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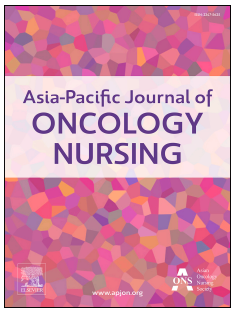

Knowledge of Opioid-induced Respiratory Depression Among Chinese Healthcare Professionals：A Cross-Sectional Study

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Knowledge of Opioid-induced Respiratory Depression Among Chinese Healthcare Professionals：A Cross-Sectional Study

Abstract

Purpose The purposes of this study were to measure knowledge about opioid-induced respiratory depression (OIRD) among Chinese healthcare professionals and to explore the associated factors that influence Chinese healthcare professionals's knowledge

Methods A cross-sectional survey was conducted. A convenience sample of 900 Chinese healthcare professionals from 21 provinces, 4 municipalities, and 4 autonomous regions was used. The OIRD knowledge questionnaire, which is a self-designed questionnaire based on evidence, was used to judges the degree of knowledge among Chinese healthcare professionals according to the accuracy rate. The questionnaire included questions on 6 dimensions of knowledge. Socio-demographic characteristics were also measured by amulti-item questionnaire.

Results The mean accuracy and correct response rate range on the OIRD knowledge questionnaire for all participants were 64.5±10.0% and 20%-100%, respectively. According to univariate analysis, Chinese healthcare professionals' OIRD knowledge was positively correlated with age, region, profession, hospital level, type of hospitals and departments, education level, years of clinical working, and clinical practice of chronic cancer pain management. Multiple linear regression analysis showed differences in professions and regions.（all $p<0.05$）.

Conclusions Most Chinese healthcare professionals had misconceptions about OIRD and lacked relevant knowledge. We should assign importance to developing targeted training programs and exploring feasible and effective training methods.

Key words

Cancer pain, Opioid-induced respiratory depression, Knowledge, Healthcare professionals, Opioid-induced adverse

Background

Pain is one of the most common symptoms among cancer patients and seriously affects quality of life. According to statistics, the incidence of pain during treatment in cancer patients is approximately 55%. The incidence of pain in patients with advanced cancer is approximately 60%-80%, of which 1/3 of patients have moderate to severe pain[1]. Chinese researcher Wang Wei[2] conducted an investigation on the current status of cancer pain control in a population of 477 patients in 11 hospitals in Beijing. The results showed that there is still a relatively high proportion of patients with moderate to severe cancer pain (65.82%). Analgesic medication is one of the main methods of comprehensive tre

atment of cancer pain. As one of the treatment drugs for moderate to severe p ain, opioid are widely used in hospitalized patients with cancer pain. While opi oid relieve pain, they also cause many adverse drug reactions. Among them, O IRD is one of the most serious adverse reactions to opioid. Once it occurs, it may be life-threatening.

Most studies used naloxone to reverse respiratory depression and count the occurrence of OIRD. Rosenfeld etal[3] retrospectively analysed the use of nalo xone in a tertiary hospital in the United States for three years and found that the incidence of OIRD in surgical patients was 0.38%. The incidence of OIRD in medical patients was 0.2%, and the risk of OIRD in patients using patient-controlled analgesia (PCA) and epidural opioid injection was 1.21% and 1.31%, respectively. Gordon etal[4] used a case-control method to analyse the incidenc e of OIRD in the population of postoperative patients, and the result showed t hat the incidence of postoperative OIRD was 0.53%. Suissas etal[5] used a cros s-sectional study to investigate the occurrence of OIRD in 419 perioperative pa tients, and the results showed that the incidence of OIRD in perioperative patie nts was 0.18%. Weingarten and other large-scale survey studies have shown tha t[6] the incidence of OIRD in patients recovering from anaesthesia is 0.25%. In summary, the incidence of OIRD is 0.2% to 1.5%.

Medication safety is one of the goals of patient safety, and it is also the focus of medical institutions. The latest Hospital National Patient Safety Goals (NPSG)[7] released by The Joint Commission (TJC) specifically emphasized “Im prove the safety of using medications”. The latest patient safety goals (2019 ed ition)[8] issued by the Chinese Hospital Association mentioned “To ensure drug safety, medical institutions should safely and strictly implement the use and ma nagement of special drug regulations. such as narcotic drugs, psychotropic drug s, medical toxic drugs, radioactive drugs, and pharmaceutical precursor chemical s and anti-tumour drugs.” Healthcare professionals play an important role in en suring drug safety, including drug use, monitoring and management.

