index, identification, management, cost of treatment, morbidity and mortality due to delirium.

**Keywords:** Delirium; Nursing; Intensive care unit

### INTRODUCTION

Delirium is a neurological disorder often found in critically ill patients admitted in intensive care units (ICU).<sup>(1-5)</sup> Its relevance is not only due to high incidence but essentially to its outcomes such as: influence on the morbidity and mortality rates and prolonged length of stay resulting in higher treatment costs.<sup>(4-9)</sup>

Tools were devised to facilitate observation and diagnosis of delirium in hospitalized patients, the Delirium Rating Scale and the Cognitive Test for Delirium, among others.<sup>(10,11)</sup> In the decade of the eighties Inouye et al. created the instrument Confusion Assessment Method (CAM), based upon the main characteristics of the disorder described by the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-III), because they perceived that existing tools were limited and required complex training for use.<sup>(12)</sup>

In 2001, this tool was adapted for assessment of critically ill patients,

intubated and under mechanical ventilation (MV) in intensive care environments and then called Confusion Assessment Method for the Intensive Care Unit (CAM - ICU). It has four items: 1 - acute onset, 2 - inattention, 3 - disorganized thinking and 4 - altered level of awareness. The proposed assessment comprises observation of the patient's non verbal response pattern to simple orders, recognition of figures by applying the Attention Screening Examination (ASE), surveillance and logical replies with yes and no to simple questions.<sup>(1)</sup>

Considering the importance of delirium consequences in the follow-up status of the critically ill patient, existence of a tool for early detection of this disorder and in order to provide subsidies for daily practice of the ICU professionals related to CAM-ICU regarding performance and scope of utilization, the aim of this study was to verify the aspects of delirium already studied using the CAM-ICU.

## METHODS

This is a literature review, conducted by searching the LILACS, MedLine, PubMed and CINAHL databases. The period under study was from CAM-ICU validation, July 2001 to March 2008, with no language restriction. The keywords delirium and intensive care unit were used for the search in LILACS, MedLine, PubMed and delirium and intensive care were used in CINAHL. Selection criteria were description of CAM-ICU or its use for study of delirium.

## RESULTS

No publications on CAM-ICU were found in LILACS database, 144 studies were identified in PubMed, 25 were selected; in MedLine, 142 publications were found, of which 24 were selected. However, 17 of these had already been selected in PubMed, as such seven were selected. In the CINAHL seven articles were found and three were selected. Thus, a total of 35 studies was selected (Chart 1).

**Chart 1 – Studies about the Confusion Assessment Method for Intensive Care Unit from June 2001 to March 2008**

Journal (reference)	Quantity	Year	Country	Type of study
Acta Anaesthesiologica Scandinavica <sup>(35)</sup>	1	2007	England	Descriptive exploratory
Anaesthesia <sup>(17)</sup>	1	2007	England	Prospective cohort
Anesthesiology <sup>(3)</sup>	1	2006	USA	Prospective cohort
Archives of Internal Medicine <sup>(19,26)</sup>	2	2007	USA	Prospective cohort
		2006	USA	Prospective cohort
Chest <sup>(29)</sup>	1	2007	USA	Narrative review
Clinical Pulmonary Medicine <sup>(39)</sup>	1	2002	Canada	Narrative review
Critical Care <sup>(5,15,32,40)</sup>	4	2007	USA	Prospective cohort
		2006	USA	Prospective cohort
		2005	USA	Prospective cohort
		2002	USA	Prospective cohort
Critical Care Medicine <sup>(1,2,6,8,14,16,22,31)</sup>	8	2008	USA	Prospective cohort
		2007	USA	Prospective cohort
		2005	USA	Prospective cohort
		2005	USA	Prospective cohort
		2004	China	Prospective cohort
		2004	USA	Prospective cohort
		2004	USA	Descriptive exploratory
		2001	USA	Prospective cohort
Critical Care Nurse <sup>(24)</sup>	1	2003	USA	Narrative review
Critical Care Nurse Q <sup>(30,33)</sup>	2	2003	USA	Case study
		2003	USA	Narrative review
Current Opinion in Critical Care <sup>(38)</sup>	1	2005	USA	Narrative review
Hu Li Za Zhi <sup>(34)</sup>	1	2007	China	Descriptive exploratory
Intensive Care Medicine <sup>(20,36)</sup>	2	2007	USA	Prospective cohort
		2007	USA	Systematic review

Continue...

