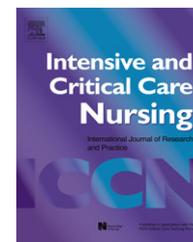




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ORIGINAL ARTICLE

Validation of the Greek version of confusion assessment method for the intensive care unit (CAM-ICU)

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Summary

Objectives: Delirium is associated with the most adverse outcomes in critically ill patients but it is often undiagnosed and untreated. The Confusion Assessment Method for Intensive Care Unit (CAM-ICU) is widely used for delirium assessment. This scale, however, has not been translated and validated into the Greek language. This paper is a report of the translation and validation of the CAM-ICU into Greek.

Research methodology: The applicability and validity of CAM-ICU was tested in two Greek general ICUs. Each patient was included in the study only once. Inter-rater reliability and concurrent validity of both raters compared to the gold standard (DSM-IV) was calculated.

Results: Study sample consisted of 71 patients. Based on psychiatric diagnosis the prevalence of delirium was 33.8%. Compared to the reference standard for diagnosing delirium, the two study

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raters who used the CAM-ICU had sensitivities of 87.5% and 79.0%, specificities of 91.0% and 87.0%, and good inter-rater reliability ($\kappa = 0.75$). Cronbach's alpha was 0.84 (95% CI 0.77–0.89). The mean CAM-ICU administration time was 6 minutes and 30 seconds.

Conclusion: CAM-ICU seems to be a valid and reliable instrument for delirium detection in Greek intensive care patients, which can be easily incorporated in every day clinical practice after appropriate training.

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Implications for clinical practice

- Mechanically ventilated ICU patients are at high risk for developing delirium which is difficult to assess with the standardized scales that rate delirium in patients without communication problems.
- This study evaluates and validates a Greek version of CAM-ICU. Given the lack of any instrument to detect delirium in Greek ICUs this will have major impact in local level.
- A more important implication in International level is that the availability of a valid scale which is used widely allows the exchange of data, information, and compatible treatment guidelines among care providers in ICUs.

Introduction

Delirium has been defined as an etiologically nonspecific organic cerebral syndrome, characterised by concurrent disturbances of consciousness and attention, perception, thinking, memory, psychomotor behaviour, emotion and the sleep-wake schedule. It is a syndrome of acute onset, over hours to days, followed by a course of fluctuation in the level of consciousness, attention and cognition, and sometimes it is accompanied by delusions or hallucinations (APA, 1994). In intensive care units (ICUs), both prevalence and incidence of delirium are high and rise up to 80% in intubated patients (Ely et al., 2001a). ICU patients are at high risk for developing delirium due to multisystem acute illnesses, comorbidities, medications (Devlin et al., 2007; Ouimet et al., 2007), and other environmental and iatrogenic factors such as the absence of visible daylight, isolation, limited visiting hours and the use of physical restraints, feeding tubes and catheters (Devlin et al., 2007; Van Rompaey et al., 2009a). As in medical wards, critical care delirium is associated with high mortality (Ely et al., 2004; Pisani et al., 2009; Van Rompaey et al., 2009b), increased length of stay and health care costs which increase linearly with severity of delirium (Ely et al., 2001a; Milbrandt et al., 2004). Delirium is associated with lower quality of life in survivors (Van Rompaey et al., 2009b). Also, some of delirium clinical features are irreversible (Rudberg et al., 1997) and there is emerging evidence of its relationship with dementia and cognitive decline at least in older patients (Girard et al., 2010; Macdonald and Treloar, 1996).

Although delirium is associated with poor outcomes, it is frequently under-diagnosed (Girard et al., 2008). Without the use of a screening tool, around 65% of delirium patient-days in the ICU are missed (Spronk et al., 2009). The routine use of a validated tool for the presence of delirium has been recommended in critical care guidelines (Jacobi et al., 2002). Despite that, the use of assessment tools for

detecting delirium in critical care is suboptimal. In a recent study (Mac Sweeney et al., 2010), it was found that delirium in critical care is routinely screened by only 25% of clinicians in the United Kingdom (UK), while only 14% of them use a validated tool. Similar findings are reported from intensive care settings in other countries as well (Ely et al., 2004; Mehta et al., 2006; Shehabi et al., 2008; Van Eijk et al., 2008).