Management guidelines for OIRD have been formulated by many countries and institutions in domestic and foreign recent years. In them, the risk factors, diagnosis, prevention, and management of OIRD are discussed[9-11]. For exampl e, the American Society for Pain Management Nursing (ASPMN) developed th e “Guidelines on Monitoring for Opioid-induced Sedation and Respiratory Depr ession”[10],the American Association of Anesthesiologists developed the “Practice Guidelines for the Prevention, Detection, and Management of Respiratory Depr ession Associated with Neuraxial Opioid Administration”[9] and Chinese Medical Association Anesthesiology Branch developed the “Expert Consensus on Pain Management after Surgery in Adults”[11] in 2014.

KamendatJ etal[12] implemented the ASPMN’s “Guidelines on Monitoring f or Opioid-induced Sedation and Respiratory Depression” in a hospital, and in-h ospital online educational resources were used to educate and train 324 nurses. The number of occurrences of respiratory depression, the number of OIRD–rela ted rapid responses and the Self-designed knowledge questionnaire were used a

s evaluation indices. The results showed that after implementation of the guidel ines the number of occurrences of respiratory depression in the hospital decreas ed, and the nurses' knowledge improved. The results suggest that the improve ment in knowledge helps nurses identify OIRD early and take measures to pre vent the occurrence of OIRD. Knowledge is the basis of behaviour change. A lthough there are many practical guidelines for OIRD, the correct implementati on of healthcare professionals is closely related to their knowledge of OIRD. A cross-sectional study on opioid-related knowledge and attitudes among 133 n urses in the United States[13] showed that nurses lacked knowledge about the ri sk of opioid addiction, monitoring and management of respiratory depression, a nd disposal,storage of opioid. This situation may affect the ability of nurses to provide effective drug treatment and management to patients[13].

At present, there is no survey on the status of knowledge about OIRD in domestic and foreign healthcare professionals, but there are a number of studie s on the knowledge and attitudes of healthcare professionals regarding cancer p ain and opioid in domestic and foreign[14,15]. The evaluation tools were used in clude knowledge of OIRD, such as the Pennsylvania Patient Safety Authority q uestionnaire and the Pain Management Knowledge and Attitude Questionnaire (KASRP)[16]. However, due to the small number of questions and low proportio n, the results cannot fully represent the current status of healthcare professional s's knowledge of OIRD.

Studies have shown[15,17] that knowledge about cancer pain and opioid amo ng healthcare professionals is usually affected by many factors, such as demogr aphic characteristics, education level, experience, and the frequency of managin g pain patients. At present, there is no research about the factors affecting the knowledge of OIRD in healthy professionals.Therefore, the factors affecting the knowledge of OIRD in healthcare professionals are still unclear, and further in vestigation and analysis are needed.

The purpose of this study was to measure the knowledge of Chinese healt hcare professionals's knowledge regarding OIRD and related factors. and provid e a basis for targeted training programs and safety of clinical opioid use.

Method

Design, Setting, and Sample

This descriptive cross-sectional study included 900 healthcare professionals which from the medical institution where the member of the Oncology Commit tee of the Chinese Nursing Society is located.They were selected using conveni ence sampling methods. The inclusion criteria were individuals oldre than 18 y ears old that engaged in medical or nursing work, had physician qualifications or nurse qualifications, and volunteered to fill out the questionnaire.

According to the calculation formula for a cross-sectional study, $n=(t\alpha/\square S/\delta)^2$, the study presumes that the standard deviation of the self-designed question naire's accuracy is 12.6%,which is based on the results of 30 pre-tests, the all owableerror is 0.012, which is 0.1 times the standard deviation,$\alpha=0.05$, $t_{(0.05,2)}=1.96$, and the sample size is approximately equal to 361.Considersing an efficie

ncy of 80% of the questionnaires,the minimum sample size was 451.

