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Translation and validation of the Tibetan confusion assessment method for the intensive care unit

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Abstract

Background: At present, there is no available delirium translated assessment method for 3.3 million Tibetans. This study aimed to provide a method for delirium assessment for Tibetan patients speaking this language by validating a translation of the Confusion Assessment Method for the Intensive Care Unit (CAM-ICU).

Methods: The study was conducted between July 2018 and November 2018. Patients were screened for delirium by a neurologist using the Diagnostic and Statistical Manual of Mental Disorders IV (DSM-IV). Patients were subsequently screened by two nurses using Tibetan translations of the CAM-ICU. With DSM-IV criterion as the reference standard, the sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were calculated to assess the validity of the CAM-ICU criterion. Interrater reliability was determined by comparing the CAM-ICU ratings of nurse 1 *vs.* nurse 2 using the κ coefficient.

Results: Ninety-six patients were assessed independently by two nurses and one neurologist. According to DSM-IV standard, 42 out of 96 (43.8%) patients developed delirium. The sensitivities of Tibetan CAM-ICU were 90.5% for nurse 1 and 92.9% for nurse 2, respectively. Their specificities were 85.2% and 90.7%, respectively. The PPV were 82.6% for nurse 1 and 88.6% for nurse 2. Their NPV were 92.0% and 94.2%, respectively. The Tibetan CAM-ICU was done with good interrater reliability between nurse 1 and nurse 2 ($\kappa = 0.91$, $P < 0.001$).

Conclusion: The Tibetan CAM-ICU shows good validity and might be incorporated into clinical practice in Tibetan Intensive Care Units.

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Keywords: Delirium; Tibet; CAM-ICU; Validation

Introduction

Delirium is a disturbance in consciousness and is characterized by acute confusion, inattention, disorganized thinking, and altered level of consciousness.[1] According to recent studies,[2-4] delirium is a common complication seen in intensive care unit (ICU) patients, with an incidence ranging from 16% to 87%, and up to 80% in elderly and mechanically ventilated patients. Delirium not only prolongs the length of ICU as well as total hospital stay, but also increases health care costs and the risk of long-term cognitive impairment.[5-8] Moreover, the mortality rate of patients with delirium is higher than patients without delirium.[9] Therefore, the Society of Critical Care Medicine (SCCM) guidelines [10] have recommended routine screening and assessment for the presence of delirium in ICU inpatients.

Several methods, such as Confusion Assessment Method for the Intensive Care Unit (CAM-ICU), the Intensive Care Delirium Screening Checklist (ICDSC) and so on, have been developed and validated to diagnose delirium in ICU patients.[11] Of all these methods, CAM-ICU is considered the most frequently employed tools for the purpose of delirium screening.[12] CAM-ICU was developed by Ely *et al*, and it can be used to assess patients with speech impairment due to endotracheal intubation or tracheotomy. CAM-ICU is a simple, reliable, and valid tool for assessing ICU delirium, and has high specificity (98%–100%) and sensitivity (93%–100%).[2] It can be used by non-psychiatrists with minimal training and takes only few minutes to complete.[13] Due to these advantages, CAM-ICU has been translated into over 40 languages, but a Tibetan version of the CAM-ICU is not yet available. Thus, assessment of delirium cannot be turned to be a routine clinical practice in Tibet, where approximately 3.31 million people speak Tibetan. Therefore, in this study,

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we attempted to translate and validate the CAM-ICU for practical use in the Tibetan ICU setting.

Methods

Ethical approval

The study was conducted in accordance with the *Declaration of Helsinki* and was approved by the Ethics Committee of Peking Union Medical College Hospital, Chinese Academy of Medical Sciences (No. JS-1170).

Patients

The study population included adult ICU patients who are admitted to the Tibet Autonomous Region People's Hospital, with an 800-bed university-affiliated teaching hospital in Tibet, and 18 adult ICU beds. Otherwise, they should meet the inclusion criteria of 18 years or older, hospitalized in ICU for more than 24 h, and could understand the Tibetan language. The exclusion criteria were as follows: patients (1) with preexisting psychosis or neurologic disease; (2) who are comatose or moribund at the time of screening; (3) diagnosed with delirium before assessment and have been prescribed antipsychotics; (4) with a history of vision or hearing impairment; and (5) who refused informed consent. Data collection was conducted between July 2018 and November 2018.

