


BMJ Open Knowledge, attitudes and practices of ICU nurses regarding subsyndromal delirium among 20 hospitals in China: a descriptive cross-sectional survey

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ABSTRACT

Objectives This study sought to investigate nurses' knowledge, attitudes and practices, and analyse the influencing factors for subsyndromal delirium (SSD).

Design A descriptive cross-sectional survey.

Setting E-questionnaires were distributed to intensive care unit (ICU) nurses from 20 tertiary-grade, A-class hospitals in Henan Province, China.

Participants A total of 740 ICU nurses participated in the questionnaire survey.

Main outcome measures Each dimension score is converted to a percentage scale. A score of $\leq 60\%$ on each dimension of the questionnaire was considered a negative score, $< 80\%$ was considered an intermediate score and $\geq 80\%$ was considered an excellent score.

Results A total of 733 questionnaires were included in the study. More than half of the nurses were at the intermediate level, and a few nurses were at the excellent level. Nurses self-assessed their level of knowledge was intermediate. In the attitudes dimension, nurses' attitudes were negative. The results of the practical dimension showed that most nurses could carry out the clinical practice. Multiple linear regression analysis showed that educational level and received SSD training were influencing factors.

Conclusions ICU nursing staff overestimated their knowledge of SSD and showed a negative attitude towards it. Various forms of education and training are necessary.

INTRODUCTION

Subsyndromal delirium (SSD) is a common complication in intensive care unit (ICU) patients, with an incidence of 12.6%–60.9%.^{1,2} SSD is often considered a state of mind that lies in between the normal state and delirium. The altered state of consciousness in patients with SSD is less severe than in delirium and has only partial manifestations of delirium.² A study showed that the incidence of SSD was higher than that of delirium in patients with a normal mental state and that patients with SSD could develop delirium.³

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ Using a large sample of nurses, this study examines the attitudes and practices of intensive care unit (ICU) nurses towards subsyndromal delirium (SSD).
- ⇒ This study can provide a reference for the development of a more comprehensive ICU SSD training programme.
- ⇒ Nursing knowledge is measured and evaluated by nurses themselves, but subjective factors may not reflect the true level of knowledge.

Background

At present, research on SSD mainly focuses on risk factors,^{4–6} diagnosis^{7,8} and treatment.⁹ Currently, the diagnosis of SSD is mainly based on delirium assessment tools. Taking the Intensive Care Delirium Screening Checklist (ICDSC) as an example, when using the ICDSC to assess for delirium, a patient score of 0 indicates that the patient is in a normal state of mind.¹⁰ A score of ≥ 4 indicates that the patient is in a state of delirium. A patient score of 1–3 indicates that the patient has SSD.¹¹ The 'Clinical Practice Guidelines for the Prevention and Management of Pain, Agitation/Sedation, Delirium, Immobility, and Sleep Disruption in Adult Patients in the ICU' (PADIS Guidelines) indicates that the incidence of nosocomial infection, hospitalisation costs, and mortality are increased in patients with delirium, and delirium is an independent risk factor for death.¹² Until now, there has been no effective treatment for delirium, and the effect of drug treatment is not clear. According to PADIS Guidelines, early recognition of delirium is crucial; however, delirium monitoring and prevention have become low priorities in inadequately staffed ICUs.^{12,13} More delirium occurs when delirium monitoring is reduced.¹³ Therefore, as a precursor state of delirium, timely



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prevention and detection of SSD are of great significance to patients.^{12 14}

ICU nurses spend most of their time at work with patients. Compared with doctors, they can detect changes in patients' consciousness in time.¹⁵ Therefore, the identification, reporting and care of SSD are closely related to ICU nurses. However, few studies have focused on the importance of nurses in the course of SSD. ICU nurses are medical workers who have the closest contact with patients.⁵ Their knowledge, attitudes and practices towards diseases have an important impact on the observation, prevention and outcome of diseases.¹⁶ Therefore, we concluded that nurses' knowledge, attitudes and practices regarding SSD may affect the identification and nursing of patients with SSD. Trogrlić *et al* showed that ICU nurses lacked knowledge about delirium, had erroneous attitudes and were unwilling to routinely evaluate delirium.¹⁷ A study showed that the negative attitudes of healthcare providers can affect the quality of nursing.¹⁸ Through the above research, we know that nurses' knowledge, attitudes and practices regarding a disease affect their decision-making in clinical work, and these decisions are closely related to the interests of patients. Al-Dossary *et al* noted that when nurses have sufficient knowledge reserves, they can adopt different coping strategies as the disease progresses.¹⁹ When nurses have a positive attitude, they can promote themselves to actively carry out clinical practice. Understanding nurses' knowledge, attitudes and practices towards SSD can reveal the problems in nurses' evaluation practice of the syndrome, which is an important basis for taking countermeasures.