Chart 1 – Continuation

Journal (reference)	Quantity	Year	Country	Type of study
Intensive and Critical Care Nursing <sup>(25)</sup>	1	2007	Australia	Systematic review
Journal of the American Geriatrics Society <sup>(18,23,37)</sup>	3	2006	USA	Prospective cohort
		2005	USA	Comparative study
		2003	USA	Prospective cohort
Journal of the American Medical Association <sup>(9,13,28)</sup>	3	2007	USA	Comparative study
		2004	USA	Prospective cohort
		2001	USA	Prospective cohort
Journal of Nursing Scholarship <sup>(21)</sup>	1	2007	USA	Prospective cohort
Nursing in Critical Care <sup>(27)</sup>	1	2004	England	Systematic review

### Validation of CAM-ICU and detection of delirium in daily routine

The process of CAM-ICU validation was presented in two studies, in both it was carried out by nurses and physicians or specialists in delirium, independently, in adult ICU patients with no previous history of neurological dysfunction. Patients under study had Acute Physiologic Chronic Health Evaluation II (APACHE II) score of 17.1 in average in one study and of 22.9 in the other. Incidence of delirium was 87% and 83.3% and performance of CAM-ICU to detect the disorder, achieved by assessing sensitivity, ranged from 95% to 100% and 93% to 100% and specificity of 89% to 93% and 98% to 100%, respectively.<sup>(1,13)</sup>

For the purpose of assessing patients for delirium, two studies were carried out on implementation of a daily assessment routine for nurses using CAM-ICUs. These studies proved the importance and efficacy of this care for detection of the disorder, in addition to encouraging constant attention to the patient's mental status. It was observed that reports on the disorder were more frequently made by nurses than by the medical staff and that there was a better communication with the multiprofessional team according to the nurses' report.<sup>(14, 15)</sup>

Notwithstanding acknowledgment of delirium as a serious issue in an intensive care environment because of its high incidence and consequence, a study evaluating practices and beliefs on the disorder by ICU professionals noted that 78% admitted to not having properly diagnosed the condition and only 32% endeavored to improve their knowledge on how to handle delirium.<sup>(16)</sup> Among 40% of professionals who reported routine assessment of the patient regarding delirium, 67% made the assessment daily, but only 16% used specific tools. The Mini Mental State Examination (50%) was most often used, followed by

the Glasgow coma scale (28%), sedation scale (16%) and only 7% used the CAM-ICU.<sup>(16)</sup>

### Characterization of delirium with use of CAM-ICU

In the studies using CAM-ICU to detect delirium, mostly in clinical and coronary ICU with critically ill patients it was found that incidence ranged from 14.8% to 89%.<sup>(2,8,13,17,21)</sup> The condition developed in the first five days<sup>(8)</sup> in the ICU and lasted from one to three days,<sup>(2,20)</sup> the length of stay was increased from one to 10 days compared to patients who did not develop delirium.<sup>(2,9,21,22)</sup>

Hypoactive form of delirium was essentially observed in clinical older patients who were MV dependent (51.8%), in comparison to the young (26.6%). The mixed type of delirium was more frequent among younger persons (54.9%).<sup>(23)</sup> In surgical and trauma ICU there was a higher prevalence of the hypoactive form (64% surgical and 60% trauma), followed by the mixed form (9% and 6% respectively).<sup>(20)</sup>

In studies that assessed development and exacerbation of delirium related to use of drugs, it was observed that benzodiazepines and narcotics impaired cognition and worsened the disorder,<sup>(24-26)</sup> having, furthermore, a significantly greater effect than opioids on development of delirium.<sup>(3)</sup> In contrast, another study observed a certain protective effect against development of delirium in post-surgical patients in ICU who had been given general anesthesia or sedation.<sup>(21)</sup> Administration of lorazepam (20 mg) was associated to a 100% probability of developing delirium.<sup>(3,27)</sup> On the other hand it was noted that use of dexmedetomidine reduces the prevalence and duration of delirium, as well as mortality in patients under MV, when compared with use of lorazepam.<sup>(28,29)</sup> Among these drugs, haloperidol together with an assessment routine of the patient's mental status, is recommended.<sup>(30)</sup>