Instrument

Demographic data and OIRD konwledge information of the Chinese health care professionals were collected by a general information questionnaire and self-develpoed questionnaire about OIRD. The general information questionnaire was designed by the researchers based on a literature review, included: gender, age of healthcare professionals, area of work, grade and type of hospital, department, education level, work experience, cancer pain-related training experience, and the average monthly number of patients with chronic cancer pain.

The Chinese healthcare professionals's OIRD knowledge were assessed by a self-developed questionnaire about OIRD,which based on relevant guidelines and literature,such as Practice Guide[9], the United States Joint Committee developed 'Sentinel Event Alert"[18] and the China issued "Expert Consensus on Pain Management in Adults after Surgery"[11].The questionnaire was reviewed and revised by two rounds of medical, anaesthesia and nursing experts. The members of the expert committee included: 1 medical oncologist, 1 anaesthesiologist, 1 pain physician, and 3 nursing experts, all with senior titles. The questionnaire includes 20 questions covering 6 dimensions, including incidence of respiratory depression,judgement criteria, risk factors, preventive measures, close monitoring, and correct administration. The question types are true or false and single choice. The accuracy, rangingfrom 0 to 100%, represents the number of correct answers/thenumber of all questions; if the accuracy was more than 80%,this represented adequate knowledge and attitudes regarding OIRD.

Data collection

To prevent possible deviations, all data were submitted anonymously. If there was an omission, the system automatically jumped to the missing items after clicking "Submit" to ensure the integrity of the questionnaire. The electronic questionnaire was used to collect data, Before data collection, team members uniformly explained the purpose and significance of the research to participants.

Data analysis

Database construction, data input, and data analysis were performed using IBM SPSS 25.0. The missing data included in the self-develpoed questionnaire about OIRD were random and were filled by manual method. According to the Chinese regional economic development and geographic location criteria issued by the State Council, healthcare professionals who participated in the questionnaire were divided into eastern, central, western, and northeastern regions. Means, standard deviations, frequencies, and percentages were used to describe the sample characteristics. Pearson correlation, independent sample *t* test, analysis of variance, and LDS post hoc tests (PHT), and multiple linear regressions were used to explore the related factors of OIRD accuracy. All statistical tests were two-sided (α=0.05).

Results

Description of the sample

Of the 900 healthcare professionals recruited, 900 questionnaires were used

for the ultimate data analysis. 900 healthcare professionals from 21 provinces, 4 municipalities, and 4 autonomous regions in this study. The average age was 33±7 years old(mean±SD), with a range from 20 to 80. Furthermore, 81.4%of healthcare professionals had a bachelor's degree or above, 77.1% of healthcare professionals had worked for more than 5 years.Table 1 summarizes the healthc are professionals's socio-demographic characteristics.

Self-Reported Knowledge Regarding OIRD

The average percentage of accuracy was 64.5±10.0%(mean±SD), with a ra nge from 20% to 100%. Only 74(8.1%) healthcare professionals had accuracy of more than 80%. The items accuracy from high to low are listed in Table 2.

Factors Associated with Knowledge Regarding OIRD

Healthcare professionals age was significantly and positively related to the OIRD knowledge questionnaire accuracy(r=0.94, p <0.05)The OIRD's accuracy of healthcare professionals who in the eastern, western and central regions was higher. Moreover, the accuracy varied by grade and type of hospital, departmen t,education level, work experience, and average monthly number of patients wit h chronic cancer pain. Among them, the higher the education leve and hospital s, the higher the accuracy of the OIRD knowledge questionnaire. The knowled ge of healthcare professionals who manage>5 cases and 2-4 cases of chronic c ancer pain was better than that of healthcare professionals who do not manage chronic cancer pain patients (Table 2).

The accuracy of OIRD knowledge questionnaire was used as the dependen t variable, and the variables with statistical significance in univariate analysis w ere used as independent variables for multiple linear regression analysis. profess ions and region were the independent of accuracy on the OIRD knowledge que stionnaire and could jointly explained 12.1% of the Chinese healthcare professi onals' knowledge about OIRD when adjust region, education level, work experi ence.(Table 3).