Ning *et al* surveyed 352 ICU nurses in Zhejiang province in 2019; however, in the study, nurses were only required to have worked in the ICU for at least 6 months. ICU nurses in China generally need at least 1 year of training before they can independently take charge of ICU work.²⁰ Therefore, Ning's study was insufficient in terms of population type.²⁰ At present, there is a lack of a large sample survey of ICU nurses. Therefore, this study investigated ICU nurses in Henan province by using a questionnaire to explore the current status of knowledge, attitudes and behaviours of Chinese ICU nurses towards SSD.

DESIGN AND METHODS

Design

This is a descriptive cross-sectional survey.

Setting and sample

The convenience sampling method was adopted to select ICU nurses from 20 tertiary-grade, A-class hospitals (high-level hospitals in the Chinese healthcare system) in 17 cities in Henan province for a questionnaire survey. The inclusion criteria were as follows: (1) a professional nursing certificate, (2) at least 1 year of working in the ICU and (3) volunteering to participate in the study. Exclusion criteria were as follows: (1) nurses who do not

Table 1 ICU nurses' general information

Variable	n	%
Gender		
Female	632	86.2
Male	101	13.8
Age (years)		
≤30	352	48
30< to ≤35	279	38.1
35< to ≤40	66	9
40<	36	4.9
Educational level		
Diploma	69	9.4
Bachelor's degree	653	89.1
Master's degree	11	1.5
Professional title		
Primary nurse	113	15.4
Nurse practitioner	335	45.7
Supervisor nurse	271	37
Co-chief nurse	14	1.9
ICU experience (years)		
≤2	131	17.9
2< to ≤5	127	17.3
5< to ≤10	301	41.1
10<	174	23.7
Marital status		
Unmarried	261	35.6
Married	467	63.7
Divorced	5	0.7
ICU style		
Integrated ICU	301	41.1
Emergency ICU	39	5.3
Surgery ICU	70	9.5
Medical ICU	118	16.1
Neurological ICU	99	13.5
Respiratory ICU	106	14.5
Received subsyndromal delirium training		
Yes	139	19.0
No	594	81.0

ICU, intensive care unit.

belong to this hospital, (2) rotation personnel and (3) personnel on a long-term vacation.

Data collection tools

The questionnaire used in this study consisted of two parts. (1) General data: customised by researchers, including age, gender, years of work experience and other items. (2) 'ICU Nurses Knowledge, Belief and practices Survey Scale for Subsyndromal Delirium': this scale

was developed by Ning *et al* and published in the Chinese language²⁰ (online supplemental file 1). It contains 32 items in total, among which, items 1–15 are ‘knowledge items’, (In this part, nurses evaluate themselves based on their situation rather than answer objective questions.) items 16–22 are ‘attitudes items’ and items 23–32 are ‘nursing practices items’. A Likert scale was used for each item, and the score ranged from 1 to 5. Each item is scored positively. For example, a higher score in the knowledge dimension indicates a higher level of adequate knowledge, a higher score in the attitude dimension indicates more positive attitude to participate in SSD management and a higher score in the behaviour dimension indicates that the respondent performs more actions to participate in SSD management in clinical work. The Cronbach’s α coefficient, reliability and validity of the questionnaire were 0.964, 0.985 and 0.97, respectively. We have obtained the permission from the original author. In this study, we convert the score into a standard score (eg, the maximum score of 15 knowledge items is 75. If an interviewee scores 60, their score translates to $60 \div 75 \times 100\% = 80\%$). A score of $\leq 60\%$ on each dimension of the questionnaire was considered a negative score, $< 80\%$ was considered an intermediate score and $\geq 80\%$ was considered an excellent score.²¹

Data collection methods

The research team first contacted the nursing departments of 20 grade A hospitals, and after obtaining consent, asked the ICU nursing managers of the hospitals to coordinate the nurses in the department to participate in the survey. Participation in the survey was voluntary. After obtaining informed consent from the nurses, the research team issued questionnaires through the Questionnaire Star platform (www.wjx.cn). All questions need to be answered, and the questionnaires could only be answered once by each respondent. The questionnaire was open from 09:00 on 10 August 2021 to 09:00 on 11 August 2021. After the questionnaires were collected, two researchers jointly checked the questionnaires and eliminated those with obvious errors or inconsistencies. A preliminary survey of 30 ICU nurses found that the shortest time to answer the questionnaire was 200s, so questionnaires completed in less than 200s were excluded.

