Investigation of the Knowledge, Beliefs, and Practices of ICU Nurses Regarding ICU-Acquired Weakness in Jining Region Hospitals at or Above the Secondary Level and Analysis of Influencing Factors

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Abstract：Objective To understand the current status of ICU nurses' knowledge and beliefs about ICU-acquired weakness (ICU-AW) in secondary and above hospitals in the Jining area, and to analyze its influencing factors, in order to provide a theoretical basis for improving the current status of ICU nurses' ICU-AW knowledge and beliefs in the Jining area, as well as for the subsequent development of ICU-AW training. **Methods** A convenience sampling method was used to select 204 ICU nurses from secondary and above hospitals in Jining City, China in September 2024, and the ICU nurses ICU-AW Knowledge, Belief, and Action questionnaire was used to investigate them.Results ICU nurses' ICU-AW knowledge score was (25.84 ± 8.20); ICU-AW attitude score was (30.08 ± 8.72); The ICU-AW behavior score was (22.02 ± 9.41). A comparison of ICU-AW knowledge scores among ICU nurses with different education levels and titles showed statistically significant differences ($P < 0.05$); ICU-AW attitude scores of ICU nurses with varying ages, education levels, and titles also demonstrated statistically significant differences ($P < 0.05$). **Conclusion** ICU nurses' knowledge and behaviors regarding ICU-AW are at a low level, while their attitudes are at a high level in ICU nurses from level II and above hospitals in the Jining area. This indicates a need for enhanced education and training for ICU nurses in ICU-AW, as well as the promotion of clinical implementation of early ICU-AW prevention.

Keywords：ICU nurse；Intensive Care Unit Acquired Weakness；Jining area；influencing factors

Intensive Care Unit Acquired Weakness (ICU-AW) refers to a clinical syndrome characterized by widespread limb weakness that occurs in critically ill patients during their hospitalization in the ICU, caused by factors not directly related to the disease. It is a common and serious complication in the ICU. The main symptoms include difficulty in weaning off ventilator support, loss of limb mobility, reduced reflex activity, muscle strength weakness, and muscle atrophy. Research shows that the incidence of ICU-AW in critically ill patients is approximately 44% to 59%. ICU-AW has a severe impact on the rehabilitation process of critically ill patients and their quality of life after discharge. The Knowledge, Attitude, and Practice (KAP) theory was proposed by Professor Mayo from Harvard University in 1960. This theoretical model has become widely used in clinical nursing due to its maturity and stability. This study applies the KAP theory model, where 'Knowledge' refers to the knowledge of ICU nurses in secondary hospitals regarding ICU-AW; 'Attitude' refers to the attitudes of ICU nurses in secondary hospitals towards ICU-AW; and 'Practice' refers to the actions taken by ICU nurses in secondary hospitals towards ICU-AW patients under the influence of their existing knowledge and attitudes.

ICU Nurses play a key role as direct caregivers for critically ill patients in preventing and reducing the occurrence of ICU-acquired weakness (ICU-AW) and improving patient recovery and otheraspects. They need to have an in-depth understanding of the prevention strategies, assessment methods, and interventions for ICU-AW. However, according to domestic research findings, ICU nursing staff generally have insufficient awareness of ICU-AW and lack the ability to identify and address ICU-AW issues [7] . This study aims to investigate the

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knowledge, beliefs, and behavioral status of ICU nurses regarding ICU-AW in the Jining area, and analyze the influencing factors to gain a deeper understanding of ICU nurses' awareness level of ICU-AW, providing a reference basis for formulatingeffective and targeted ICU nurse training programs.

1 Subjects and Methods

1.1 Study Subjects

Using a convenience sampling method, in September 2024, 204 ICU nurses from 5 secondary and higher hospitals in the Jining area of Shandong Province were selected as study subjects. According to the sample size calculation principle, sample size = variables × (5-10) × [1 + (10%-15%)]. There are a total of 31 independent variables in this study, resulting in a calculated sample size of 170-356 individuals. Considering limitations such as time and manpower, we plan to collect data from 170 individuals. Taking into account a 20% non-response rate, the sample size is increased by 20% on this basis. That is, 170 × (1 + 20%) = 204 individuals. Therefore, a total of 204 ICU nurses were included. Inclusion criteria: ① Registered nurses engaged in critical care work in the ICU; ② Independently rotating shifts, with more than 1 year of work experience in the ICU; ③ Informed consent and voluntary participation in this study. Exclusion criteria: ① Nurses who are not on duty due to sick leave, personal leave, maternity leave, or external training; ② ICU training nurses or rotating nurses; ③ Nurses who are unable to complete the questionnaire for various reasons. This study was approved by the ethics review committee of the hospital before it began.