Discussion

Opioid, as the main therapeutic drugs for moderate to severe pain, are wi dely used for the treatment of cancer pain and postoperative pain. Respiratory depression is the most serious adverse reaction to opioid, and once it occurs, it may be life-threatening. However, because of its low incidence, so often overl ooked. Based on available evidence, this study designed an OIRD's knowledge questionnaire to evaluated Chinese healthcare professionals's knowledge,which i ncluded 6 dimensions: incidence of respiratory depression,judgement criteria, ris k factors, preventive measures, close monitoring, and correct administration. Th e average accuracy was 63.62% (8.2%-96.2%). This finding shows that Chinese healthcare professionals have a poor grasp about the safe use of opioid and n eeds to be improved. Among them, knowledge of the judgement criteria are w ell-mastered, and there are some misunderstandings and lack of knowledge in o ther dimensions.

OIRD is caused by opioid overdose. Some disease factors can increase the risk of OIRD, including lung diseases such as COPD or obstructive sleep apn

oea syndrome[19] , diabetes[20], heart disease[21], and kidney or liver dysfunction[22]. The results for this survey item 3 (correct rate 95.9%) and item 7 (correct rate 93.8%) show that healthcare professionals have a good grasp of this information.

In addition, factors related to combined medication cannot be ignored. The guidelines suggest that the simultaneous use of central inhibitory drugs and opioid can increase the risk of respiratory depression[10], including anticonvulsants and benzodiazepines[23]. The results for research item 9 (correct rate 84%) and item 5 (correct rate 68%) show that healthcare professionals do not have a good grasp of this information. In particular, for the item, "The simultaneous use of benzodiazepines and opioid can increase the risk of respiratory depression", the accuracy was only 68%. Yu Wenhua etal[15]conducted a survey of cancer pain knowledge and attitudes among 505 oncology nurses and found that "whether benzodiazepines have analgesic effects and whether they can be used as routine analgesic drugs in combination with analgesics". The accuracy among healthcare professionals was 36.3%. There was a general misunderstanding among healthcare professionals that benzodiazepines can be used in combination with analgesics for analgesia, but they ignore the risk of increased respiratory depression. In pain treatment, although it may be beneficial to use benzodiazepines in cancer pain patients with anxiety, it is not recommended for routine pain treatment.

It is worth noting that item 1 (correct response rate 51.9%), 4 (correct response rate 52.1%) and 15 (correct response rate 24.8%), which examined the relationship between opioid use time and respiratory depression. The results show that healthcare professionals generally believe that the longer the use of opioid is, the more likely they are to develop respiratory depression. However, this situation was not the case. TJC[18]pointed out that patients who use opioid for the first time or who restart after stopping are at higher risk of respiratory depression. In treatment of chronic cancer pain, the existence of such misunderstandings by healthcare professionals limits the use of opioid or increases the dose for pain patients, resulting in poor pain control.

OIRD has predictable risk factors and risk groups. It is very important to use correct preventive measures. This study shows that healthcare professionals comprehensively evaluate the current use of analgesics and other drugs before issuing a medical order, and have a good grasp of information about cautious titration and dosage.However what is worrying is that item 1 shows that 17.4% of healthcare professionals agree that "patients should be encouraged to endure pain and minimize the use of opioid." In particular, item 8 examines the healthcare professionals's consideration of respiratory depression in a patient's near-death analgesia. The results showed that 60.6% of healthcare professionals believed "for patients who are dying with pain, the amount of opioid should be minimized to avoid respiratory depression", and the results are worrying. Bonnie Freeman mentioned in her book "Compassionate Person-Centered Care for the dying"[24] that progressive loss of consciousness is a manifestation of the death p

rocess, not a side effect of opioid, especially those who have been tolerant of opioid. It is inhuman for patients in the near-death stage whose death is in dis tress and unable to die with dignity because of fear of accelerated death.

Item 12 and 18 show that postoperative patients are prone to respiratory d epression, which requires healthcare professionals to monitor the degree of seda tion. However, only 8.2% of healthcare professionals understand that "the most important predictor of respiratory depression in patients who receiving opioid th erapy is the sedation level." Most healthcare professionals do not know that th e sedation level can be quantitatively assessed and can predict the occurrence of respiratory depression. In addition, the results of item 18 shows that only 1 7.3% of healthcare professionals understand that for patients inhaling oxygen, fi ngertip oxygen saturation monitoring cannot detect respiratory depression early. Jon S Thompson etal[25] conducted a prospective study in 211 patients to under stand the timing of adverse reactions to opioid. The results showed that opioid-induced sedation usually occurs between awareness and respiratory depression, before respiratory depression appears. Close monitoring is very important. The "Guidelines on Monitoring for Opioid-induced Sedation and Respiratory Depress ion" developed by ASPMN pointed out[10] that the sedation level is a sensitive indicator for predicting respiratory depression, and nurses should monitor and e valuate patients. For patients taking oxygen, fingertipp blood oxygen saturation monitoring cannot detect respiratory depression early. Because[10,26] fingertip bloo d oxygen saturation is an alternative oxygenation measurement method and can not measure ventilation, the ability to identify respiratory depression is limited. It also needs to be determined in conjunction with capnography.