Data analysis

Statistical analyses were performed using SPSS V.22.0. Numerical data were expressed as frequency and percentage. The F test or t-test was used to analyse differences between groups. The measurement data subject

Table 2 The three items with the highest and lowest scores in each dimension

Items	Score
Knowledge	
Do you know the scoring criteria for SSD?	3.56±1.276
Do you know what assessment tools can diagnose SSD?	3.55±1.193
Do you know the incidence of SSD in ICU patients?	3.54±1.207
Do you think the actual occurrence of SSD in ICU is higher than the definite diagnosis in clinical practice?	2.70±1.092
Do you know the difference between SSD and delirium?	3.21±1.200
Do you know the major risk factors for SSD?	3.26±1.115
Attitudes	
Do you think your knowledge of SSD meets clinical needs?	3.15±1.190
Do you think SSD is widely recognised and effectively treated by medical professionals?	2.63±1.031
Do you think it is necessary for ICU staff to make bedside rounds and discuss SSD together?	2.17±0.880
Do you think it is necessary for ICU nurses to know about SSD in their clinical work?	1.72±0.864
Do you think it is necessary for ICU nurses to be able to assess and diagnose SSD?	1.77±0.829
Do you think it is necessary to routinely use assessment tools to assess SSD?	1.93±0.828
Practices	
I can timeously report the patient’s state of consciousness to the doctor.	4.36±0.850
I will carefully evaluate whether the patients need to be restricted to avoid the stimulation of unnecessary restraint.	4.00±9.47
I would recommend early transfer out of ICU if the condition permits.	3.92±1.258
I can be trained in SSD to improve my recognition and care.	2.92±1.244
I can use SSD assessment tools frequently in my clinical work.	2.98±1.244
I can use noise reduction, eye masks or earplugs at night to prevent patients’ sleep deprivation.	3.29±1.257
ICU, intensive care unit; SSD, subsyndromal delirium.	

Table 3 The influence of ICU nurses' general information on different dimensions

Variable	Knowledge		Attitudes		Practices		Total score	
	F test/t-test	P value	F test/t-test	P value	F test/t-test	P value	F test/t-test	P value
Gender	-1.373*	0.170	0.965*	0.336	-1.555*	0.120	-1.813*	0.070
Age (years)	2.157†	0.092	1.606†	0.187	0.837†	0.474	1.781†	0.149
Educational level	2.320†	0.099	2.356†	0.096	4.706†	0.009	0.603†	0.547
Professional title	4.734†	0.003	2.472†	0.061	2.412†	0.66	3.044†	0.28
ICU experience (years)	2.776†	0.040	1.489†	0.216	1.981†	0.115	2.564†	0.054
Marital status	3.693†	0.025	3.894†	0.021	1.175†	0.309	3.317†	0.037
ICU style	3.806†	0.002	4.885†	0.000	2.743†	0.018	5.455†	0.000
Received subsyndromal delirium training	-13.948*	<0.01	-7.921*	<0.01	10.095*	<0.01	-10.132*	<0.01

*t-test.
†F test.
ICU, intensive care unit.

to normal distribution were expressed as the difference in mean±SD, and the differences between groups were compared using a t-test. Nurses' scores were treated as dependent variables in the multivariate linear logistic regression analysis, and general data were treated as independent variables. Differences were considered statistically significant when $p < 0.05$.

Patients and public involvement

Patients and the public were not involved in this study, including the design, data collection, analysis and interpretation.

RESULTS

ICU nurses' general information

A total of 740 questionnaires were received in this study, of which 4 were excluded because the answer time was less than 200s and 3 were excluded because of obvious errors. Thus, 733 (99.1%) were finally included as valid questionnaires. In the included questionnaires, there were 632 female ICU nurses (86.2%), the age of the nurses was (30.1±5.3) years and the length of time working in ICU was (6.7±4.3) years. For nurses' general information, see [table 1](#).