1.2 Method

1.2.1 Survey Tools

①General Information Survey Form

Including the age, gender, education level, professional title, employment type, years of work experience, and type of ICU of ICU nurses.

② ICU Nurse ICU-AW Knowledge, Attitude, and Behavior Questionnaire

The ICU Nurse ICU-AW Knowledge, Attitude, and Behavior Questionnaire, developed by Wu Li et al. [8], was used to survey ICU nurses. This questionnaire includes three dimensions: knowledge (15 items), attitude (8 items), and behavior (8 items), totaling 31 items. The knowledge dimension includes subjective knowledge and objective knowledge. Subjective knowledge (items 1-6) has three response options for each item: 'Know', 'Know a little but not exactly', and 'Do not know', scoring 3 points, 2 points, and 1 point respectively; objective knowledge (items 7-15) has three response options: 'Correct', 'Uncertain', and 'Incorrect', scoring 3 points, 2 points, and 1 point respectively. The total score range is 15-45 points. A higher score indicates better knowledge of ICU-AW among ICU nurses. In the attitude dimension, each item has five response options: 'Strongly agree', 'Agree', 'Neutral', 'Disagree', and 'Strongly disagree', scoring 5 points, 4 points, 3 points, 2 points, and 1 point respectively. The total score range is 8-40 points. A higher score indicates a more positive attitude towards ICU-AW among ICU nurses. In the behavior dimension, the response options are: 'Always', 'Yes', 'Generally', 'No', and 'Never', scoring 5 points, 4 points, 3 points, 2 points, and 1 point respectively. The total score range is 8-40 points. A higher score indicates more behaviors implemented by ICU nurses regarding ICU-AW. The Cronbach's α coefficient of this questionnaire is 0.96, the test-retest reliability coefficient is 0.87, and the content validity is 0.92, indicating good reliability and validity.

1. 2.2 Survey Method

This survey was conducted using an online questionnaire format via Questionnaire Star. Before starting the survey, the researchers communicated with the head nurse of the ICU at the surveyed unit to explain the purpose and methods of the study in detail. With their permission, the head nurse of the department was responsible for conducting the survey, sending the Questionnaire Star link to suitable nurses via the WeChat app for completion. Each participant could only fill out the questionnaire once, and all questions in the questionnaire were mandatory. A total of 204 questionnaires were distributed, and 204 were returned. After excluding 6 invalid questionnaires, a final total of 198 valid questionnaires were obtained. The effective recovery rate of the questionnaire was 97.06%.

1.3 StatisticsAnalysis

Data entry and analysis were conducted using SPSS2 6.0 software, with measurement data expressed as (`c ±s) and analyzed using t-tests; count data expressed as rates (%) and analyzed using c 2 tests. Frequencies, composition ratios, means, and standard deviations were used to describe the general information of ICU nurses; scores for ICU nurses' knowledge, attitudes, and behaviors regarding ICU-AW were described using (`c ± s); univariate

analysis of knowledge, beliefs, and behaviors was conducted using t-tests and analysis of variance. A P-value of < 0.05 was considered statistically significant.

2 Results

2.1 General Information of ICU Nurses

Among the 198 ICU nurses surveyed, 46 nurses aged 25 and below accounted for 23.2% of the respondents, 68 nurses aged 26-30 accounted for 34.3%, 58 nurses aged 31-35 accounted for 29.3%, 19 nurses aged 36-40 accounted for 9.6%, and 7 nurses aged over 40 accounted for 3.5%; there were 38 males, accounting for 19.2%,and 160 females, accounting for 80.8%; 125 nurses had a bachelor's degree or higher, accounting for 63.1%, 60 nurses had a college diploma, accounting for 30.3%, and 13 nurses had a secondary vocational education, accounting for 6.6%; 16 nurses held a senior professional title, accounting for 8.1%, 66 nurses held an intermediate professional title, accounting for 33.3%, 72 nurses were junior (teacher) nurses, accounting for 36.4%, and 44 nurses were junior (staff) nurses, accounting for 22.2%. General information about ICU nurses is shown in Table 1.

