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Research Paper

Knowledge, attitudes, and practices (KAP) regarding intra-abdominal pressure monitoring among pediatric intensive care nurses: A cross-sectional study

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ABSTRACT

Objectives: This study aimed to assess the knowledge, attitudes, and practices (KAP) and the training requirements of pediatric intensive care nurses regarding intra-abdominal pressure (IAP) monitoring, in order to provide a reference for the development of relevant training programs and operational procedures in clinical practice.

Methods: This descriptive cross-sectional survey was conducted from April 2023 to June 2023. A convenience sample was created by recruiting 212 pediatric intensive care nurses in eight hospitals in Zhejiang Province. A self-developed IAP monitoring KAP assessment tool was used for evaluation, which included knowledge (14 items), attitude (6 items), and practice (8 items), three dimensions, 28 items.

Results: The overall KAP score was 60.73 ± 8.35; the knowledge score was 7.84 ± 2.35, with a scoring rate of 56.0%; the attitude score was 25.16 ± 3.23, with a scoring rate of 83.9%; and the practice score was 28.44 ± 6.46, with a scoring rate of 69.3%. Nurses wh-o have received IAP monitoring training have higher KAP score, knowledge score and practice score than those who have not received it ($P < 0.05$). Nurses aged ≤ 30 showed better knowledge of IAP monitoring than those aged > 30 ($P < 0.05$). Among the participants, 55.7% of the nurses believed the current knowledge was insufficient to perform IAP measurement effectively. Difficulty in identifying the high-risk population of intra-abdominal hypertension (IAH) (64.6%), unfamiliarity with the operation process of IAP measurement (55.6%), and unreasonable nurse-patient ratio allocation (52.8%) were the main obstacles for nurses to monitor IAP.

Conclusions: Pediatric intensive care nurses have a positive attitude towards IAP monitoring, but the knowledge level and practical behavior still need to be strengthened. In particular, the knowledge of published consensus definitions, measurement techniques, and frequency for IAP monitoring is inadequate. It is necessary to implement tailored IAP monitoring training based on their training needs and potential obstacles to promote the standardization and scientificity of IAP monitoring.

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What is known?

- The intra-abdominal hypertension (IAH) and abdominal compartment syndrome (ACS) are potentially life-threatening complications, most of which are occult in occurrence, with complex and variable clinical symptoms.
- IAH and ACS cannot be recognized without measuring IAP as they have no specific clinical presentation and are defined based on intra-abdominal pressure (IAP).
- The lack of knowledge about IAP monitoring is one of the main reasons for the continuous progression, poor prognosis, and increased mortality of IAH and ACS.

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What is new?

- Pediatric intensive care nurses have a positive attitude towards IAP monitoring, but their knowledge level and practical behaviors still need to be strengthened.
- Difficulty identifying the population at high risk of IAH, unreasonable nurse-patient ratio allocation, and unfamiliarity with the IAP measurement process are the main obstacles for nurses in monitoring IAP.
- Knowledge and skill training related to IAP monitoring will help improve the probability of pediatric intensive care nurses' knowledge adequacy.

1. Introduction

Intra-abdominal pressure (IAP) is the steady-state pressure in the abdominal cavity caused by the interaction between the abdominal wall and internal organs [1]. The baseline IAP values of healthy children are approximately 3–5 mmHg (1 mmHg = 0.133 kPa), 4–10 mmHg in critically ill children, and 7 ± 3 mmHg in children on mechanical ventilation [2]. Intra-abdominal hypertension (IAH) refers to a sustained or recurrent pathological elevation in IAP greater than 10 mmHg, which has been proven to be an independent cause of death in critically ill patients [3,4]. Abdominal compartment syndrome (ACS) is associated with new or worsening organ dysfunction that can be attributed to elevated IAP. It is an increasingly recognized complication in medically and surgically diagnosed critically ill children and is associated with high mortality [5]. The incidence of ACS was reported to be between 0.6% and 4.7% among children in a single-center mixed pediatric intensive care unit (PICU) population [6]. Although ACS is rarely reported, it advances rapidly and is often a highly under recognized fatal disease in the pediatric population. IAH and ACS have a significant impact on multiple organ failure in critically ill patients. The pathophysiological effects of increased IAP are substantial and impact hemodynamic, respiratory, gastrointestinal, neurological, and renal function in critically ill patients [7]. Failure to promptly identify ACS may lead to considerable delays in its diagnosis and medical or surgical intervention, resulting in higher morbidity and mortality. ACS-related mortality has been reported as up to 40%–60% in various studies focusing on children admitted to the PICU [4,8].