Analysis about influence of the practice of physi-

cal restraint on development of delirium discloses that even when this practice is used carefully for restraint of agitated patients, it may collaborate to development and worsening of delirium in addition to aggravating agitation and confusion.<sup>(25,27)</sup>

Factors related to genetic aspects were also studied, analyzing the relationship between apolipoprotein E (APOE) and the duration of delirium. It was verified that APOE represents the first genetic factor to genetically influence the long duration of the disorder in humans.<sup>(31)</sup>

When analyzing the relation between delirium and mortality in ICU patients it was noted that the disorder is an independent predictor for mortality in patients under MV. Mortality rates in patients who developed it ranged from 19% to 63.6% while in those who did not present it ranged from 6% to 32.5%.<sup>(8)</sup> Patients who manifested at least one episode of delirium presented higher hospital expenses. Hospital cost of patients who developed delirium was 31% higher and the cost, specifically in ICU, was 39% higher than those without delirium.<sup>(6)</sup>

CAM-ICU was also used to elucidate other disorders such as post-traumatic stress disorder, in case studies about delirium and in studies of translation and validation of this tool into another language.<sup>(32-34)</sup>

## DISCUSSION

In the past, changes in the neurological pattern of patients in the ICU were usually called an ICU syndrome or psychosis. Over time, studies were carried out to better understand the disorder and, it is now known that it is a neurological dysfunction named delirium.

To make identification of delirium easier in an objective way, some tools have been developed among them CAM-ICU. This tool is characterized by ease of usage, high sensitivity and specificity. It does not require complex training and only 2-3 minutes are needed for its application,<sup>(1,13,35)</sup> making it quite attractive as a tool to be used in clinical practice. However, to reach a decision, the limitations of CAM-ICU must also be known.

In the validation studies of the tool, patients who presented dementia, psychosis or neurological disease that could be confused with delirium were excluded, which may have influenced results related to its high specificity. Another limitation was that for assessment

with the tool the patient must be able to reply to the questions. However, if the patient presents an impaired level of awareness due to intermittent administration of sedatives, false diagnosis of the type of delirium may occur, as these agents promote its fluctuation, hindering continued assessment of the disorder.<sup>(1,13,36)</sup>

Comparative analysis of six validation tools for detection of delirium in critically ill patients, including CAM-ICU, disclosed considerable differences in relation to time needed for assessment, sensitivity and specificity of each.<sup>(36)</sup> Although CAM-ICU presented a high specificity, another tool may be better suited to identify the hypoactive type, because, in addition to assessing the level of perception, it includes the level of psychomotor lentification. With regard to the time needed for application, it was seen that CAM-ICU requires less time for assessment of delirium.<sup>(36)</sup>

An often noted, a limiting factor in the method of the studies was that data collection was made in a single unit and results might not be applicable in other settings.<sup>(19,21)</sup> However, regardless of limitations, the tool has been important for a better understanding of delirium, its organic consequence, costs related to treatment, as well as the causes and therapeutic measures.

Although CAM-ICU presents characteristics that favor easy use, application is not recommended for critically ill patients not under MV. For those, the CAM-ICU is recommended as it permits to detect subtle delirium cases as found in a study that compared performance of both tools for detection of delirium in elderly patients in the ICU.<sup>(37)</sup>

Regarding drugs used for delirium control, some variables were not analyzed and could affect results, such as degree of renal and hepatic function, hypoxemia, sleep deprivation and administration of doses above plasma concentration. However, the importance of assessing delirium more frequently must be stressed, to better observe transition of the cognitive status due to drug administration.<sup>(29)</sup>

For the adequate prevention, detection and treatment of delirium, physicians and nurses must take leadership of actions for continued education of the team professionals on the disorder, as well as for implementation of monitoring and treatment routines.<sup>(24,31,38)</sup> Among these preventive and therapeutic measures for delirium in critically ill patients, it is necessary to highlight, periodic assessment of the mental condition by using a tool,<sup>(18,20,28,31,39-40)</sup> identification of risk factors related to the patient's personal data,

decrease of excessive noise and other factors that collaborate to increase anxiety and stress and could trigger development of delirium.<sup>(24,31)</sup> Further measures are balanced administration of sedatives and analgesics to reduce unnecessary doses and careful use of physical restraint of the patients.<sup>(3)</sup>

With CAM-ICU, it was perceived that delirium is a disorder frequently found in intensive care environments and its development may often be related to inadequately used therapeutic measures and the importance of these effects on the patient's evolution. The importance of the multiprofessional team to carry out continued assessment of patients using tools and protocols and the adequate therapeutic measures as required, is again stressed. Also highlighted is the importance of constant updating of the professionals to enhance performance with a more efficient intervention that contributes for better prognosis of these intensive care patients.