Table 1 General Information of ICU Nurses

Item	Category	Number of People	Percentage (%)
Hospital Level	Secondary Class A	36	18.2
	Secondary Class B	44	22.2
	Tertiary Grade A	79	39.9
	Level 3, Grade B	39	19.7
Age (years)	≤ 25 years old	46	23.2
	26-30 years old	68	34.3
	31-35 years old	58	29.3
	36-40 years old	19	9.6
	> 40 years old	7	3.5
Gender	Male	38	19.2
	Female	160	80.8
Marital Status	Single	79	39.9
	Married	117	59.1
	Divorced	2	1.0
Education Level	Secondary Vocational School	13	6.6
	Associate degree	60	30.3
	Bachelor's degree or above	125	63.1
Title	Senior	16	8.1
	Intermediate	66	33.3
	Beginner (Teacher)	72	36.4

	Junior (Soldier)	44	22.2
Employment Type	In-house	44	22.2
	Outsourced	154	77.8
The ICU belongs to	comprehensive	139	70.2
	Surgery	9	4.5
	Internal Medicine	47	23.7
	Others	3	1.5
Years of nursing experience	≤ 5 years	86	43.4
	6-10 years	67	33.8
	11-15 years	35	17.7
	16-20 years	5	2.5
	> 20 years	5	2.5

2.2 ICU nurse ICU-AW knowledge, attitude, behavior scores

The total score of the ICU-AW knowledge, attitude, and behavior questionnaire for 198 ICU nurses is (77.94 ± 19.41) points. The score for the knowledge dimension is (25.84 ± 8.20) points, with the highest scoring item being 'How to assess ICU-AW patients' (2.11 ± 0.66) points; the score for the attitude dimension is (30.08 ± 8.72) points, with the highest scoring item being 'Should receive formal ICU-AW care training' (3.90 ± 1.16) points; the score for the behavior dimension is (22.02 ± 9.41) points, with the highest scoring item being 'Assessing patients' ICU-AW in clinical work' (2.89 ± 1.25) points. For a comparison of ICU nurses' knowledge, attitude, and behavior scores regarding ICU-AW, see Table 2-1 and Table 2-2.

Table 2-1 ICU Nurses' Scores on ICU-AW Knowledge, Attitude, and Behavior

Item	Score Range	Minimum Value	Maximum Value	Mean ± Standard Deviation
Knowledge Dimension (15)	14-45	15	45	25.84±8.20
Attitude Dimension (8)	8-40	10	40	30.08±8.72
Behavioral Dimension (8)	8-40	8	40	22.02±9.41
Overall (31)	30-125	35	125	77.94±19.41

Table 2-2 Scores of ICU nurses on ICU-AW knowledge, attitudes, and behaviors

Dimension	Item	Average Score ($\bar{x}$±s)	Item Total Score
Knowledge	The concept of ICU-AW	1.77±0.59	3