Once OIRD occurs, it may be life-threatening, and it is very important for healthcare professionals to master correct administration. Item 19 uses a case t o investigate whether healthcare professionals can take correctly respond with measures based on the sedation level. The results showed that the correct respo nse rate was only 49.3%. Item 20 examines how healthcare professionals corre ctly rescue the patient when OIRD occurs. Conventional treatment methods, suc h as the use of naloxone, are well-mastered, but only 45.3% of healthcare prof essionals know "whether to give high-concentration oxygen inhalation." High-co ncentration oxygen inhalation will cause a hypoxia reflex to stimulate respirati on to disappear, thereby increasing respiratory depression, leading to carbon dio xide retention, and even respiratory arrest[27]. The "Practice Guidelines for the P revention, Detection, and Management of Respiratory Depression Associated wit h Neuraxial Opioid Administration" developed by the American Association of Anesthesiologists recommends that[10] patients with altered levels of consciousne ss, respiratory depression or hypoxemia should be given routine oxygen at low flow that continues until the patient is conscious and has no respiratory depres sion or hypoxemia.

A single factor analysis of the knowledge of Chinese healthcare profession als shows that healthcare professionals in different regions have different knowl edge of OIRD. The knowledge of healthcare professionals in the central and w

estern regions is better than that of the northeastern region. Considering that fi ndings on the one hand, the sample size from the central and western regions included is less than that of the northeast region, and the smaller sample size cannot fully reflect the overall situation. On the other hand, medical institutions and technology in these areas have advantages. There are many cancer patient s and many opportunities for healthcare professionals to participate in the mana gement and practice of OIRD. The results show that doctors' knowledge of OI RD is better than that of nurses, which is similar to the survey results from Wenhua Yu[15] and KimM-h[28] on cancer pain knowledge. This finding may be because domestic cancer pain diagnosis and treatment is dominated by doctors, and the organizational model with nurses as the main body is still in a the pr eliminary exploration and development stage, and there are fewer opportunities for nurses to receive training. The knowledge of oncology healthcare profession als is better than that of non-oncology healthcare professionals,and the knowled ge of healthcare professionals with more clinical experience and experience in managing cancer pain patients is higher than that of healthcare professionals wi th less experiences and a lack of management experience with cancer pain pati ents. This finding suggests that the experience of healthcare professionals partic ipating in clinical practice can improve their knowledge of OIRD.

Further multiple linear regression analysis showed differences in profession s and regions, suggesting that in the future, relevant training programs should f ocus on nurses, especially nurse with insufficient clinical practice experience, to promote their professional role in improving opioid safety.

Limitations

Convenience sampling was used in this study, and the healthcare professio nals adopted the principle of voluntary participation. The sample distribution ac ross the country is uneven. In the future, a cluster sampling method should be used to make the results more representative.

Conclusion

Opioid safety is the focus of medical work. Respiratory depression is a se rious adverse reaction to opioid. Once it occurs, it is life-threatening. Healthcar e professionals play an important role in the prevention of OIRD. However, m ost healthcare professionals in China lack this knowledge. Developing targeted t raining programs, exploring feasible and effective training methods, and improvi ng the relevant knowledge and skills of healthcare professionals to improve the safety of opioid use, has become an important and urgent task.

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Nil.

Conflicts of interest

There are no conflicts of interest.