Scores of each dimension of the questionnaire

The total score of 733 questionnaires included in this study was (101.2±15.3). In total, 65.3% of nurses were at the intermediate level (≥96 points), and 2.9% were at the excellent level (≥128 points). As a self-evaluation in the knowledge dimension (score 49.6±15.0), 37.7% of the nurses thought themselves to be at the intermediate level (≥45) and 28.9% at the excellent level (≥60). In the attitudes dimension, the score was (15.23±4.573), 10% of the nurses were at the intermediate level (≥21 points) and 1.5% were at the excellent level (≥28 points). In the practical dimension, the score was (36.4±7.9), 47.9% of the nurses were at the intermediate level (≥30 points) and 35.9% were at the excellent level (≥40 points). The three items with the highest and lowest scores in each dimension are shown in [table 2](#).

Factors influencing the knowledge dimension

Results of the univariate analysis showed that the professional title, ICU experience, marital status, ICU style and received SSD training influenced respondents' performance in the knowledge dimension ([table 3](#)). We included the above factors in the multiple linear regression analysis. It shows that only received SSD training can influence the knowledge dimension ($p < 0.01$) ([table 4](#)).

Table 4 Multivariate linear regression analysis of general data for each dimension

Variable	Knowledge		Attitudes		Practices		Total score	
	β	t-test	β	t-test	β	t-test	β	t-test
Educational level	—	—	—	—	-2.147	-2.531*	—	—
Received subsyndromal delirium training	17.348	13.807**	3.276	7.936**	-6.782	-9.761**	13.706	10.132**

*P<0.05.
**P<0.01.

Factors influencing the attitudes dimension

Marital status, ICU style and received SSD training were the influencing factors of ICU nurses' attitudes towards SSD (table 3). We included the above factors in the multiple linear regression analysis. It showed that only received SSD training can influence the attitudes dimension ($p<0.01$) (table 4).

Factors influencing the practical dimension

Education level, ICU style and received SSD training influenced nurses' practical dimension (table 3). We included the above factors in the multiple linear regression analysis. It showed that education level ($p<0.05$) and received SSD training influence the attitude dimension ($p<0.01$) (table 4).

Factors influencing the total score

Marital status, ICU style and received SSD training influenced nurses' total score (table 3). We included the above factors in the multiple linear regression analysis. It showed that received SSD training can influence the total score ($p<0.01$) (table 4).

DISCUSSION

Nurses are the most direct caregivers for ICU patients on a daily basis and are best placed to monitor and prevent delirium in the ICU.²⁰ This study investigated the knowledge, attitudes and practices of ICU nurses in relation to SSD through a questionnaire survey of 733 nurses. The majority of nurses in the study (68.2%) had a moderate or higher self-rating for SSD, but fewer nurses (2.9%) had an excellent level. It suggests that there is still a lot of confusion or misunderstanding about SSD, although the majority of ICU nurses have an average understanding of the condition.

Nurses' knowledge of SSD is crucial to their ability to correctly detect and assess patients with the syndrome. In the knowledge dimension, 28.9% of ICU nurses evaluated themselves at an excellent level, and 37.7% evaluated themselves at a moderate level. The overall score of the nurses was (49.6 ± 15.0) , which was higher than that of Ning *et al* (40.8 ± 14.1) in their investigation of 352 ICU nurses in 9 tertiary-grade, A-class hospitals in Zhejiang province.²⁰ Nurses in this survey were more confident about their knowledge dimension than those in Ning's survey.²⁰ Additionally, only 19% of the ICU nurses in the study reported having received SSD training, but 28.9% reported having excellent SSD knowledge. This suggests that nurses overestimated their knowledge level. A self-evaluation of nurses' knowledge related to nuclear medical examination showed that 55.1% thought they had sufficient knowledge, but the accuracy rate of objective questions was only $(54.9\%\pm 10\%)$.²² This indicates that nurses' self-evaluation results are higher than the actual level. Studies have shown that although most nurses have not received formal training, they can obtain relevant knowledge from the literature, or their colleagues, to meet their knowledge needs.²²⁻²³ Therefore, the scores

of the knowledges dimension of nurses being higher than that of Ning's study may be due to nurses obtaining the relevant knowledge by themselves and the increase in relevant training carried out by hospitals in recent years.²⁰ With the development of training, nurses' knowledge of SSD has improved significantly. However, an analysis of scores for each item in the knowledge dimension revealed gaps in ICU nurses' understanding of the actual incidence of SSD, associated risk factors and differentiation from ICU delirium. This suggests that some ICU nurses severely lack basic knowledge, which prevents them from correctly judging SSD. A Chinese study shows that the level of knowledge of the medical staff is a major obstacle to the implementation of disease surveillance.²⁰ Therefore, it is very important to improve nurses' knowledge of SSD.

