

Effectiveness of an Instructional Program on Nurses' Skills Regarding the International Pediatric Early Warning Scoring System in Mosul Hospitals: A Randomized Controlled Trial

Instructional Program on Nurses' Skills Regarding Pediatric Early Warning

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ABSTRACT

Objective: To evaluate the effectiveness of an instructional program in improving nurses' skills related to the International Pediatric Early Warning Scoring System (IPEWS) in pediatric wards.

Study Design: Randomized controlled trial study

Place and Duration of Study: This study was conducted at the Pediatric Wards of Five Major Governmental Hospitals in Mosul City, Iraq, from 23 February to 23 April 2026.

Methods: Mosul General Hospital, Ibn Al-Atheer Teaching Hospital, and Al-Khansa Teaching Hospital were assigned to the experimental group, while Al-Salam Teaching Hospital and Ibn Sina Teaching Hospital served as the control group.

Methods: Registered nurses were randomly allocated to either an experimental group or a control group. The experimental group received a structured instructional program consisting of four educational sessions on the International Pediatric Early Warning Scoring System (IPEWS), while the control group received routine practice. Nurses' skills were assessed before and after the intervention using a researcher-developed observational questionnaire. Content validity was established by a panel of 20 experts, and reliability was confirmed through a pilot study (Cronbach's $\alpha = 0.810$). Data was analyzed using descriptive statistics, independent and paired *t*-tests, and analysis of variance (ANOVA), with statistical significance set at $p \leq 0.05$.

Results: The instructional program produced a significant improvement in nurses' IPEWS skills in the experimental group. The proportion of nurses with unacceptable skill levels declined from 60.0% at baseline to 0% after the intervention, while 56.7% achieved an excellent level of performance. In contrast, the control group demonstrated minimal changes between pretest and posttest assessments. Statistical analyses confirmed significant improvements in the experimental group ($p \leq 0.05$), whereas no significant differences were observed in the control group.

Conclusion: The structured instructional program was effective in significantly enhancing nurses' skills related to the International Pediatric Early Warning Scoring System. Incorporating similar educational interventions into continuing nursing education programs may strengthen pediatric patient assessment and contribute to improved quality of care.

Key Words: Instructional Program, Nurses' Skills, International Pediatric Early Warning Scoring System, Pediatric Nursing, Educational Intervention, Randomized Controlled Trial.

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INTRODUCTION

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The International Pediatric Early Warning Scoring System (IPEWS) is a standardized assessment tool designed to facilitate the early recognition of clinical deterioration in hospitalized children. It evaluates key physiological parameters, including respiratory rate, heart rate, temperature, circulatory status, and level of consciousness, to generate scores that guide timely clinical intervention and escalation of care.¹

Pediatric Early Warning Systems (PEWS) were developed in response to the limitations of early adult warning tools in pediatric populations. Since their introduction in the early 2000s, PEWS have become widely used to identify children at risk of serious clinical deterioration and to improve patient safety and outcomes.² IPEWS has been implemented across

various pediatric settings, including hospital wards, emergency departments, and intensive care units, demonstrating effectiveness in predicting adverse events such as respiratory failure, cardiac arrest, and unplanned PICU admissions.^{3, 4}

Despite these benefits, successful implementation of IPEWS depends on accurate assessment, score calculation, and appropriate clinical response. Nurses play a critical role in this process, and evidence suggests that educational programs significantly improve nurses' competence, confidence, and adherence to IPEWS protocols.^{5, 6}

In Iraq, the use of standardized pediatric early warning systems remains limited, with patient monitoring often relying on subjective clinical judgment. Furthermore, few studies have examined IPEWS implementation within the Iraqi healthcare context. Therefore, this study aimed to assess nurses' skills regarding IPEWS and evaluate the effectiveness of an instructional program in improving their competencies. The study also explored the relationship between selected demographic characteristics and post-intervention skill levels.⁷

METHODS

Study Design: A randomized controlled trial (RCT) was conducted to evaluate the effectiveness of an instructional program on nurses' skills regarding the International Pediatric Early Warning Scoring System (IPEWS). The study was carried out between 23 February to 23 April 2026, in selected pediatric wards of hospitals in Mosul, Iraq.

Study Setting: The study was conducted in the pediatric wards of five public healthcare institutions in Mosul City, Iraq. Mosul General Hospital, Ibn Al-Atheer Teaching Hospital, and Al-Khansa Teaching Hospital were assigned to the experimental group, while Al-Salam Teaching Hospital and Ibn Sina Teaching Hospital served as the control group. These hospitals provide specialized pediatric healthcare services and employ registered nurses responsible for monitoring and managing hospitalized children.