About twenty-four different delirium scales are available for identifying delirium in non-ICU populations (Adamis et al., 2010), but their use in ICU is difficult. ICU patients are often intubated and unable to give answers to the components of the scales that require verbal responses. Also, because their level of consciousness is often reduced and their medical condition is unstable it is difficult for them to co-operate in lengthy and complex delirium scales. Around six screening tools have been adjusted and validated for use in the ICU (Devlin et al., 2007). Among them the Confusion Assessment Method for the Intensive Care Unit (CAM-ICU), (Ely et al., 2001b) is widely accepted as the standard in intensive care delirium assessment. It is based on the Confusion Assessment Method (CAM), which was designed specifically for use by health care professionals without formal psychiatric training, and incorporates DSM-IV criteria for the diagnosis of delirium, by a yes or no answer to a four point algorithm (Inouye et al., 1990). The CAM-ICU is widely used by non-psychiatrists, for the evaluation of delirium. Since delirium is fluctuating, a one-time only assessment may fail to detect it. Thus bedside nurses are in a unique position to screen and diagnose delirium not only in the ICU but also in other settings, as they have contact with patients for an entire 8 or 12 hour shift (Insel and Badger, 2002; Pun et al., 2005). Critical care nurses using the CAM-ICU are able to complete delirium assessment in an average of 2 minutes with an accuracy of 98%, compared to a full DSM-IV assessment by a psychogeriatrician expert, who usually requires at least 30 minutes to complete the assessment (Ely et al., 2001b).

Methods

Research questions

Given the adverse outcomes from delirium and the fact that is frequently missed (Ely et al., 2001c), there is an urgent need for a reliable scale for assessing delirium in both everyday clinical practice and in research in Greek ICU settings. No such scale exists in the Greek language and thus the aim of this study was to standardise an already translated but not yet validated CAM-ICU in the Greek population. More specific the aims of the present study were to:

- (a) Provide data on the reliability and validity of the CAM-ICU in Greek ICU patients.
- (b) Report descriptions of the current sample including sensitivity, specificity, inter-rater reliability, over the course of the assessments.

Settings

Two Intensive Care Units, the one located in inner area of Athens (eight beds) and the other in Heraklion, Crete (11 beds).

Participants

All consecutive admissions in two ICU who fulfilled the inclusion criteria:

- (a) At least 24 hours in the ICU
- (b) RASS score from -3 and above.

Exclusion criteria were:

- (a) Previous history of alcohol
- (b) Poor understanding of Greek language
- (c) Severe hearing or visual impairment
- (d) Readmitting in the ICU and
- (e) RASS score <-3

Measurements

- (a) Greek version of CAM-ICU for a dichotomous classification of delirium/non delirium. The original CAM-ICU (Ely et al., 2001b) has been translated forward and backwards to Greek language from two independent teams (including ours) and a consensus has been achieved where differences existed.
- (b) Richmond Agitation-Sedation Scale (RASS) (Sessler et al., 2002) as a pre-requisite for the application or not of CAM-ICU.
- (c) APACHE II score (Knaus et al., 1985) for the measurement of severity of the physical illness.
- (d) DSM-IV (APA, 1994) application of delirium criteria by psychiatrists for a dichotomous assessment for delirium/non delirium.

Data collection of secondary sources (files)

- (a) Demographic data
- (b) Previous illness
- (c) Reason of admission
- (d) Length of stay

Study procedures

Delirium assessment was performed daily and only in the morning, (any time between 7.00 a.m. to 12.00) by three raters: two staff who administered the CAM-ICU, one a member of ICU staff and the other a psychiatrist. These two personnel received training from a delirium expert in the use of the CAM-ICU. They assessed each patient on the same day, in random order for each patient and the time interval between them was less than one hour. Then the reference standard evaluation was performed by the psychiatrist with DSM-IV criteria for delirium. Total time space among first rater and the psychiatrist could not exceed two hours maximum. We have used this timeframe in order to avoid false positive or negative CAM-ICU results due to the fluctuating nature of delirium. One rater, always the same, collected the data before hand in order to investigate the inclusion – exclusion criteria. None of the raters had access to other's evaluations or ratings. Each patient was assessed once.