Prevention is the most effective way to avoid the deleterious effects of IAH, therefore, identifying risk factors and clinical symptoms of IAH is particularly important to improve intensive care outcomes [9]. Common physiological parameters, such as blood pressure, electrocardiography, heart rate, and hemoglobin saturation, are routinely monitored for each intensive care patient. Measurement of IAP is not a new concept, but only recently has its importance and therapeutic implications in the ICU become more apparent. However, measurements of IAP have rarely been used as a standard monitoring element, conversely, it is common to measure IAP only when a specific risk factor or the presence of IAH is identified. Intermittent IAP measurements through the bladder in symptomatic patients or those with a high clinical suspicion of developing IAH every 4–6 h are widely accepted as routine practice [4]. Many researchers strongly recommend conducting a simple IAP monitoring procedure on patients in the ICU to predict the development of ACS and provide better care [10,11]. Although it is currently not possible to provide clear guidelines for selecting patients who should accept IAP measurements, in addition to conducting IAP measurements for high-risk patients, routine clinical evaluation of IAH signs should become a part of the bedside assessment for each patient in the ICU, allowing for immediate IAP monitoring in cases of any suspicion of IAH development.

Pediatric critical care nurses play an important role in continuously monitoring and identifying subtle and dynamic IAP changes in critically ill children. Previous studies have described the experience of pediatric medical staff, emphasizing the low level of awareness regarding the definition of IAP/IAH/ACS, IAP measurement, and treatment care [12,13]. A survey conducted by Ejike et al. [14] on IAH/ACS awareness showed that only 46.8% of pediatric medical staff knew the correct definition, 24.2% of pediatric healthcare workers had never measured IAP before, and only half (51%) reported managing children with IAH/ACS. Liang et al. [15] conducted a survey on the awareness of IAP/IAH/ACS among medical staff at the pediatric critical care conference and found that only 7.2% of participants (10/138) knew the definition; among people using intravesical pressure measurement, only 57.1% (20/35) know the correct amount of perfusion volume.

Due to changes in treatment paradigms for critically ill patients, the improvement in awareness of IAH/ACS and the development of medical management algorithms regarding IAH/ACS by the World Society of the Abdominal Compartment Syndrome (WSACS) have likely contributed to the decline in the development of ACS [1]. Nevertheless, it remains necessary for critical care nurses to regularly monitor IAP, fully understand the definitions and clinical signs of IAH/ACS, and be proactive in the IAH/ACS management of critical care children. The awareness and implementation status of IAP monitoring among pediatric intensive care nurses in China is still unclear. Whether IAP monitoring has received sufficient attention in pediatric critical care and how to carry out clinical practice still needs further discussion. This study fully investigated pediatric critical care nurses' knowledge, attitudes, and practices (KAP) regarding IAP monitor, identified the influencing factors and training requirements for implementing IAP monitoring, and aimed to provide a reference for the development of relevant training programs and operational procedures in clinical practice.

2. Methods

2.1. Study design and participants

A cross-sectional survey was conducted from April to June 2023 to assess pediatric intensive care nurses' KAP in eight Class-A tertiary hospitals in China regarding IAP measurement, monitoring frequency, timing of monitoring, and the harm of IAH in critically ill children. A convenience sampling method was used to recruit participants.