## CONCLUSION

The aspects about delirium studied with CAM-ICU were performance of the tool itself, identification, treatment, cost, morbidity and mortality resulting from delirium. Thus, it was noted that CAM-ICU is an important tool to detect delirium and, when used by the team brings about a more efficient control of critically ill patients who present the disorder, as well as those under risk of developing it.

## RESUMO

O *delirium* é freqüentemente observado em pacientes internados em unidades de terapia intensiva e a sua ocorrência relaciona-se com o aumento da morbimortalidade, do período de internação, declínio funcional e custos elevados. O *Confusion Assessment Method for Intensive Care Unit* é um instrumento que facilita a identificação precoce e a ocorrência de *delirium* em pacientes intubados. Este trabalho tem como objetivo verificar aspectos já estudados sobre o *delirium* utilizando o *Confusion Assessment Method for Intensive Care Unit*. Foi realizada uma revisão narrativa nas bases de dados LILACS, MedLine, PubMed e CINAHL que compreendeu desde o ano de validação do *Confusion Assessment Method for Intensive Care Unit* (2001) até março de 2008. Os descritores utilizados nas bases de dados LILACS, MedLine, PubMed foram *delirium e intensive care unit* e na CINAHAL foram *delirium e intensive care*. Do total de 293 artigos encontrados foram selecionados 35. Em relação aos aspectos estudados constatou-se incidência variável dos tipos de delirium em diferentes tipos de unidades de terapia intensiva. Quanto a sensibilidade do *Confusion Assessment Method for Intensive Care Unit* este apresentou uma variação de 93 a 100% e a especificidade foi de 89 a 100% sendo considerado um instrumento valioso na detecção, caracterização e controle do *delirium* e suas repercussões. Além disso, sua utilização permite o controle mais eficaz dos pacientes graves que apresentam o distúrbio ou riscos para desenvolvê-lo.

**Descritores:** Delirium; Enfermagem; Unidade de terapia intensiva

## REFERENCES

1. Ely EW, Margolin R, Francis J, May L, Truman B, Dittus R, et al. Evaluation of delirium in critically ill patients: validation of the Confusion Assessment Method for the Intensive Care Unit (CAM-ICU). *Crit Care Med*. 2001;29(7):1370-9. Comment in: *Crit Care Med*. 2001;29(7):1481-3.
2. Micek ST, Anand NJ, Laible BR, Shannon WD, Kollef MH. Delirium as detected by the CAM-ICU predicts restraint use among mechanically ventilated medical patients. *Crit Care Med*. 2005;33(6):1260-5. Comment in: *Crit Care Med*. 2005 Jun;33(6):1433-4.
3. Pandharipande P, Shintani A, Peterson J, Pun BT, Wilkinson GR, Dittus RS, et al. Lorazepam is an independent risk factor for transitioning to delirium in intensive care unit patients. *Anesthesiology*. 2006;104(1):21-6.
4. Granberg Axèll AI, Malmros CW, Bergbom IL, Lundberg DB. Intensive care unit syndrome/delirium is associated with anemia, drug therapy and duration of ventilation treatment. *Acta Anaesthesiol Scand*. 2002;46(6):726-31.
5. Thomason JW, Shintani A, Peterson JF, Pun BT, Jackson JC, Ely EW. Intensive care unit delirium is an independent predictor of longer hospital stay: a prospective analysis of 261 non-ventilated patients. *Crit Care*. 2005;9(4):R375-81. Comment in: *Crit Care*. 2005;9(4):335-6.
6. Milbrandt EB, Deppen S, Harrison PL, Shintani AK, Speroff T, Stiles RA, et al. Costs associated with delirium in mechanically ventilated patients. *Crit Care Med*. 2004;32(4):955-62. Comment in: *Crit Care Med*. 2004;32(4):1080-1.
7. Inouye SK, Bogardus ST Jr, Charpentier PA, Leo-Summers L, Acampora D, Holford TR, Cooney LM Jr. A multicom-