Ethics

The study has been approved by the Research Ethics Committee from both sides. As most of the participants did not have the capacity to consent and the study did not involve any risk or harm to the participants, we used an approach that has been previously described and used (Adamis et al., 2005). We involved all the potential participants. If a proxy was available we asked for assent. In case that a participant did not have capacity and a proxy was not available we proceeded with the assessments and asked for verbal consent if patient capacity was regained during his/her ICU stay.

Statistical analysis

The inter-rater agreement (reliability) of evaluation between the two raters was assessed using Cohen's kappa coefficient. Sensitivity, specificity and positive or negative predictive values were also calculated as measures of concurrent validity. SPSS version 18.0 (PASW) was used for analysis.

Results

Participants

Between April to November 2009, 172 patients were assessed and 112 (65.1%) met the inclusion criteria. Among patients eligible to participate at enrolment, 41 (36.6%) could not be assessed due to deep sedation throughout their ICU stay (RASS scale <-3) (Fig. 1). The remaining 71 patients were included in the study. Patient's mean age was 61.5 (SD \pm 16.9). Thirty two (45.1%) of them were intubated

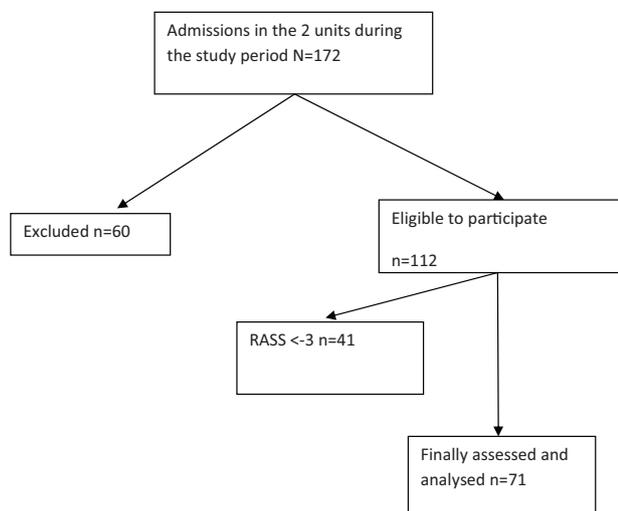


Figure 1

during assessment with the CAM-ICU. Other demographic variables of the studied sample are presented in Table 1.

Delirium related findings

According to psychiatrist findings 24 patients (33.8%) were positive for delirium. Based on the CAM-ICU the number of participants positive for delirium was 25 (35.2%). Mean (SD) duration of ICU stay until the first delirium assessment was 8.0 (7.9) days. Mean time for CAM-ICU completion for both raters was about 6 minutes 30 seconds.

Table 2 Inter-rater reliability of CAM-ICU.

CAM-ICU	κ (95% CI)
Complete	0.75 (0.59–0.91)
FEATURE 1 "Acute onset or fluctuating course"	0.83 (0.70–0.96)
FEATURE 2 "Inattention"	0.74 (0.59–0.90)
FEATURE 3 "Disorganised thinking"	0.63 (0.45–0.80)
FEATURE 4 "Altered level of consciousness"	0.67 (0.50–0.85)

Reliability

The two independent raters completed evaluations for all patients, allowing 71 paired comparisons for inter-rater reliability. The two raters agreed on 63 ratings providing a K value of 0.75 (95% CI: 0.59–0.91). Kappa value for each feature of the instrument was calculated separately (Table 2). Internal consistency was sufficient with Cronbach's alpha equal to 0.84 (95% CI 0.77–0.89).

Concurrent validity

Paired comparisons between the psychiatrist and 2 raters were available for 71 patients. Sensitivity of 1st and 2nd

Table 1 Participant's demographics and diagnoses.