The inclusion criteria were nurses who had worked in the PICU for more than one year, had obtained a nurse practice qualification certificate, and had given their informed consent. Intern nurses, rotating nurses, and nurses with on-the-job training were excluded. A total of six demographic factors and 28 scale-related dimensions were considered independent variables in the study, assuming an attrition rate of 20%; at least $(6 + 28) \times 5 \times (100\% + 20\%) = 204$ participants were needed [16].

2.2. Instruments

2.2.1. General information questionnaire

A form with six questions regarding sociodemographic and professional characteristics, including age, sex, education level, job title, length of work experience, and training in IAP, was used.

2.2.2. Questionnaire on knowledge, attitudes, and practices of IAP monitoring

A self-report questionnaire measured pediatric critical care nurses' KAP regarding IAP monitoring. Based on the practice guidelines of IAP monitoring in critically ill patients [1,17], the

questionnaire was guided and reviewed by five medical and nursing experts in the field of pediatric critical care and checked by one expert in scale development methodology to ultimately form a questionnaire. A pretest was conducted for understandability, language clarity, and relevance of the questionnaire among 20 pediatric critical care nurses who met the inclusion criteria. Revisions were made to some unclear items (such as measurement frequency) to make them easier for respondents to understand. The Cronbach's α coefficient increased from 0.766 in the pre-survey questionnaire to 0.780 in the formal questionnaire, and the content validity index (CVI) of the knowledge dimension, attitude dimension, and practice dimension were, respectively 0.928, 0.916, 0.916, and the scale-level CVI was 0.920. The questionnaire consisted of three dimensions as follow. 1) the knowledge dimension (14 items): the knowledge items covered aspects about the definition of IAH/ACS, IAP measurement methods, monitoring frequency, and risk factors and hazards of IAH/ACS; 1 point was given for a correct or "Yes" answer, while 0 for a wrong or "No" answer for a total of 14 points. In addition, to fully ascertain the knowledge sources, obstacles for implementing IAP monitoring, and training needs of pediatric critical care nurses, four questions (not included in the scoring) were added, "With your current knowledge, are you capable of performing IAP measurement well?" "What methods would you like to strengthen the training in IAP monitoring?" "Why do you not measure IAP?" "What training content would you like to receive regarding IAP?". 2) attitude dimension (6 items): the items were scored on a 5-point Likert scale, 1–5 points representing "completely disagree" to "completely agree" with a total score of 6–30, including recognition of the implementation effect of IAP measurement and willingness to implement IAP measurement and obtain training. Reverse scoring was used for Item 6, "IAP is unimportant compared to vital signs." 3) practice dimension (8 items): The items were scored on a 5-point Likert scale, 1–5 points represent "never" to "always" with a total score of 8–40, covering aspects about shift handover and abnormal reporting frequency and frequency of correctly measuring IAP (including correct position, reference point, and reading). Calculate the scoring rate by dividing the actual average score by the total score [18].

2.3. Data collection

Data were collected using WJX (www.wjx.cn), a website that allows for the free creation of electronic survey questionnaires. The online survey helped ensure the submitted responses did not contain missing data. The questionnaire took approximately 20 min to complete. The researcher contacted the director of the hospital's nursing department and the PICU head nurse. After obtaining consent, the questionnaire was distributed through the WJX network platform to nurses who met the inclusion criteria. The researcher provided unified training to the staff responsible for distributing the questionnaire, informed them of the purpose and importance of the research, and explained the matters that needed attention during the questionnaire distribution process. A total of 240 questionnaires were distributed in this study, 28 were excluded due to irregular answers.

2.4. Statistical analysis

SPSS software, version 26.0 (IBM Corp., Armonk, NY), was used in the statistical analysis. Descriptive statistics are reported as the means with standard deviations (SDs) for continuous variables and frequencies (percentages) for categorical variables. Potential factors that influence the knowledge, attitude, practice, and KAP scores were identified by independent samples *t*-test and ANOVA to compare KAP scores between different demographic characteristics of the sample. The results with $P < 0.05$ were considered to be statistically significant.