Participants and Sampling: The study population comprised registered nurses working in pediatric wards of selected hospitals in Mosul, Iraq. Participants were recruited using a probability sampling method and were eligible if they had at least six months of pediatric nursing experience and provided informed consent. Nurses who had previously received formal IPEWS training, were on leave, or were unavailable during data collection were excluded.

Eligible participants were randomly assigned to either an experimental group, which received the IPEWS instructional program, or a control group, which continued routine clinical practice without intervention during the study period.

Instructional Program: The instructional program was developed based on an extensive review of the literature and international IPEWS guidelines to improve nurses' knowledge and skills in pediatric assessment and early recognition of clinical deterioration. The program consisted of four structured sessions covering IPEWS principles, scoring criteria, score interpretation, clinical decision-making, and escalation of care. Educational strategies included lectures, group discussions, case-based learning, practical examples, and the use of printed materials and presentation slides.

Study Instrument: Data were collected using a researcher-developed questionnaire designed to assess nurses' skills regarding the International Pediatric Early Warning System. The questionnaire consisted of two sections:

Section I: Demographic Characteristics: This section included information related to participants' demographic and professional characteristics such as age, gender, educational level, years of nursing experience, years of pediatric nursing experience, and previous participation in training courses.

Section II: Nurses' Skills Related to IPEWS

This section contained items measuring nurses' practical skills concerning the assessment, calculation, interpretation, and application of the International Pediatric Early Warning Scoring System. Responses were scored according to predetermined criteria, with higher scores indicating better skill performance.

Data Collection Procedure: Baseline data were collected from both experimental and control groups before implementation of the instructional program (pretest). Following completion of the educational intervention, posttest assessments were conducted for both groups using the same instrument to evaluate changes in nurses' skills related to IPEWS. Data collection was performed under standardized conditions to ensure consistency and minimize measurement bias.

Statistical Analysis: Data was coded and analyzed using SPSS version 28. Descriptive statistics (frequencies, percentages, means, and standard deviations) summarized participant characteristics and studied variables. Paired-samples t-tests assessed pre-post changes within groups, while independent-samples t-tests compared differences between the experimental and control groups. ANOVA was used to examine associations between demographic characteristics and IPEWS skill scores. Statistical significance was set at $p \leq 0.05$.

RESULTS

Participants' Demographic Characteristics (Table 1).

A total of 60 nurses participated in the study, with 30 assigned to the experimental group and 30 to the control group. Most participants were aged 20–29 years, female, and held a bachelor's degree. The majority had 1–5 years of nursing experience and 1–3

years of pediatric ward experience. None had previously received IPEWS training. No significant

demographic differences were observed between the groups, confirming baseline comparability.

Table No. 1. Distribution of Nurses According to Their Total Skills Regarding the International Pediatric Early Warning Scoring System (IPEWS) at Pretest

Skill Level	Experimental Group F (%)	Control Group F (%)
Failed	10 (33.3)	6 (20.0)
Non-acceptable	18 (60.0)	18 (60.0)
Acceptable	2 (6.7)	5 (16.7)
Good	0 (0.0)	1 (3.3)
Excellent	0 (0.0)	0 (0.0)
Total	30 (100.0)	30 (100.0)

Table No. 2. Distribution of Nurses According to Their Total Skills Regarding the International Pediatric Early Warning Scoring System (IPEWS) at Posttest

Skill Level	Experimental Group F (%)	Control Group F (%)
Failed	0 (0.0)	8 (26.7)
Non-acceptable	0 (0.0)	18 (60.0)
Acceptable	2 (6.7)	2 (6.7)
Good	11 (36.7)	2 (6.7)
Excellent	17 (56.7)	0 (0.0)
Total	30 (100.0)	30 (100.0)

At baseline, nurses in both groups demonstrated inadequate IPEWS skills, with most participants classified as “failed” or “non-acceptable” across all assessment domains. Following the instructional program, the experimental group showed substantial improvement, with over 80% achieving “good” or “excellent” performance levels, whereas the control group showed minimal change and largely remained in the lower performance categories.

Table No.3. Comparison of Pretest and Posttest Total Skill Scores Using Paired Samples t-Test

Group	Comparison	Mean Difference	SD	t-value	P-value	Significance
Experimental Group	Pretest vs. Posttest	-2.967	0.669	-24.300	0.000	Highly Significant
Control Group	Pretest vs. Posttest	0.100	1.125	0.487	0.630	Not Significant

Before the intervention, most nurses in both the experimental (93.3%) and control (80.0%) groups demonstrated failed or non-acceptable IPEWS skill levels. After the instructional program, the experimental group showed marked improvement, with 93.4% achieving good or excellent performance and no participants classified as failed or non-acceptable. In contrast, the control group showed minimal improvement, with 86.7% remaining in the failed or non-acceptable categories.