	Clinical manifestations of ICU-AW	2.04±0.68	3
	ICU-AWHow toDiagnose	2.09±0.69	3
	How toAssess ICU-AW Patients	2.11±0.66	3
	What are the risk factors for ICU-AW?	1.97±0.68	3
	What are the preventive measures for ICU-AW?	2.00±0.70	3
	ICU-AW is one of the common complications in critically ill patients.	1.54±0.74	3
	The occurrence of ICU-AW in critically ill patients on mechanical ventilation for more than 4 to 7 days can reach 33% to 82%.	1.56±0.71	3
	The diagnosis of ICU-AW mainly relies on the Medical Research Council score (MRC-score) for assessment.	1.65±0.73	3
	The clinical manifestations of ICU-AW patients primarily include difficulty weaning from mechanical ventilation, mild paresis or quadriplegia, reduced reflexes, and muscle atrophy.	1.47±0.71	3
	ICU-AW not only prolongs the length of hospital stay and increases medical costs, but it is also more likely to decrease patients' functional ability and survival rates.	1.46±0.74	3
	Muscle weakness and functional impairment are still very common among ICU survivors one year after discharge.	1.57±0.73	3
	Bradycardia may be an important risk factor for ICU-AW.	1.52±0.75	3
	Early mobilization of ICU patients is the most effective intervention to prevent or mitigate ICU-AW.	1.47±0.74	3
	Standard insulin therapy can reduce the incidence and duration of neuromuscular complications, thereby alleviating ICU-AW.	1.61±0.76	3
Attitude	Knowledge related to one's own ICU-AW needs to meet clinical requirements.	3.57±1.31	5
	ICU nurses should dynamically observe the patient's ICU-AW status	3.85±1.21	5
	Formal ICU-AW care training should be received	3.90±1.16	5
	Nurses should take on the responsibility of assessing ICU-AW care work	3.75±1.12	5
	Early functional exercise is very important for the prevention and recovery of ICU-AW	3.86±1.23	5
	Healthcare personnel should prioritize the prevention of ICU-AW just as they do with other symptoms (such as delirium).	3.85±1.22	5
	It is necessary to educate patients or their families about ICU-AW-related knowledge in clinical practice.	3.70±1.31	5
	The ICU-AW status of critically ill patients should be included in the handover content of clinical work.	3.60±1.26	5
Behavior	Actively pay attention to the patient's ICU-AW status in clinical work	2.80±1.26	5
	Communicate with patients about limb muscle strength in clinical	2.73±1.33	5

work		
Assessment of patients' ICU-AW in clinical practice	2.89±1.25	5
Timely feedback to the department's doctors regarding the patient's muscle strength status	2.63±1.31	5
Provide effective early functional exercise for critically ill patients	2.77±1.24	5
Guide family members to help patients engage in appropriate activities to alleviate symptoms such as physical fatigue	2.67±1.21	5
Timely evaluation of nursing interventions for early patient mobilization	2.73±1.22	5
Accumulation of knowledge related to ICU-AW during work processes	2.80±1.23	5

2.3 Comparison of ICU-AW knowledge, attitudes, and behavior scores among ICU nurses with different characteristics

The results of the one-way ANOVA indicate that there are statistically significant differences in ICU-AW knowledge scores among ICU nurses with different educational backgrounds and titles ($P < 0.05$). Among different age groups of nurses, those over 40 years old had the highest knowledge scores, while nurses aged 26-30 had the lowest. Among different educational groups, nurses with a bachelor's degree or higher had the highest knowledge scores, while those with a secondary vocational education had the lowest.

Comparison of ICU-AW knowledge, attitudes, and behavior scores among ICU nurses with different characteristics see Table 3.

Table 3 Comparison of ICU-AW knowledge, attitudes, and behavior scores among ICU nurses with different characteristics

Item	Category	Knowledge Score ($\bar{x}\pm s$)	Attitude Score ($\bar{x}\pm s$)	Behavior Score ($\bar{x}\pm s$)
	≤25 years old	25.48 ± 10.60	33.59 ± 8.23	21.17 ± 11.55
	26-30 years old	24.62 ± 7.44	29.54 ± 8.27	20.78 ± 9.39
Age (years)	31-35 years old	26.72 ± 7.43	28.40 ± 8.96	24.40 ± 7.80
	36-40 years old	27.05 ± 6.30	28.16 ± 10.23	21.42 ± 8.59
	> 40 years old	29.57 ± 7.72	31.29 ± 3.45	21.57 ± 6.75
FValue		1.035	2.828	1.345
Pvalue		0.39	0.026	0.255
Gender	Male	24.42±7.43	30.34±8.09	23.50±9.66
	Female	26.18±8.36	30.01±8.89	21.67±9.35
t value		-1.190	0.209	1.078
Pvalue		0.235	0.835	0.282
	Single	25.15±9.25	31.33±8.34	21.39±10.33
Marital Status	Married	26.30±7.48	29.26±8.96	22.47±8.83
	Divorced	26.50±3.54	28.50±6.36	20.50±4.95
FValue		0.465	1.369	0.333
Pvalue		0.629	0.257	0.717
Education Level	Secondary Vocational	18.77±6.43	23.92±9.09	17.62±11.05