Translation and back-translation

After permission from E. Wesley Ely, the CAM-ICU was translated into Tibetan according to the guidelines recommended by the Translation and Cultural Adaptation group.[14,15] The CAM-ICU was translated into Tibetan by the authors-doctors of critical care medicine who are native Tibetan speakers and proficient in English. Each of them carried out their translation independently and then discussed. The final Tibetan version was submitted to a professional translator for back-translation to English without any information about the original version. The back-translated version was sent to the original author E. Wesley Ely for approval and acceptance of the Tibetan version (see the Tibetan version of the CAM-ICU [Tibetan CAM-ICU] at www Icudelirium.org).

Validation of delirium assessment and interrater reliability

Two study nurses independently conducted delirium assessment in the enrolled patients using Tibetan CAM-ICU. For reference standard evaluation, a neurologist with more than 10 years experiences independently assessed the delirium using a complete clinical examination of each patient and the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) criteria. All assessments were done between 10:00 AM and 1:00 PM to avoid any bias that arise due to changes in patients' condition.

To validate the Tibetan version, we compared the Tibetan CAM-ICU users to the neurologist ratings of delirium using the DSM-IV criteria as the reference standard. For interrater reliability, we compared the Tibetan CAM-ICU ratings between the two nurses by the κ coefficient.

Before conducting the study, two nurses in the research received formal training, which included the instructions given by the researcher, where the definition and cases of delirium features were explicated and discussed, and the training courses were held.

Statistical analysis

Continuous variables were described as mean ± standard deviation (SD) and were compared by using a t test. Categorical data were analyzed as proportions and compared by using Fisher exact test or Chi-squared test. With DSM-IV criterion as the reference standard, the sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were calculated to assess the validity of the CAM-ICU criterion. Interrater reliability was determined by comparing the CAM-ICU ratings of nurse 1 $vs.$ nurse 2 using the κ coefficient. Statistical analysis was conducted using SPSS 20.0 (SPSS Inc., Chicago, IL, USA) software for Windows. Two-tailed tests of significance were employed, and the significance was assumed at $P < 0.05$.

Results

Patient characteristics

A total of 268 consecutive patients were admitted to the ICU during the study period, and the patient enrollment and the flow details are presented in Figure 1. One hundred and seventy-two patients were excluded from the study due to previous exclusion criteria. The remaining 96 patients were enrolled and subsequently evaluated by the DSM-IV reference standard expert and the two study nurses were included in the study population.

The baseline characteristics of the patients are shown in Table 1. Most of the patients (55.2%) were male, with a median age of 53 years. The most common cause of ICU admission (22.9%) was respiratory failure. The APACHE (Acute Physiology and Chronic Health Evaluation) II at admission was 15 ± 6. According to the DSM-IV reference standard, 42 out of 96 (43.8%) enrolled patients developed delirium during the period of evaluation.

Interrater reliability of the Tibetan CAM-ICU

The interrater reliability was defined as the agreement of CAM-ICU results between the two study nurses. Ninety-six paired comparisons were conducted in the included patients. The kappa values of each feature were 0.78, 0.84, 0.77, and 0.80, respectively [Table 2]. The Tibetan CAM-ICU demonstrated good interrater reliability by synthetically considering all four indexes between nurse 1 and 2 ($\kappa = 0.91$; $P < 0.001$).