2.5. Ethical consideration

This study was conducted after obtaining ethical approval from the Ethics Committee of the First Affiliated Hospital School of Medicine, Zhejiang University (IIT20220469B-R1). All participants were informed of the purpose of this study and were ensured of the confidentiality of their personal information and their right to withdraw from this study without any consequence.

3. Results

3.1. Characteristics of the participants

A total of 212 pediatric intensive care nurses were considered for the final analysis. The sample size for each hospital participating in the survey ranges from 21 to 51. All participants were registered nurses employed in PICU, and the mean age of the participants was (32.46 ± 6.58) years. Of the participants, 89.1% ($n = 189$) were women, a majority of participants (93.4%) had a bachelor's degree, 96 (45.3%) had a nurse-in-charge job title, 53 (25.0%) had worked in the PICU for >10 years. A total of 119 (56.1%) had never received training in IAP measurement, with a sample size ranging from 10 to 19 in each hospital (with a rate of 27.4%–75.0%). Table 1 reports the participants' characteristics and KAP scores in detail.

3.2. Overall status and influencing factors of the questionnaire

The overall KAP score was 60.73 ± 8.35, and the scores of the three dimensions of knowledge, attitude, and practice were 7.84 ± 2.35, 25.16 ± 3.23 and 28.44 ± 6.46, respectively. In this survey, the scoring rate of the knowledge and practice dimensions of IAP monitoring was 56.0% and 69.3% proportions for those dimensions, respectively, which indicates that pediatric intensive care nurses exhibited moderate knowledge and practice toward IAP monitoring. Nurses who have received IAP monitoring training have better KAP scores than those who have not received it ($P < 0.05$). The group aged ≤30 showed better knowledge of IAP monitoring than those aged >30 ($P < 0.05$).

Regarding the knowledge of IAP monitoring, item K14,"Measures to be taken for children with IAH/ACS," scored the highest, with approximately 82.6% of nurses answering correctly. The scoring rate for item K13,"When is necessary to initiate IAP monitoring" was 81.2%, while item K4,"The ideal position during IAP measurement" was 77.9%. The question with lower scores were "K5: Perfusion volume for intravesical pressure measurement in children," for which only 21.5% responded correctly. Only 30.0% of nurses were aware of the definition of IAH/ACS in children, and only 48.3% of nurses were aware of the risk factors for IAH. The score for IAP monitoring frequency was generally low, and most nurses were unaware of the correct monitoring frequency when IAH occurs (70.0%) and when the risk factors for IAH have been resolved (79.9%). Fifty-nine (55.7%) nurses believed that their current knowledge was not sufficient to perform IAP measurements effectively. For the attitude about IAP monitoring, item A5, "IAP should be included in critical illness scoring systems," scored the highest, indicating that pediatric intensive care nurses have realized the importance of monitoring intra-abdominal pressure in critically ill children. Even so, approximately half of the nurses (45.91%) believed that IAP is unimportant compared to vital signs for critically ill children. Regarding the practice of IAP monitoring, item P1, "I measure IAP when children have any risk factors for IAH/ACS," scored the highest, while P8: "At the handover, I explain the

Table 1
KAP score of paediatric critical care nurses related to IAP monitoring with differing characteristics ($n = 212$).