	School			
	Associate degree	26.12±10.17	32.37±8.50	21.30±10.75
	Bachelor's degree or above	26.45±6.93	29.62±8.47	22.82±8.43
FValue		5.443	5.740	2.077
Pvalue		0.005	0.004	0.128
Title	Senior	31.13±12.10	36.19±4.86	24.81±11.52
	Intermediate	26.48±7.91	31.12±8.73	22.45±9.71
	Beginner (Teacher)	26.10±8.15	29.10±8.81	22.46±9.18
	Junior (Soldier)	22.55±5.55	27.89±8.66	19.64±8.30
FValue		5.031	4.374	1.521
Pvalue		0.002	0.005	0.210
The ICU belongs to	comprehensive	25.18 ± 6.92	28.23 ± 8.99	21.77 ± 8.72
	Surgery	26.00 ± 6.71	30.78 ± 6.26	24.44 ± 6.06
	Internal Medicine	28.11 ± 11.28	35.55 ± 5.09	22.40 ± 11.74
	Others	20.67 ± 4.51	27.67 ± 14.57	20.33 ± 10.97
FValue		1.922	9.417	0.287
Pvalue		0.127	0.000	0.835
Years of nursing experience	≤5 years	24.88 ± 8.82	30.73 ± 8.41	21.12 ± 10.10
	6-10 years	25.99 ± 7.84	29.52 ± 9.22	22.39 ± 9.36
	11-15 years	26.77 ± 7.35	28.97 ± 9.53	23.83 ± 8.41
	16-20 years	29.40 ± 7.16	32.80 ± 4.21	18.40 ± 5.68
	> 20 years	30.40 ± 8.08	31.20 ± 4.21	23.60 ± 7.02
FValue		1.033	0.467	0.763
Pvalue		0.392	0.760	0.550

3 Discussion

3.1 The knowledge level of ICU nurses in secondary and above hospitals in Jining regarding ICU-AW is relatively low

The results of this study show that the knowledge score of ICU nurses in secondary and above hospitals in Jining regarding ICU-AW is (25.84 ± 8.20) points (with a total knowledge dimension score range of 14-45 points), indicating that the knowledge level of ICU nurses in this region regarding ICU-AW is low. This is consistent with the findings of Cai Yuqing [9] and Yao Yanrong [10]. From the scores of each item, the highest score was for 'how to assess ICU-AW patients' (2.11±0.66), indicating that ICU nurses are aware of the assessment methods for the frail state of critically ill patients. The lowest scoring item was 'ICU-AW not only prolongs the patient's hospital stay and increases medical costs but is also likely to decrease the patient's functional ability and survival rate' (2.11±0.66), indicating that ICU nurses in this region do not understand the relevant knowledge of ICU-AW and do not pay enough attention to its hazards. This is related to the fact that ICU nurses in this region have not received relevant training on ICU-AW and have insufficient awareness of its potential dangers. Similar results were found in Zhao Xin's study [11]. A comparison of ICU-AW knowledge scores among ICU nurses with different educational backgrounds and titles showed statistically significant differences ($P<0.05$). Since research on ICU-AW in China started relatively late, coupled with the slow pace of updates in nursing textbooks, ICU nurses have had little exposure to relevant content on ICU-AW during their formal education, and they can only learn

this knowledge through professional training after starting work. Nurses with higher education levels have relatively more avenues to acquire knowledge and stronger clinical thinking abilities, thus performing better in knowledge scores than those with lower education levels. Research shows [12] that the promotion of nurses' positions not only helps enhance their professional quality but also promotes the overall improvement of nurses' capabilities. Nurses with senior titles not only accumulate rich clinical practice experience but also possess a more complete knowledge system. Additionally, they participate in doctors' rounds, case discussions, and academic exchanges more frequently than general nurses, providing them with more opportunities to encounter and master new knowledge [13]. Therefore, their knowledge of ICU-AW is better than that of nurses with other titles.