Validity of the Tibetan CAM-ICU

The neurology expert and the two study nurses completed the 96 paired evaluations in the patients. According to the DSM-IV reference raters, 42 patients were found to be
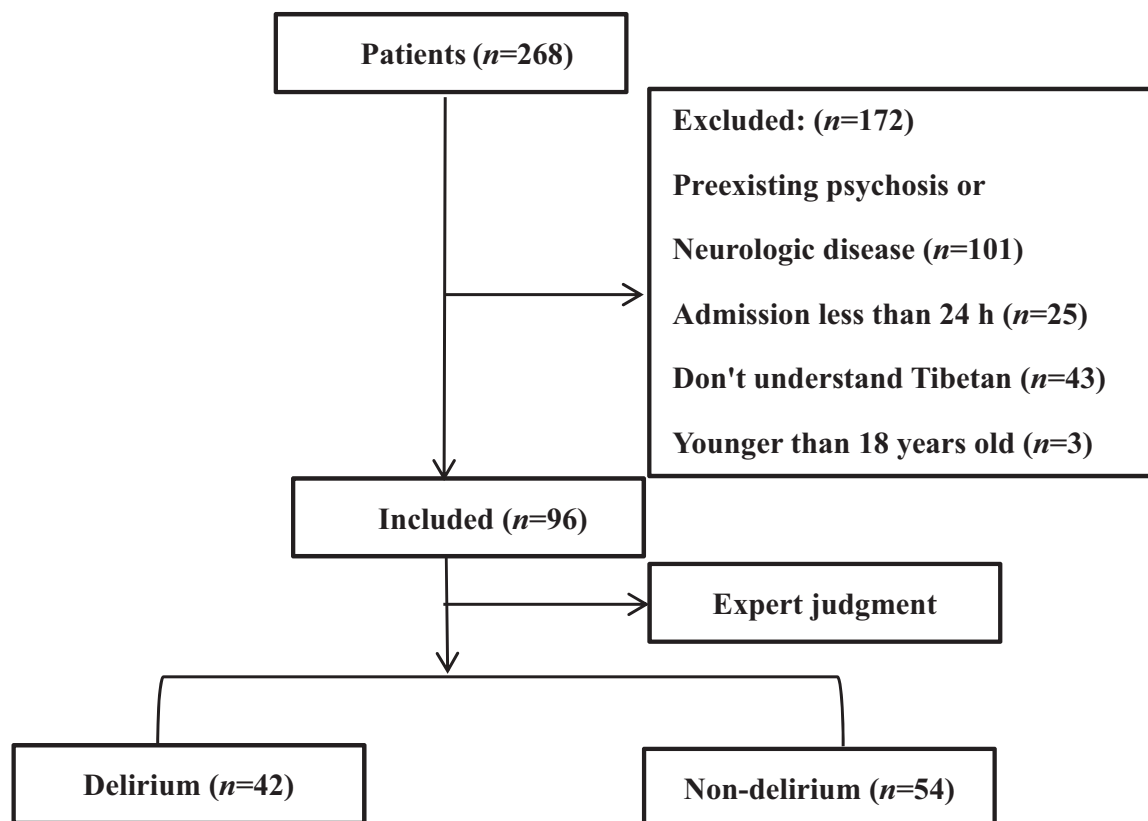
Figure 1: Patient enrollment and flow. A total of 268 consecutive patients were admitted. One hundred and seventy-two patients were excluded from the study because preexisting psychosis or neurologic disease ($n = 101$); less than 24 h admission in ICU ($n = 25$); do not understand Tibetan ($n = 43$); younger than 18 years old ($n = 3$). Ninety-six patients who are evaluated by reference standard expert and two study nurses comprised the final study population.

Table 1: Baseline characteristics of the study population.

Characteristics	Values
Male	53 (55.2)
Age (years)	53 ± 18
APACHE II	15 ± 6
Cause of ICU admission	
Sepsis	17 (17.7)
Respiratory failure	22 (22.9)
Pancreatitis or cholecystitis	11 (11.5)
Abdominal surgery	13 (13.5)
Thoracic surgery	15 (15.6)
Orthopedic surgery	8 (8.3)
Others	10 (10.4)
Delirium using DSM-IV	42 (43.8)

Data are presented as n (%) or mean ± standard deviation. APACHE: Acute Physiology and Chronic Health Evaluation; ICU: Intensive Care Unit; DSM-IV: Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition.

delirious and 54 patients were non-delirious. Nurse 1 found that 46 patients had delirium, whereas nurse 2 found that 44 patients had delirium [Table 3]. Compared with the reference raters, the sensitivities of the two study nurses in using the Tibetan CAM-ICU for evaluation were 90.5% and 92.9%, and their specificities were 85.2% and 90.7%, respectively. The PPVs were 82.6% for nurse 1 and 88.6% for nurse 2, and their NPVs were 92.0% and 94.2%, respectively [Table 4].

Table 2: Interrater reliability of each part of the Tibetan CAM-ICU ($n = 96^*$).

Parameters	Component of CAM-ICU	Kappa	P
Feature I	Acute onset or fluctuating course	0.78	<0.001
Feature II	Inattention	0.84	<0.001
Feature III	Altered level of consciousness	0.77	<0.001
Feature IV	Disorganized Thinking	0.80	<0.001

Feature I is an acute onset or fluctuating course. Feature II is inattention. Feature III is an altered level of consciousness. Feature IV is disorganized Thinking. *Interrater reliability measures across 96 paired comparison showed kappa of 0.91 ($P < 0.001$). CAM-ICU: Confusion Assessment Method for the Intensive Care Unit.

Discussion

With the help of the national aid medical team of Tibet, this novel study translated and validated the CAM-ICU for use in the Tibetan ICU settings. Our study results showed that the Tibetan CAM-ICU had high sensitivity (90.5% for nurse 1 and 92.9% for nurse 2) and specificity (85.2% for nurse 1 and 90.7% for nurse 2) against the DSM-IV reference raters.