- ponent intervention to prevent delirium in hospitalized older patients. *N Engl J Med.* 1999;340(9):669-76.
8. Lin SM, Liu CY, Wang CH, Lin HC, Huang CD, Huang PY, et al. The impact of delirium on the survival of mechanically ventilated patients. *Crit Care Med.* 2004;32(11):2254-9. Comment in: *Crit Care Med.* 2004;32(11):2352-4.
  9. Ely EW, Shintani A, Truman B, Speroff T, Gordon SM, Harrell FE Jr, et al. Delirium as a predictor of mortality in mechanically ventilated patients in the intensive care unit. *JAMA.* 2004;291(14):1753-62. Comment in: *JAMA.* 2004;292(2):168; author reply 168-9.
  10. Trzepacz PT, Baker RW, Greenhouse J. A symptom rating scale for delirium. *Psychiatry Res.* 1987;23(1):89-97.
  11. Kennedy RE, Nakase-Thompson R, Nick TG, Sherer M. Use of the cognitive test for delirium in patients with traumatic brain injury. *Psychosomatics.* 2003;44(4):283-9.
  12. Inouye SK, van Dyck CH, Alessi CA, Balkin S, Siegel AP, Horwitz RI. Clarifying confusion: the confusion assessment method. A new method for detection of delirium. *Ann Intern Med.* 1990;113(12):941-8. Comment in: *Ann Intern Med.* 1991;114(11):991-2.
  13. Ely EW, Inouye SK, Bernard GR, Gordon S, Francis J, May L, et al. Delirium in mechanically ventilated patients: validity and reliability of the confusion assessment method for the intensive care unit (CAM-ICU). *JAMA.* 2001;286(21):2703-10.
  14. Pun BT, Gordon SM, Peterson JF, Shintani AK, Jackson JC, Foss J, et al. Large-scale implementation of sedation and delirium monitoring in the intensive care unit: a report from two medical centers. *Crit Care Med.* 2005;33(6):1199-205. Comment in: *Crit Care Med.* 2005;33(6):1421-2.
  15. Pisani MA, Araujo KL, Van Ness PH, Zhang Y, Ely EW, Inouye SK. A research algorithm to improve detection of delirium in the intensive care unit. *Crit Care.* 2006;10(4):R121.
  16. Ely EW, Stephens RK, Jackson JC, Thomason JW, Truman B, Gordon S, et al. Current opinions regarding the importance, diagnosis, and management of delirium in the intensive care unit: a survey of 912 healthcare professionals. *Crit Care Med.* 2004;32(1):106-12. Comment in: *Crit Care Med.* 2004 Jan;32(1):295-6.
  17. Plaschke K, Hill H, Engelhardt R, Thomas C, von Haken R, Scholz M, et al. EEG changes and serum anticholinergic activity measured in patients with delirium in the intensive care unit. *Anaesthesia.* 2007;62(12):1217-23.
  18. McNicoll L, Pisani MA, Zhang Y, Ely EW, Siegel MD, Inouye SK. Delirium in the intensive care unit: occurrence and clinical course in older patients. *J Am Geriatr Soc.* 2003;51(5):591-8.
  19. Nelson JE, Tandon N, Mercado AF, Camhi SL, Ely EW, Morrison RS. Brain dysfunction: another burden for the chronically critically ill. *Arch Intern Med.* 2006;166(18):1993-9.
  20. Pandharipande P, Cotton BA, Shintani A, Thompson J, Costabile S, Truman Pun B, et al. Motoric subtypes of delirium in mechanically ventilated surgical and trauma intensive care unit patients. *Intensive Care Med.* 2007;33(10):1726-31. Erratum in: *Intensive Care Med.* 2007 Oct;33(10):1860.
  21. Balas MC, Deutschman CS, Sullivan-Marx EM, Strumpf NE, Alston RP, Richmond TS. Delirium in older patients in surgical intensive care units. *J Nurs Scholarsh.* 2007;39(2):147-54.
  22. Fan E, Shahid S, Kondreddi VP, Bienvenu OJ, Mendez-Tellez PA, Pronovost PJ, Needham DM. Informed consent in the critically ill: a two-step approach incorporating delirium screening. *Crit Care Med.* 2008;36(1):94-9. Comment in: *Crit Care Med.* 2008;36(1):342-3.
  23. Peterson JF, Pun BT, Dittus RS, Thomason JW, Jackson JC, Shintani AK, Ely EW. Delirium and its motoric subtypes: a study of 614 critically ill patients. *J Am Geriatr Soc.* 2006;54(3):479-84.
  24. Truman B, Ely EW. Monitoring delirium in critically ill patients. Using the confusion assessment method for the intensive care unit. *Crit Care Nurse.* 2003;23(2):25-36; quiz 37-8. Erratum in: *Crit Care Nurse.* 2003;23(3):14. Comment in: *Crit Care Nurse.* 2003;23(4):13; author reply 13-4.
  25. Hofso K, Coyer FM. Part 1. Chemical and physical restraints in the management of mechanically ventilated patients in the ICU: contributing factors. *Intensive Crit Care Nurs.* 2007;23(5):249-55.
  26. Pisani MA, Murphy TE, Van Ness PH, Araujo KL, Inouye SK. Characteristics associated with delirium in older patients in a medical intensive care unit. *Arch Intern Med.* 2007;167(15):1629-34. Comment in: *Arch Intern Med.* 2008;168(11):1229.
  27. Bray K, Hill K, Robson W, Leaver G, Walker N, O'Leary M, Delaney T, Walsh D, Gager M, Waterhouse C; British Association of Critical Care Nurses. British Association of Critical Care Nurses position statement on the use of restraint in adult critical care units. *Nurs Crit Care.* 2004;9(5):199-212.
  28. Pandharipande PP, Pun BT, Herr DL, Maze M, Girard TD, Miller RR, et al. Effect of sedation with dexmedetomidine vs lorazepam on acute brain dysfunction in mechanically ventilated patients: the MENDS randomized controlled trial. *JAMA.* 2007;298(22):2644-53. Comment in: *JAMA.* 2008;299(13):1540-1; author reply 1542. *JAMA.* 2008;299(13):1540; author reply 1542. *JAMA.*