Patient characteristics (n = 71)		Main diagnoses on admission n (%)		History of psychiatric disorder n (%)	
Male n (%)	45 (63.4%)	Medical	43 (60.6%)	Depression	3 (4.2%)
Age (Mean)	61.5, SD \pm 16.9	Sepsis	11 (15.5%)	Schizophrenia	3 (4.2%)
APACHEII (Mean)	14.8 SD \pm 6.3	ARDS	8 (11.3%)	Dementia	3 (4.2%)
Intubated n (%)	32 (45.1%)	Respiratory infection	2 (2.8%)	Other mental illness	2 (2.8%)
		COPD	4 (5.6%)		
		Pulmonary oedema	3 (4.2%)		
		Cardiac arrest	3 (4.2%)		
		Cancer	2 (2.8%)		
		Pulmonary embolism	2 (2.8%)		
		Other	8 (11.3%)		
		Elective surgery	6 (8.5%)		
		Cancer	4 (5.6%)		
		Other	2 (2.8%)		
		Emergency surgery	22 (31%)		
		Brain injury	5 (7%)		
		Trauma	10 (14.1%)		
		Ileus	2 (2.8%)		
		Ruptured abdominal aneurysm	2 (2.8%)		
		Other	3 (4.2%)		

Table 3 Sensitivity, specificity, positive and negative predictive value of CAM-ICU.

	1st rater	2nd rater	Combined rater
CAM-ICU positive N(%)	25 (35.2%)	25 (35.2%)	29 (40.8%)
Sensitivity (95% CI)	87.5% (69–95)	79.2% (59–90)	95.2% (74–98)
Specificity (95% CI)	91.5% (80–96)	87.2% (75–87)	85.0% (72–93)
Positive predictive value (95% CI)	84.0% (65–94)	76.0% (56–88)	76.0% (58–88)
Negative predictive value (95% CI)	94.0% (82–97)	89.0% (77–89)	91.7% (84–99)
Number of patients	71	71	71

rater, when using the CAM-ICU, compared with the standard reference, was 87.5% and 79.2%, respectively, whereas their specificity was 91.5% and 87.2%, respectively. Positive predictive value for the two raters was 84% and 76%, respectively, whereas their negative predictive value was 94% and 89%, respectively. Combined results of the two raters (considering as positive each combination that resulted from at least one positive rater) showed substantial agreement to the psychiatrist's diagnosis ($\kappa=0.73$). Twenty nine patients (29) (40.8%) were positive to at least one rater. See also [Table 3](#).

Discussion

In this study more emphasis was given to the psychometric properties of the Greek translation of CAM-ICU than in the measurement of delirium prevalence. The results show that the Greek translation of CAM-ICU is a reliable and valid scale to detect delirium. CAM-ICU demonstrated substantial agreement between raters with K coefficient of 0.75 which is comparable to previous studies ([Larsson et al., 2007](#); [Tobar et al., 2010](#)). In addition, observation of K statistics in separated features of the scale has shown slightly descending K values for features 3 and 4 (0.63 and 0.67). Analogous K values for features 3 and 4 are reported by the Korean version ([Heo et al., 2011](#)). Appropriate training is important for the use of CAM-ICU especially for feature 3 which seems to be the most difficult to assess in nonverbal patients and perhaps the most subjective of the four features ([Ely and Truman, 2005](#)). Furthermore, ICU nurses possibly were not accustomed to RASS evaluation (Feature 4) since it was not a part of their previous every day practice. Educational preparation of inexperienced raters should emphasise that point and insist in proper comprehension and implementation of CAM-ICU to patients. This was also concluded in a recent study which showed that trained nurses achieved outstanding measurement compliance and considerable agreement for delirium diagnosis with CAM-ICU and RASS when they were used routinely in clinical practice ([Pun et al., 2005](#); [Vasilevskis et al., 2011](#)). Additionally, we have shown that CAM-ICU is a valid instrument with relatively high sensitivity and specificity compared with the reference standard DSM-IV ratings for delirium. Similar results has been reported and in other validation studies e.g. in the Spanish version of CAM-ICU sensitivity and specificity was >80% and 96%, respectively ([Tobar et al., 2010](#)). Also taking into consideration a recent publication by Soja et al. ([Soja et al., 2008](#)) regarding reliability of CAM-ICU in intensive care trauma

patients we did not exclude brain injured patients from our sample. The inclusion of this group of patients did not affect our results, but the number was very small (five patients).

Relatively long completion time (average 6 minutes) in our study was due to the measurement of whole CAM-ICU completion times (all four features) in each patient, even though in most cases fewer features would be adequate for diagnosis. Thus the actual time spend for completion of CAM-ICU is overestimated. In fact CAM-ICU is a feasible and utile instrument, can be easily incorporated in Greek intensive care units for everyday clinical practice and can be used by appropriately trained non-psychiatric personnel.