Theoretically, SCCM guidelines[10] recommend CAM-ICU and the Intensive Care Delirium Screening Checklist (ICDSC) as the most valid and reliable delirium monitoring tools in adult ICU patients. This was consistent with more than a dozen other original studies,[16-20] and our

Table 3: Comparison of delirium assessment between nurse and the neurology expert (*n* = 96[*]).

Expert DSM-IV delirium rating	Study nurse 1			Study nurse 2		
	Yes	No	Total	Yes	No	Total
Yes	38	4	42	39	3	42
No	8	46	54	5	49	54
Total	46	50	96	44	52	96

[*] The neurology experts and two study nurses completed the evaluation in 96 patients. The neurology expert found that 42 patients were delirious and 54 patients were not delirious. Nurse 1 found that 46 patients had delirium, whereas nurse 2 found that 44 patients had delirium. DSM-IV: Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition.

Table 4: Validity of the Tibetan version of CAM-ICU (*n* = 96[*]).

Rater	Study nurse 1	Study nurse 2
Sensitivity	90.5 (76.5–96.9)	92.9 (79.4–98.1)
Specificity	85.2 (72.3–92.9)	90.7 (79.0–96.5)
PPV	82.6 (68.0–91.7)	88.6 (74.6–95.7)
NPV	92.0 (79.9–97.4)	94.2 (83.0–98.5)
Kappa	0.75 ($P < 0.001$)	0.83 ($P < 0.001$)

[*] The neurology experts and two study nurses completed the evaluation in 96 patients. Data are presented as median (95% confidence interval). CAM-ICU: Confusion Assessment Method for the Intensive Care Unit; PPV: Positive predictive value; NPV: Negative predictive value.

investigation showed that the Tibetan CAM-ICU had high sensitivity and specificity against the DSM-IV reference raters. Thus, our data demonstrated that the CAM-ICU was valid in the Tibetan population. In addition, we reviewed the misclassified CAM-ICU ratings by the study nurses (where there were eight false positives and four false negatives for nurse 1 and five false positives and three false negatives for nurse 2), and these discordant ratings might be due to: (a) unfamiliarity of the patients' baseline mental status, (b) the use of analgesics and sedatives between the study nurses and the intake of DSM-IV ratings, and (c) the fluctuating nature of delirium.

Clinically, delirium is common in ICU patients but unrecognized by medical and nurse ICU teams if the validated delirium-screening tools were not used.[16] The CAM-ICU had great psychometric properties, and was translated into many different languages.[2] Therefore, we hope that the translation of CAM-ICU will allow for a larger implementation of this tool in the Tibetan ICU inpatients. Moreover, for the second feature of CAM-ICU worksheet, the experts used the Vigilance A form of the attention examination (including repetition of letters and asking the patient to squeeze on every "A"). Considering that most of the Tibetan population is not so familiar with Latin alphabets, we have adapted the attention test by using numbers instead.

Politically, the Tibetan version of CAM-ICU is a vital reflection of the achievements of the national aid medical team for Tibet. Department of critical care medicine of Peking Union Medical College Hospital (PUMCH) counterpart aids the Department of critical care medicine of Tibet Autonomous Region People's Hospital (TARPH). With the help of professors from PUMCH, the local medical team of TARPH translated CAM-ICU into Tibetan and made it available on the international website for the first time (https://www.icudelirium.org/medical-professionals/resource-language-translations). This has been set as an example for the professional development of critical care medicine in the Tibet autonomous region.

However, the present study has some limitations. Firstly, more than half of the patients were excluded due to preexisting psychosis or neurologic disease. We do not have exact detailed clinical information of these patients even though we screened all patients who are admitted to ICU. Whether there are valid and reliable instruments to monitor delirium in neuro-critically ill patients and whether delirium is related to relevant clinical outcomes in this population are still unknown. These questions should be clarified in future research. Secondly, Ely et al,[2] who originally studied the CAM-ICU, interviewed the patients' family members to estimate their baseline mental status. However, we just presumed the patients' baseline mental status from the previous medical records because the nurses in our study could not accomplish such family interviews. Thirdly, we used DSM-IV but not DSM-V criteria as the reference standard evaluation in this study. Although studies[21-22] indicated that DSM-IV and DSM-V have no significant difference in diagnosing delirium, DSM-V was supposed to be more restrictive in defining in terms of its cognitive features. Further study could be required to explore the diagnostic relevance of different application of these criteria.

In conclusion, this study provides evidence to support that the Tibetan version of CAM-ICU monitoring is valid, reliable, and feasible in Tibetan ICU patients. We hope that the availability of such worksheet will facilitate the implementation of delirium screening in Tibetan-speaking ICU inpatients and eventually improve the outcome of patients.

Funding

Conflicts of interest

None.

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