- 2008;299(13):1541-2; author reply 1542.
29. Pun BT, Ely EW. The importance of diagnosing and managing ICU delirium. *Chest*. 2007;132(2):624-36.
  30. Marshall MC, Soucy MD. Delirium in the intensive care unit. *Crit Care Nurs Q*. 2003;26(3):172-8.
  31. Ely EW, Girard TD, Shintani AK, Jackson JC, Gordon SM, Thomason JW, et al. Apolipoprotein E4 polymorphism as a genetic predisposition to delirium in critically ill patients. *Crit Care Med*. 2007;35(1):112-7. Comment in: *Crit Care Med*. 2007;35(1):304-5.
  32. Girard TD, Shintani AK, Jackson JC, Gordon SM, Pun BT, Henderson MS, et al. Risk factors for post-traumatic stress disorder symptoms following critical illness requiring mechanical ventilation: a prospective cohort study. *Crit Care*. 2007;11(1):R28.
  33. Hartwick SS. ICU delirium: a case study. *Crit Care Nurs Q*. 2003;26(3):221-4.
  34. Chuang WL, Lin CH, Hsu WC, Ting YJ, Lin KC, Ma SC. [Evaluation of the reliability and validity of the Chinese version of the confusion assessment method for the intensive care unit]. *Hu Li Za Zhi*. 2007;54(4):45-52. Chinese.
  35. Larsson C, Axell AG, Ersson A. Confusion assessment method for the intensive care unit (CAM-ICU): translation, retranslation and validation into Swedish intensive care settings. *Acta Anaesthesiol Scand*. 2007;51(7):888-92.
  36. Devlin JW, Fong JJ, Fraser GL, Riker RR. Delirium assessment in the critically ill. *Intensive Care Med*. 2007;33(6):929-40.
  37. McNicoll L, Pisani MA, Ely EW, Gifford D, Inouye SK. Detection of delirium in the intensive care unit: comparison of confusion assessment method for the intensive care unit with confusion assessment method ratings. *J Am Geriatr Soc*. 2005;53(3):495-500.
  38. Pandharipande P, Jackson J, Ely EW. Delirium: acute cognitive dysfunction in the critically ill. *Curr Opin Crit Care*. 2005;11(4):360-8.
  39. Dial S, Payne J. Managing acute delirium in the intensive care unit. *Clin Pulm Med*. 2002;9(5):260-6.
  40. Bergeron N, Skrobik Y, Dubois MJ. Delirium in critically ill patients. *Crit Care*. 2002;6(3):181-2.