In terms of attitudes, the ICU nurses' score was (15.2 ± 4.6) , which was significantly lower than that of Ning *et al*'s study (28.3 ± 4.2).²⁰ In this study, the ICU nurses did not have a positive attitude towards SSD, but most agreed that SSD had been brought to the attention of medical staff and that doctors and nurses should discuss the problems related to SSD together during ward rounds. However, in this dimension, nurses had the lowest evaluation score on knowledge of SSD, ability to assess SSD and routine treatment of SSD. These two attitudes seem to be contradictory; for example, nurses believe that the medical team should pay attention to the occurrence of SSD, but do not want to assess SSD in their daily work. The same conflicting views have been reported in other studies. In an investigation of ICU nurses on the early activity of patients, Wang *et al* found that ICU nurses believed that early activity was very important for patients' recovery, but they were unwilling to consider patients' rehabilitation exercise as a routine practice because it would increase their workload and pose certain risks.²⁴ In addition, nurses' negative attitudes towards the evaluation of SSD may be related to the heavy workload of the ICU and the lack of relevant practice guidelines.²⁴⁻²⁵ In this survey, nurses agreed that the staff should discuss SSD together, but rated their ability to assess delirium as low. This may be related to poor medical cooperation. Trogrlic *et al* found that although there is a consensus among medical staff on the routine evaluation of delirium in the ICU, there are still problems such as inadequate understanding of guidelines, defects in delirium assessment and insufficient medical cooperation.¹⁷ At present, the assessment of SSD still uses delirium assessment tools, so the problems in delirium assessment also affect nurses' attitudes towards the assessment of SSD.¹⁰ There is evidence that ICU nurses perceive patients with delirium as adding to their workload, and this may be one of the more negative factors for nurses to evaluate delirium.²⁶ A study showed that when medical staff use delirium assessment tools to assess delirium, the assessment tools will be less effective than researchers use these tools.¹⁰ A reduction in the effectiveness of assessment tools can reduce the



willingness of medical staff to perform assessments.²⁵ It is very important that nurses have a more positive attitude.

In the practical dimension, the score of this study was (36.4±7.9), which is slightly higher than that reported by Ning *et al*'s study (36.1±7.0).²⁰ This indicates that the practice level of SSD is the same among ICU nurses in China, and most nurses (83.8%) can evaluate SSD in clinical work, which is mainly related to the requirements of ward work. Simultaneously, nurses reported in the survey that it is difficult to carry out a routine assessment of delirium and SSD, which may be related to the high work intensity and nurses' difficulty in having enough time to perform the assessment.²⁵ Yang *et al* surveyed 325 ICU nurses in Beijing and found that only 52.9% of them routinely performed delirium screening.²⁷ In addition, difficulty in routine screening for delirium may be related to nurses' ability to use delirium/SSD assessment tools correctly. Three studies^{28–30} showed that ICU nurses correctly diagnosed SSD with assessment tools between 19% and 57% of the time. Lower accuracy may also affect nurses' willingness to use assessment tools.³¹ Self-confidence is an important factor that affects nurses' clinical decision-making.³¹

Multivariate analysis showed that education level and received SSD training influenced ICU nurses' scores. Interestingly, this study found a negative correlation between education level and nurses' practices dimension scores ($\beta=-2.147$, $p<0.05$). Our analysis suggests that this may be related to the younger age and shorter working experiences of nurses with bachelor's degree or above in this study. A previous study showed that most new nurses obtain delirium knowledge from school, think that their theoretical knowledge does not guarantee a proper assessment of delirium.²⁰ That is to say, nurses have received theoretical training in school, but their practical ability is deficient. Liu *et al* conducted a survey on the voice behaviour of Chinese nurses and found that the more highly educated nurses are, the worse their voice behaviour is, which may be related to the short entry time of highly educated nurses and their lack of work experience.³² This study found that received SSD training affected all dimensions. Training has a positive impact on the knowledge dimension ($\beta=17.348$, $p<0.01$), attitudes dimension ($\beta=3.276$, $p<0.01$) and the total score ($\beta=13.706$, $p<0.01$) of nurses. Hospital continuing education is very important for the professional development of nurses. Many studies have shown that educational training can improve nurses' knowledge level and positive attitude towards delirium and SSD.^{20 25 33} At present, existing training cannot meet the needs of nurses' clinical work and cannot make nurses realise the importance of delirium/SSD management in a real sense.²⁵ Nurses hope to improve their confidence in assessing delirium through various forms of training and will be encouraged to become more involved in the care of patients with delirium.²⁵ This may be why the correlation between training and practical ability is negative. Nursing managers should use a variety of training methods, such