Tables

Table 1: Description of Chinese healthcare professionals' sociodemographic characteristics and factors associated with knowledge of OIRD (n=900)

Item	N/Mean (%)	Correct rate	*t/F*	*P*	PHT
Profession					
Physician	112（12.4）	68.57±8.53	4.578	＜0.001**	——
Nurse	788（87.6）	63.98±10.13			
Region					
Eastern region(a)	429（47.7）	66.26±9.46	23.728	＜0.001**	a、b、c＞d
Midland(b)	131（14.6）	66.60±9.97			
Western region(c)	131（14.6）	64.58±9.73			
Northeast region(d)	209（23.2）	59.71±9.98			
Hospital level					
Level 1(a)	6（0.7）	62.50±8.22	20.940	＜0.001**	c＞b
Level 2(b)	255（28.3）	61.20±9.58			
Level 3(c)	639（71）	65.90±9.58			
Hospital type					
General hospital	515（64.3）	66.20±9.31	5.793	＜0.001**	——
Specialized hospital	385（35.7）	62.34±10.63			
Department type					
General department	321（35.7）	63.05±10.64	3.331	＜0.001**	——
Specialized department	579（64.3）	65.37±9.63			
Education level					
High school degree(a)	5（0.6）	63.00±5.70	12.421	＜0.001**	d＞c＞b
Associate degrees(b)	162（18.0）	61.57±9.63			
Bachelor degree(c)	654（72.7）	64.66±9.79			
Master degree or above(d)	79（8.8）	69.81±11.28			
Years of clinical experience					
＜5year(a)	206（22.9）	64.10±10.62	6.716	＜0.001**	b＜a＜c
5-10year(b)	283（31.4）	63.04±9.88			
＞10year(c)	411（45.7）	65.82±9.78			
Experience with cancer pain–related training					
Yes	777（86.3）	64.71±10.03	1.201	0.230	
No	123（13.7）	63.54±10.34			
Cancer pain-related training including respiratory depression					
Yes	725（80.6）	64.88±9.89	2.188	0.113	
No	52（5.8）	62.40±11.70			
Not applicable	123（13.7）	63.54±10.34			
Training time on Opioid-induced Respiratory Depression					
＜30 min	189（21.0）	65.87±9.85	2.347	0.053	
31-60 min	303（33.7）	64.08±9.53			
61-90 min	70（7.8）	63.86±10.26			
＞90 min	163（18.1）	65.64±10.32			
Not applicable	175（19.4）	63.20±10.74			

Frequency of managing patients with chronic cancer pain					
Often（≥5 /month）(a)	486（54.0）	65.31±10.05			
ordinary（2-4 / month）(b)	371（41.2）	63.99±9.70	5.159	＜0.05*	a＞c＞b
Never（0/ month）(c)	43（4.8）	60.70±12.03			

*P＜0.05；**P＜0.001

Table 2: The accuracy of items in the OIRD Knowledge questionnaire

No	Item content (correct answer)	Correct (n)	Accuracy (%)
6	To avoid overdose with opioid, the patient's analgesic medication history and adverse reactions should be evaluated before a medical order is issued, and the skin should be thoroughly examined to rule out the use of fentanyl transdermal patches, implantable pumps, etc.（T）[a]	867	96.2
10	Because excessive sedation precedes respiratory depression caused by opioid, the degree of sedation should be evaluated during the use of opioid painkillers.（T）[a]	865	96.0
3	Patients taking opioid with lung diseases such as COPD or obstructive sleep apnoea syndrome are at increased risk of respiratory depression.（T）[a]	864	95.9
12	The incidence of respiratory depression is highest within 24 hours after opioid analgesia treatment, and monitoring should be strengthened during this period.（T）[a]	859	95.3
2	The criteria for determining respiratory depression caused by opioid include decreased respiratory rate (≤8 breaths/min), decreased blood oxygen saturation (<90%) or increased end-tidal carbon dioxide partial pressure (>50 mmHg).（T）[a]	856	95
7	Patients who use opioid and have diabetes, heart disease, kidney or liver dysfunction, are at increased risk of respiratory depression.（T）[a]	845	93.8
11	For patients who use opioid for the first time or after stopping the drug, use short-acting opioid to start titration from a low dose, and increase the drug dose after no adverse reactions.（T）[a]	837	92.9
9	Anticonvulsants such as gabapentin and opioid can increase the risk of respiratory depression.（T）[a]	757	84.0
16	To prevent respiratory depression caused by opioid overdose in analgesia treatment, which of the following measures is wrong?（A）[b] A. Encourage patients to endure pain and minimize the use of opioid B. For patients who use opioid for the first time or after stopping the drug, use short-acting opioid to start titration from a low dose, and then increase the drug dose after no adverse reactions. C. Even for opioid-tolerant patients to quickly and dramatically increase the dose to avoid D. When it is necessary to switch to another opioid or change the route of administration, should perform an equivalent dose conversion	744	82.6
14	The clinical manifestations of respiratory depression caused by opioid analgesics	686	76.1