Characteristics	*n* (%)	Overall score	*t*/*F*	*P*	Knowledge	*t*/*F*	*P*	Attitude	*t*/*F*	*P*	Practice	*t*/*F*	*P*
Sex													
Male	23 (10.8)	60.00 ± 5.92	0.44	0.660	7.83 ± 2.17	0.03	0.977	26.13 ± 2.72	1.53	0.128	26.04 ± 3.93	1.42	0.157
Female	189 (89.2)	60.81 ± 8.61			7.84 ± 2.37			25.04 ± 3.28			27.93 ± 6.19		
Age (years)													
≤30	91 (42.9)	61.00 ± 6.51	0.43	0.666	8.26 ± 2.39	2.24	0.026	25.07 ± 2.96	0.36	0.718	27.68 ± 4.25	0.09	0.922
>30	121 (57.1)	60.52 ± 9.51			7.53 ± 2.27			25.23 ± 3.44			27.75 ± 7.05		
Years employed in PICU													
≤10	159 (75.0)	60.51 ± 8.66	0.65	0.514	7.99 ± 2.42	1.68	0.093	25.08 ± 3.11	0.62	0.533	27.43 ± 5.90	1.24	0.218
>10	53 (25.0)	61.38 ± 7.37			7.37 ± 2.04			25.40 ± 3.61			28.62 ± 6.32		
Educational background													
College degree	9 (4.2)	62.78 ± 6.49	0.40	0.667	7.89 ± 1.90	0.33	0.721	26.33 ± 2.59	0.62	0.540	28.56 ± 4.06	0.14	0.865
Bachelor's degree	198 (93.4)	60.68 ± 8.28			7.86 ± 2.35			25.11 ± 3.24			27.71 ± 6.05		
Master's degree	5 (2.4)	58.80 ± 14.20			7.00 ± 2.91			25.00 ± 4.36			26.80 ± 8.04		
IAP monitoring training													
Yes	93 (43.9)	62.48 ± 7.47	2.75	0.006	8.34 ± 2.29	2.82	0.005	25.13 ± 3.19	0.12	0.901	29.00 ± 5.16	2.78	0.006
No	119 (56.1)	59.35 ± 8.77			7.45 ± 2.32			25.18 ± 3.28			26.72 ± 6.45		
Professional title													
Junior	105 (49.5)	60.27 ± 8.03	0.92	0.399	8.05 ± 2.34	0.90	0.408	24.91 ± 3.07	0.80	0.451	27.30 ± 6.25	1.03	0.359
Intermediate	96 (45.3)	61.48 ± 8.21			7.67 ± 2.41			25.47 ± 3.43			28.33 ± 5.44		
Senior	11 (5.2)	58.55 ± 12.06			7.36 ± 2.01			24.82 ± 3.09			26.36 ± 8.23		

Note: Data are *n* (%) or *Mean* ± *SD*. IAP = intra-abdominal pressure. KAP = knowledge, attitude, and practice.

IAP of the child to the succeeding nurse," scored lowest. Table 2 reports the three items of highest and lowest scores in attitude and practice dimensions.

3.3. Training requirements

The potential obstacles to implement IAP measurement are as follows: difficulty in identifying the population at high risk of IAH (64.6%); unfamiliarity with the process of IAP measurement (55.6%); unreasonable nurse-patient ratio allocation (52.8%) and don't know how to judge the measurement results (51.4%). Regarding training methods, most nurses (84.8%) hoped to receive systematic hospital/department training on knowledge and skills related to IAP measurement, while 58.9% expected to strengthen training in IAP monitoring by attending academic conferences. Concerning the training content, nursing care for IAH/ACS (80.6%), risk factors (77.8%), and hazards of IAH/ACS (73.6%), methods for IAP measuring (71.7%) were the most desired training content for most nurses.

4. Discussion

The occurrence of IAH is often insidious, with complex and variable clinical symptoms [5]. Monitoring IAP has been widely regarded as an important mean of early identification of IAH and effective prevention of further deterioration [19,20]. However, there is a low awareness and knowledge of intensive care physicians and nurses regarding IAP and its management [21]. To better understand the characteristics and weak spots in IAP monitoring among pediatric intensive care nurses, more evidence on the target populations' KAP toward IAP monitoring is needed. This survey showed that although pediatric intensive care nurses have a positive attitude toward IAP monitoring, their knowledge level and practical behavior still need to be strengthened.