as workshops, to improve nurses' clinical practice in assessing SSD.

Limitations

There are two limitations to the implementation of this study. (1) The questionnaire used in this study is currently the only Chinese version. Although the questionnaire has good reliability and validity, self-evaluation content is used in the knowledge section. This caused respondents to overestimate their knowledge. The development of multiple choice or judgement questions for SSD knowledge can better evaluate ICU nurses' knowledge. (2) The survey was conducted in the form of an online questionnaire, which may have caused sample bias.

CONCLUSION

This study showed that ICU nurses in China overestimated their knowledge levels. Their knowledge of SSD was also lower than their self-reported results. The study also found that their attitudes are relatively negative. ICU nurses' educational level and received SSD training can influence survey results. This study can be used as a reference to understand the status of SSD among ICU nurses in China. The results suggest that training strategies should be improved to enhance nurses' knowledge of SSD. It is also important to improve nurses' attitudes and make them more positive, which is closely related to the interests of patients. This study lays a foundation for the development of a training programme for patients with SSD.

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REFERENCES

- Serafim RB, Soares M, Bozza FA, *et al.* Outcomes of subsyndromal delirium in ICU: a systematic review and meta-analysis. *Crit Care* 2017;21:179.
- Cole MG, Ciampi A, Belzile E, *et al.* Subsyndromal delirium in older people: a systematic review of frequency, risk factors, course and outcomes. *Int J Geriatr Psychiatry* 2013;28:771–80.
- Yamada C, Iwawaki Y, Harada K, *et al.* Frequency and risk factors for subsyndromal delirium in an intensive care unit. *Intensive Crit Care Nurs* 2018;47:15–22.
- Brummel NE, Boehm LM, Girard TD, *et al.* Subsyndromal delirium and institutionalization among patients with critical illness. *Am J Crit Care* 2017;26:447–55.
- Denny DL, Trotter T, Lindseth G. Preoperative nutritional status and risk for Subsyndromal delirium in older adults following joint replacement surgery. *Orthop Nurs* 2020;39:384–92.
- Denny DL, Lindseth G. Preoperative risks for subsyndromal delirium in older adults following orthopedic surgery. *West J Nurs Res* 2017;39:1376–7.
- Franco JG, Trzepacz PT, Sepúlveda E, *et al.* Delirium diagnostic tool-provisional (DDT-Pro) scores in delirium, subsyndromal delirium and NO delirium. *Gen Hosp Psychiatry* 2020;67:107–14.
- Trzepacz PT, Franco JG, Meagher DJ, *et al.* Phenotype of subsyndromal delirium using pooled multicultural Delirium rating scale—revised-98 data. *J Psychosom Res* 2012;73:10–17.
- Al-Qadheeb NS, Skrobik Y, Schumaker G, *et al.* Preventing ICU Subsyndromal delirium conversion to delirium with low-dose IV haloperidol: a double-blind, placebo-controlled pilot study. *Crit Care Med* 2016;44:583–91.
- Stollings JL, Kotfis K, Chanques G, *et al.* Delirium in critical illness: clinical manifestations, outcomes, and management. *Intensive Care Med* 2021;47:1089–103.
- Salluh JIF, Wang H, Schneider EB, *et al.* Outcome of delirium in critically ill patients: systematic review and meta-analysis. *BMJ* 2015;350:h2538.
- Devlin JW, Skrobik Y, Gélinas C, *et al.* Clinical practice guidelines for the prevention and management of pain, Agitation/Sedation, delirium, immobility, and sleep disruption in adult patients in the ICU. *Crit Care Med* 2018;46:e825–73.
- Kotfis K, van Diem-Zaal I, Roberson SW, *et al.* The future of intensive care: delirium should no longer be an issue. *Crit Care* 2022;26:200.