3.2 ICU nurses in level two and above hospitals in Jining have a relatively positive attitude towards ICU-AW.

The results of this study show that the attitude score of ICU nurses in level two and above hospitals in Jining towards ICU-AW is (30.08±8.72) points (the total score range for the attitude dimension is 8-40 points), which is the highest score among the dimensions surveyed.

This indicates that ICU nurses in this region have a relatively positive learning attitude towards ICU-AW, and it also reflects their enthusiasm for receiving training related to ICU-AW. The comparison of ICU-AW attitude scores among ICU nurses of different ages, education levels, and professional titles shows statistically significant differences ($P<0.05$). Among them, the item 'should receive formal ICU-AW nursing training' scored the highest (3.90±1.16), further demonstrating the high demand for systematic training in ICU-AW among ICU nurses in this region. Song Qingna et al. conducted a survey on the cognitive status of ICU nurses regarding ICU-AW in a certain tertiary general hospital, and the results found that ICU nurses have a serious lack of knowledge about ICU-AW, but their attitude is relatively positive, which is basically consistent with the results of this study. ICU nurses hold a positive attitude towards enhancing their own education and improving professional skills such as the identification of ICU-AW, and this self-improvement can lay a good foundation for implementing various measures to prevent ICU-AW in clinical practice. In the theory of knowledge, belief, and action, the transformation of beliefs is a key element. Through independent thinking and reflection on knowledge, individuals can convert what they have learned into their own beliefs and attitudes, which in turn guide and drive personal behavior. Nursing managers should regard the positive beliefs of ICU nurses as a foundation, strengthen the knowledge education of ICU-AW, and promote the formation of good professional behavior habits among nurses.

3.3 ICU nurses in level two and above hospitals in Jining engage in behaviors related to the implementation of ICU-AW less frequently.

The results of this study show that the ICU nurses in level two and above hospitals in Jining have an ICU-AW behavior score of (22.02±9.41) points (with a total score range of 8-40 points). This indicates that ICU nurses in this region implement behaviors related to ICU-AW patients less frequently, which is consistent with the findings of Wang Ying et al. [17]. Among the items, the score for 'timely reporting the patient's muscle strength status to the attending physician' was the lowest (2.63±1.31), indicating that nurses communicate less with doctors regarding patients' ICU-AW, and their level of awareness regarding ICU-AW is insufficient. The analysis suggests that this may be due to the busy nature of ICU work, where nurses may overlook the observation of patients' muscle strength and the intervention or education regarding limb activity. Additionally, nurses' insufficient knowledge and limited understanding of ICU-AW prevent them from fully recognizing its importance, resulting in fewer behavioral changes in nursing practice. Consequently, preventive measures for ICU-AW patients are relatively scarce. For critically ill patients, initiating early mobilization can effectively prevent complications such as ICU-AW and delirium, halt muscle atrophy, enhance physical function, promote lung function recovery, and improve patients' long-term quality of life [18-20]. Therefore, early mobilization for critically ill patients is particularly important. However, in this study, the low intervention behaviors of ICU nurses towards ICU-AW patients suggest that nursing managers should emphasize training for ICU nurses in this area, enhance nurses' awareness of early intervention, and improve their practical capabilities in early intervention.

4 Summary

In summary, the ICU nurses in level two and above hospitals in Jining have low scores in ICU-AW knowledge and behavior, while their attitude scores are relatively high, indicating a positive attitude towards ICU-AW. Management departments should strengthen the education and training of ICU nurses regarding ICU-AW, enhance nurses' professional knowledge and skills, and promote the implementation of various measures to prevent ICU-AW in clinical settings, thereby reducing the incidence of ICU-AW in critically ill patients.

Before the start of this study, a literature review revealed that there is currently a lack of similar research in the Jining area. This study is the first to investigate the awareness level of ICU-AW among ICU nurses in level two and above hospitals in Jining. The data collected has regional characteristics, and the results of the study can provide a reference for the specialized training of ICU nurses in this area, helping to accurately grasp the direction and focus of the training. However, this study has certain limitations in terms of the research area, and the sample size is relatively small. Future research could further expand the sample size to include ICU nurses from other cities and hospitals of different levels, in order to conduct a more extensive and in-depth investigation.

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