Even though our sample was relatively small and our sampling methodology was not precise for prevalence evaluation, frequency of delirium (33.8%) was in accordance with a recent international prevalence study of critical care patients in 11 counties ([Salluh et al., 2010](#)). As far as we know, data regarding prevalence of delirium in Greek critical care patients are lacking, so further studies are required for the evaluation of the epidemiology of delirium in Greek ICUs. Yet, no national strategy for routine monitoring, preventing or treating delirium exists in Greek ICUs. Implementation of the Greek version of CAM-ICU in daily practice is feasible and could lead to rising awareness of health care workers. Besides that, since CAM-ICU is an internationally recognised and used scale, we think that another important benefit of this translation and standardisation is that CAM-ICU can be used as a tool for multinational clinical research and comparison with other countries.

Limitations

A limitation of this study is that a large number of patients died or left ICU with RASS <-3 mostly because of brain injury, sepsis and ARDS as admission diagnosis. In the one ICU, admission of brain injured patients is very common as a result of numerous car accidents especially during summer period. Another limitation is that this study was carried out in only two medium- to long-term units. Further evaluation of the Greek translated CAM-ICU in other ICUs settings and in a larger sample remains a task for future research.

Conclusion

CAM-ICU appears to be a valid and reliable instrument for delirium detection in Greek intensive care patients, which can be easily incorporated in every day clinical practice after appropriate training. We hope that validation of the

Greek version of CAM-ICU will lead to increasing detection rates of this organic failure and serve as a valuable tool for future studies on delirium incidence, risk factors and outcome in Greek intensive care.

Conflict of interest

None.