This investigation revealed that intensive care nurses have insufficient knowledge of it, including published consensus definitions, deciding which patients should undergo IAP measurement, the ideal frequency for IAP monitoring, and how to measure IAP. We found that the knowledge of the definition of IAH/ACS in critically ill children was low among all nurses who responded. Only 30.0% of nurses were aware of the definition of IAH and ACS in children. In a follow-up survey conducted by Wiegandt et al. [22], only a few neonatal/pediatric intensivists in pediatric hospitals knew the correct WSACS definition of IAH/ACS (4% vs. 6%), although there was an improvement in awareness of IAH/ACS between 2010 and 2016. Consistent with these findings, Newcombe et al. [13] also demonstrated poor awareness in their survey among pediatric nurses regarding knowledge of the definition of ACS, with only 13.2% associating the definition of ACS with organ dysfunction in 2010, which was even lower than that in 2006. There is reason to suspect that the valid definitions provided by the WSACS regarding the correct diagnosis of IAH/ACS and IAP monitoring have not yet reached all pediatric hospitals. Tailored and targeted educational training on IAH/ACS knowledge needs to be provided to pediatric

Table 2
The highest and lowest scores of the three items in attitude, and practice dimensions ($n = 212$).

The three highest scoring items in each dimension	*Mean* ± *SD*	The three lowest scoring items in each dimension	*Mean* ± *SD*
A2: Nurses should have a good understanding of IAP/IAH/ACS.	4.39 ± 0.82	A1: I am interested in IAP.	4.34 ± 0.83
A4: Monitoring IAP can effectively prevent the occurrence of IAH in critically ill children.	4.45 ± 0.79	A3: Hospitals/departments should conduct systematic training on IAP knowledge and skills.	4.36 ± 0.85
A5: IAP should be included in critical illness scoring systems.	4.45 ± 0.80	A6: IAP is unimportant compared to vital signs.*	3.17 ± 1.62
P1: I measure IAP when children have any risk factors for IAH/ACS.	3.77 ± 1.36	P2: I will measure IAP in the supine position in the absence of medical contraindications.	3.34 ± 1.35
P5: When measuring, I strictly adhere to aseptic techniques.	3.62 ± 1.26	P3: Before measuring, I will make sure the bladder or stomach contents are emptied.	3.34 ± 1.24
P6: When measuring, I pay attention to whether the pipeline is unobstructed and handle it in a timely manner.	3.72 ± 1.22	P8: At the handover, I explain the IAP of the child to the succeeding nurse.	3.00 ± 1.43

Note: IAP = intra-abdominal pressure. IAH = intra-abdominal hypertension. ACS = abdominal compartment syndrome. * reverse scoring.

healthcare professionals to increase the attention and awareness of IAH/ACS. Additionally, almost half of respondents measured IAP only when those patients were thought to be likely to develop IAH/ACS, which may miss patients with clinically significant elevations in IAP. Intermittent IAP measurements via the bladder every 4–6 h are widely accepted as routine practice for symptomatic patients or those with a high clinical suspicion of developing IAH/ACS [23,24]. Unfortunately, correct implementation of this technique is difficult, and the correct instillation volume remains a fatal weakness despite the update of the WSACS recommendations in 2013 [1]. In this study, less than a quarter of participants (21.5%) were aware of the correct perfusion volume measured by intravesical abdominal pressure in children, which is consistent with previous results [17,22].

Despite the vast majority of pediatric intensive care nurses had a positive attitude towards IAP monitoring and being aware of the deleterious consequences of IAH/ACS, as well as the importance of IAP monitoring in high-risk populations, the measurement of IAP is infrequently performed, 23.1% of respondents reported that they had never measured IAP. According to a survey conducted by Wiegandt et al. [22] at 328 pediatric hospitals in Germany, the number of clinic IAP measurements nearly doubled in 2016 compared to 2010 (20% vs. 43%). However, a considerable proportion of those measuring IAP reported that they rarely measured IAP (29%), and only 3% of respondents measured IAP regularly. Hunt et al. [25] found that nearly half of the intensive care nurses considered a lack of evidence-based guidelines, policies, procedures, and education support related to IAP monitoring as the primary barriers to monitoring IAP, consistent with Wise et al. [26]. In this study, most respondents (64.6%) reported that the main obstructive factor for implementing IAP monitoring was difficulty identifying the high-risk population of IAH. Although the WSACS has proposed risk factors for IAH/ACS in critically ill adult patients, due to the highly specific disease characteristics between children and adults, as well as the clinical sensitivity, physiological responses, and neurocognitive abilities of children being more specific than those of adults, it is difficult for pediatric health care professionals to determine which population is the target group for IAP measurement [5]. Medical and nursing cooperation can be considered to determine which patients are at greatest risk of IAH based on different disease characteristics or to discuss this during interdisciplinary rounds. Others did not measure IAP because they were either unsure of how to interpret the results (51.4%) or how to measure IAP (55.6%). Additionally, 10.6% of the respondents reported that they did not measure IAP because doing so had no clinical value. This supports the impression that many health care professionals in intensive care remain sceptical about the clinical utility of IAP monitoring [27].