	do not include which of the following options?（C）[b] A.Reduced respiratory rate (≤8 breaths/min) and/or reduced tidal volume, tidal breathing B. Needle-point pupils, lethargy, coma, cyanosis, skeletal muscle relaxation, clammy skin C. Tachycardia and hypertension D. In severe cases, apnea, deep coma, circulatory failure, cardiac arrest, death		
5	Sedative drugs, such as benzodiazepines, have analgesic effects and do not increase the risk of respiratory depression.（F）[a]	613	68.0
4	The longer the patient uses opioid, the more they are likely to have respiratory depression.（T）[a]	469	52.1
1	Patients who continue to use opioid analgesia for more than 1 month rarely develop respiratory depression.（T）[a]	468	51.9
19	A 70-year-old patient with gastric cancer and malignant intestinal obstruction was admitted to the hospital with an NRS score of 9-10 for abdominal pain. He was given intravenous morphine treatment and was evaluated 2 hours later. It was found that the patient was frequently drowsy, awakened, and fell asleep during conversation. The following incorrect approach is.（C）[b] A. Close monitoring of respiratory status and sedation level B. Consider reducing the opioid dose 25% -50% C. Stop opioid immediately D. If there are no special contraindications, instruct the patient to take a deep breath every 15-30 minutes	444	49.3
20	A 70-year-old patient with gastric cancer and malignant intestinal obstruction was admitted to the hospital with an NRS score of 9-10 for abdominal pain. He was given continuous morphine injection by PCA. After evaluation 2 hours later, the patient was found to be lethargic, slightly responding to physical stimulation, and breathing less than 8 Times/min, check the pupils with pinpoints. The following approach is incorrect:（B）[b] A. Stop opioid immediately B. High concentration oxygen C. Rescue with naloxone D. Close monitoring of respiratory status and sedation level	408	45.3
8	For patients with pain while dying, the amount of opioid should be minimized to avoid respiratory depression.（F）[a]	355	39.4
13	A patient with persistent cancer pain has been receiving daily opioid analgesics for 2 months. Yesterday the patient was receiving morphine 200 mg/hour intravenously. Today he has been receiving 250 mg/hour intravenously. The likelihood of the patient developing clinically significant respiratory depression in the absence of new comorbidity is:（A）[b] A.＜1% B.1%-10% C.11%-20% D.21%-40%	228	25.3

15	Risk factors that cause opioid-induced respiratory depression do not include:（D）[b] A. Preoperative drunk ASA grade＞□ or general anesthesia time is relatively long B. PCA postoperative analgesia C. Elderly and obese patients D. Taking opioid for a long time	223	24.8
18	The patient was 65 years old and returned to the ward after lung cancer surgery. He was given oxygen inhalation via a nasal catheter and opioid analgesia via PCA. Which of the following monitoring indicators could not detect opioid-induced respiratory depression early?（C）[b] A. Breath rate B. Sedation level C. Fingertip oxygen saturation D. End-tidal carbon dioxide partial pressure	156	17.3
17	The most important predictor of respiratory depression in patients receiving opioid therapy is:（C）[b] A. Breath rate B.Patients reported pain intensity C. Sedation level D.Blood pressure	74	8.2

aThe item is a judgment question. T stands for right and F stands for wrong
bThe item is a single choice

Table 3:Factors associated with the accuracy of the OIRD knowledge questionnaire in multivariate analysis (n=900)

Factors	B	SD	Standardized coefficients	*t*	*P*
Constant	0.762	0.056	—	13.541	0.001**
Profession	-0.41	0.013	-0.134	-3.132	0.002*
Northeast region	-0.050	0.011	-0.212	-4.594	0.000**

R^2=0.121，Adjusted ΔR^2=0.107,F=8.644,P＜0.001

*p < 0.05

**p < 0.001

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