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References

- Adamis D, Martin FC, Treloar A, Macdonald AJ. Capacity, consent, and selection bias in a study of delirium. *J Med Ethics* 2005;31(March (3)):137–43.
- Adamis D, Sharma N, Whelan PJ, Macdonald AJ. Delirium scales: a review of current evidence. *Aging Ment Health* 2010;14(July (5)):543–55.
- APA. DSM-IV: diagnostic and statistical manual of mental disorders. 4th ed. Washington, D.C.: American Psychiatric Association; 1994.
- Devlin JW, Fong JJ, Fraser GL, Riker RR. Delirium assessment in the critically ill. *Intensive Care Med* 2007;33(June (6)):929–40.
- Ely E, Truman B. The confusion assessment method for the ICU (CAM-ICU) training manual 2005; 2005, Available from: http://www.icudelirium.org/docs/CAM_ICU_FAQs.pdf.
- Ely EW, Gautam S, Margolin R, Francis J, May L, Speroff T, et al. The impact of delirium in the intensive care unit on hospital length of stay. *Intensive Care Med* 2001a;27(December (12)):1892–900.
- 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* 2001b;286(December (21)):2703–10.
- Ely EW, Siegel MD, Inouye SK. Delirium in the intensive care unit: an under-recognized syndrome of organ dysfunction. *Semin Respir Crit Care Med* 2001c;22(2):115–26.
- 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 Jan;32(1):106–12.
- Girard TD, Jackson JC, Pandharipande PP, Pun BT, Thompson JL, Shintani AK, et al. Delirium as a predictor of long-term cognitive impairment in survivors of critical illness. *Crit Care Med* 2010;38(July (7)):1513–20.
- Girard TD, Pandharipande PP, Ely EW. Delirium in the intensive care unit. *Crit Care* 2008;12(Suppl. 3):S3.
- Heo EY, Lee BJ, Hahn BJ, Song EH, Lee HA, Yoo CG, et al. Translation and validation of the Korean confusion assessment method for the intensive care unit. *BMC Psychiatry* 2011;11:94.
- 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(December (12)):941–8.
- Insel KC, Badger TA. Deciphering the 4 D's: cognitive decline, delirium, depression and dementia—a review. *J Adv Nurs* 2002;38(May (4)):360–8.
- Jacobi J, Fraser GL, Coursin DB, Riker RR, Fontaine D, Wittbrodt ET, et al. Clinical practice guidelines for the sustained use of sedatives and analgesics in the critically ill adult. *Crit Care Med* 2002;30(1):119–41.
- Knaus WA, Draper EA, Wagner DP, Zimmerman JE. APACHE II: a severity of disease classification system. *Crit Care Med* 1985;13(October (10)):818–29.
- 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(August (7)):888–92.
- Mac Sweeney R, Barber V, Page V, Ely EW, Perkins GD, Young JD, et al. A national survey of the management of delirium in UK intensive care units. *QJM* 2010;103(April (4)):243–51.
- Macdonald AJ, Treloar A. Delirium and dementia; are they distinct? *J Am Geriatr Soc* 1996;44(August (8)):1001–2.
- Mehta S, Burry L, Fischer S, Martinez-Motta JC, Hallett D, Bowman D, et al. Canadian survey of the use of sedatives, analgesics, and neuromuscular blocking agents in critically ill patients. *Crit Care Med* 2006;34(February (2)):374–80.
- 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(April (4)):955–62.
- Quimet S, Kavanagh BP, Gottfried SB, Skrobik Y. Incidence, risk factors and consequences of ICU delirium. *Intensive Care Med* 2007;33(January (1)):66–73.
- Pisani MA, Kong SY, Kasl SV, Murphy TE, Araujo KL, Van Ness PH. Days of delirium are associated with 1-year mortality in an older intensive care unit population. *Am J Respir Crit Care Med* 2009;180(December (11)):1092–7.
- 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(June (6)):1199–205.
- Rudberg MA, Pompei P, Foreman MD, Ross RE, Cassel CK. The natural history of delirium in older hospitalized patients: a syndrome of heterogeneity. *Age Ageing* 1997;26(May (3)):169–74.
- Salluh JI, Soares M, Teles JM, Ceraso D, Raimondi N, Nava VS, et al. Delirium epidemiology in critical care (DECCA): an international study. *Crit Care* 2010;14(6):R210.
- Sessler CN, Gosnell MS, Grap MJ, Brophy GM, O'Neal PV, Keane KA, et al. The Richmond Agitation-Sedation Scale: validity and reliability in adult intensive care unit patients. *Am J Respir Crit Care Med* 2002;166(November (10)):1338–44.
- Shehabi Y, Botha JA, Boyle MS, Ernest D, Freebairn RC, Jenkins IR, et al. Sedation and delirium in the intensive care unit: an Australian and New Zealand perspective. *Anaesth Intensive Care* 2008;36(July (4)):570–8.
- Soja SL, Pandharipande PP, Fleming SB, Cotton BA, Miller LR, Weaver SG, et al. Implementation, reliability testing, and compliance monitoring of the confusion assessment method for the intensive care unit in trauma patients. *Intensive Care Med* 2008;34(July (7)):1263–8.
- Spronk PE, Riekerk B, Hofhuis J, Rommes JH. Occurrence of delirium is severely underestimated in the ICU during daily care. *Intensive Care Med* 2009;35(July (7)):1276–80.
- Tobar E, Romero C, Galleguillos T, Fuentes P, Cornejo R, Lira MT, et al. Confusion assessment method for diagnosing delirium in ICU patients (CAM-ICU): cultural adaptation and validation of the Spanish version. *Med Intensiva* 2010;34(January–February (1)):4–13.
- Van Eijk MM, Kesecioglu J, Slooter AJ. Intensive care delirium monitoring and standardised treatment: a complete survey of Dutch Intensive Care Units. *Intensive Crit Care Nurs* 2008;24(August (4)):218–21.

Van Rompaey B, Elseviers MM, Schuurmans MJ, Shortridge-Baggett LM, Truijen S, Bossaert L. Risk factors for delirium in intensive care patients: a prospective cohort study. *Crit Care* 2009a;13(3):R77.

Van Rompaey B, Schuurmans MJ, Shortridge-Baggett LM, Truijen S, Elseviers M, Bossaert L. Long term outcome after delirium in the intensive care unit. *J Clin Nurs* 2009b;18(December (23)):3349–57.

Vasilevskis EE, Morandi A, Boehm L, Pandharipande PP, Girard TD, Jackson J, et al. Delirium and sedation recognition using validated instruments: reliability of bedside intensive care unit nursing assessments from 2007 to 2010. *J Am Geriatr Soc* 2011;59(Suppl. 2): S249–55.