Additionally, most respondents reported unfamiliarity with the procedures for measuring IAP was an important obstacle to implementing IAP monitoring. The results of the practice items also confirmed this viewpoint, and nurses could not perform IAP measurements correctly in clinical practice. According to the theory of knowledge, attitudes, and practices, sufficient knowledge is the foundation for promoting positive behavior, and standardized measurement of IAP is the key to accurately identifying IAH. We also found that IAP monitoring training was associated with a higher probability of knowledge adequacy and practical level. This suggests that hospital managers should regularly adopt diversified teaching methods such as hospital/department training, academic conferences/lectures, operational demonstrations, and simulation exercises to strengthen the training of pediatric critical care nurses. The training content should cover concepts, nursing care, risk factors and hazards of IAH/ACS, methods for IAP measurement, frequency of IAP monitoring, and build a training and evaluation system to optimize and improve training continuously, thus promoting the standardization and scientificity of IAP measurement.

5. Limitations

There are limitations to this study that should be noted and discussed. First, this study was conducted in Zhejiang without additional data from other provinces. It was also limited to using a convenience sampling method; thus, the findings may not represent the opinions of all pediatric intensive care nurses in China. Second, this study employed a cross-sectional self-report survey, so bias was inevitable because of the self-report nature of this investigation. Third, our data did not indicate a homogeneous and fully informed use and understanding of IAP, perhaps because many fundamental questions concerning IAP monitoring frequency and clinical management of IAH/ACS remain partially or wholly unanswered due to a lack of widespread knowledge of basic concepts.

6. Conclusions

IAP measurement is a widely performed monitoring method that is more frequently being used in daily adult ICU practice but has not yet received sufficient attention or widespread application in the PICU. This study found that nurses had a positive attitude towards IAP monitoring, but their knowledge levels and practical behaviors still need to be strengthened. Future initiatives should focus on education, identifying which patients should receive routine monitoring and the ideal frequency of monitoring, and incorporating IAP monitoring into current standard of care protocols and bundles. It is highly recommended that basic knowledge about IAP, IAH, and ACS be propagated among Chinese PICU care providers through local and nationwide education initiatives.

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Data availability statement

The datasets generated during and/or analyzed during the current study are available from the corresponding author upon reasonable request.

CRediT authorship contribution statement

Zhiru Li: Conceptualization, Methodology, Validation, Investigation, Formal analysis, Writing - original draft, Writing - review & editing, Project administration. **Fangyan Lu:** Conceptualization, Methodology, Resources, Validation, Writing - review & editing, Supervision, Project administration. **Yanhong Dai:** Conceptualization, Methodology, Validation, Data curation, Investigation, Formal analysis, Writing - review & editing. **Meijun Sheng:** Conceptualization, Methodology, Validation, Investigation, Formal analysis, Writing - review & editing. **Lidan Su:** Conceptualization, Methodology, Validation, Investigation, Formal analysis, Writing - review & editing. **Ping Yao:** Conceptualization, Methodology, Validation, Investigation, Writing - review & editing. **Huafen Wang:** Conceptualization, Methodology, Resources, Validation, Writing - review & editing, Supervision, Project administration.

Declaration of competing interest

The authors declare that they have no competing interests.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ijnss.2024.05.002.

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