- Sun D, Chai W, Guo H. Analysis of duration of ICU delirium and its influencing factors. *Chinese Journal of Nursing* 2017.
- Xing H, Zhou W, Fan Y, *et al.* Development and validation of a postoperative delirium prediction model for patients admitted to an intensive care unit in China: a prospective study. *BMJ Open* 2019;9:e30733.
- Jiang L, Li L, Lommel L. Nurses' knowledge, attitudes, and behaviours related to pressure injury prevention: a large-scale cross-sectional survey in mainland China. *J Clin Nurs* 2020;29:3311–24.
- Trogrlić Z, Ista E, Ponssen HH, *et al.* Attitudes, knowledge and practices concerning delirium: a survey among intensive care unit professionals. *Nurs Crit Care* 2017;22:133–40.
- Hazzazi AA, Ageeli MH, Sharahili KA, *et al.* Physicians' and nurses' perceptions and attitudes toward sickle cell disease patients in Jazan, Saudi Arabia. *Saudi Med J* 2020;41:841–8.
- Al-Dossary R, Alamri M, Albaqawi H, *et al.* Awareness, attitudes, prevention, and perceptions of COVID-19 outbreak among nurses in Saudi Arabia. *Int J Environ Res Public Health* 2020;17. doi:10.3390/ijerph17218269. [Epub ahead of print: 09 11 2020].
- Ning L, Jun L, Li Y. Knowledge-attitude-practice on sub-syndromal delirium and its influencing factors among intensive care unit nurses in class III general hospitals. *Chinese Journal of Modern Nursing* 2019;25:93–6.
- Jingjing Z. *Cognitive impairment and affective disorder in critical patients and its intervention.* Anhui Medical University, 2016.
- Liu Y, Li W, Zhao Y. Investigation on knowledge of nurses in clinical ward on preparing patients for nuclear medicine examinations. *Chinese Journal of Nuclear Medicine and Molecular Imaging* 2022;40:726–30.
- Krupa S, Friganović A, Oomen B, *et al.* Nurses' knowledge about Delirium in the group of intensive care units patients. *Int J Environ Res Public Health* 2022;19:2758.
- Wang J, Xiao Q, Zhang C, *et al.* Intensive care unit nurses' knowledge, attitudes, and perceived barriers regarding early mobilization of patients. *Nurs Crit Care* 2020;25:339–45.
- Zamoscik K, Godbold R, Freeman P. Intensive care nurses' experiences and perceptions of delirium and delirium care. *Intensive Crit Care Nurs* 2017;40:94–100.
- Papastavrou E, Papaioannou M, Evripidou M, *et al.* Development of a tool for the assessment of nurses' attitudes toward delirium. *J Nurs Meas* 2019;27:277–96.
- Yang Y, Yu H, Yan X. Investigation on sedation nursing practice of ICU nurses. *Chinese Journal of Disaster Medicine* 2020;8:322–5.
- Inouye SK, Foreman MD, Mion LC, *et al.* Nurses' recognition of delirium and its symptoms: comparison of nurse and researcher ratings. *Arch Intern Med* 2001;161:2467–73.
- Nydahl P, Sricharoenchai T, Chandra S, *et al.* Safety of patient mobilization and rehabilitation in the intensive care unit. systematic review with meta-analysis. *Ann Am Thorac Soc* 2017;14:766–77.
- Morandi A, Piva S, Ely EW, *et al.* Worldwide survey of the "Assessing pain, both spontaneous awakening and breathing trials, choice of drugs, Delirium Monitoring/Management, early exercise/mobility, and family empowerment" (ABCDEF) bundle. *Crit Care Med* 2017;45:e1111–22.
- Norman SL, Taha AA. Delirium knowledge, self-confidence, and attitude in pediatric intensive care nurses. *J Pediatr Nurs* 2019;46:6–11.
- Liu S, Wang Y. Correlation between error aversion culture and nurses' voice behavior. *Chinese Journal of Nursing Education* 2019;16:306–9.
- Efrain NT, Zikrin E, Shacham D, *et al.* Delirium in internal medicine departments in a tertiary hospital in Israel: occurrence, detection rates, risk factors, and outcomes. *Front Med* 2020;7:581069.