DISCUSSION

The findings of the present study demonstrate that the instructional program was effective in improving nurses' skills related to the International Pediatric Early Warning Scoring System (IPEWS). The significant improvement observed among nurses in the experimental group, compared with the minimal change in the control group, indicates that structured educational interventions can substantially strengthen pediatric nurses' clinical assessment competencies. These findings are consistent with previous studies demonstrating that educational interventions improve nurses' knowledge, clinical skills, and adherence to

pediatric early warning systems, ultimately facilitating earlier recognition of patient deterioration and improving patient safety.¹²⁻¹⁵

Regarding demographic characteristics, females represented slightly more than half of the participants in both groups, reflecting the gender distribution commonly observed within the nursing workforce. Most participants were aged 20–29 years and had one to five years of clinical experience, indicating a relatively young workforce still developing professional competencies. Similar demographic profiles have been reported among pediatric nurses in previous educational intervention studies.^{8,9} Importantly, none of the participants had previously received formal training on IPEWS. This finding highlights an important educational gap and suggests that standardized pediatric early warning systems have not yet been routinely incorporated into continuing professional development programs in Iraqi hospitals.¹⁰

At baseline, nurses in both the experimental and control groups demonstrated inadequate IPEWS-related skills across all assessment domains, including respiratory assessment, cardiovascular assessment, temperature monitoring, neurological assessment, and theoretical

understanding. These findings suggest that many nurses rely on routine clinical observation rather than standardized evidence-based assessment tools when evaluating hospitalized children. Similar deficiencies have been reported internationally, where insufficient education and lack of standardized pediatric early warning protocols were identified as major barriers to timely recognition of clinical deterioration.^{10,11,16}

A major finding of this study was the substantial improvement observed following participation in the instructional program. After the intervention, most nurses in the experimental group achieved good or excellent performance across all skill domains. This improvement is likely attributable to the structured educational strategy, which integrated theoretical instruction with practical application and reinforced systematic clinical assessment using IPEWS. According to adult learning theory, educational programs that combine active participation, repeated practice, and clinically relevant scenarios facilitate knowledge retention and skill acquisition.²⁰ Previous investigations similarly demonstrated that structured educational interventions significantly improve nurses' competence in pediatric assessment, clinical reasoning, and early detection of patient deterioration.^{12,13,17}

Conversely, nurses in the control group demonstrated minimal improvement throughout the study period. Most participants remained within the failed or non-acceptable performance categories after the posttest assessment. This finding indicates that routine clinical experience alone is insufficient for developing competency in specialized assessment systems such as IPEWS. Similar results have been reported in controlled educational studies, where participants receiving routine practice without structured training showed little or no improvement compared with intervention groups.^{13,18}

The remarkable improvement in total skill scores among nurses in the experimental group further confirms the effectiveness of the instructional program. More than half of the participants achieved an excellent level of performance following the intervention, whereas none of the nurses in the control group reached this level. These findings support previous evidence demonstrating that implementation of Pediatric Early Warning Score education enhances nurses' confidence, assessment accuracy, escalation of care, and responsiveness to clinical deterioration.^{14,16,19}

The paired-samples *t*-test demonstrated highly significant improvements between pretest and posttest scores in the experimental group, whereas no significant changes were observed in the control group. Likewise, ANOVA confirmed a highly significant intervention effect. These statistical findings provide strong evidence that the observed improvements resulted directly from the instructional program rather than from routine clinical exposure or natural

progression over time. Similar outcomes have been consistently reported following structured nursing education programs in pediatric and acute care settings.^{15,20-21}

Analysis of demographic variables revealed only limited associations with nurses' performance. Years of service were significantly associated with baseline skill levels, whereas duration of employment in pediatric wards was associated with post-intervention performance. These findings suggest that accumulated clinical exposure may facilitate the acquisition and application of newly learned competencies. Similar relationships between professional experience and educational outcomes have been reported in previous nursing education research.^{17,18} However, age, sex, and educational qualification were not significantly associated with skill outcomes, indicating that the instructional program was effective regardless of participants' demographic characteristics.

Overall, the present study provides strong evidence that a structured instructional program can substantially improve nurses' competence in applying the International Pediatric Early Warning Scoring System. Integrating standardized IPEWS education into orientation programs, continuing professional development, and routine competency assessments may strengthen nurses' ability to recognize early clinical deterioration, promote timely intervention, and ultimately improve the quality and safety of pediatric healthcare.^{14,16}

CONCLUSION

The study found that pediatric nurses in Mosul hospitals had inadequate baseline IPEWS skills. The instructional program significantly improved nurses' competencies across all assessed domains, while no significant improvement was observed in the control group. These findings confirm the effectiveness of the program in enhancing nurses' ability to assess, interpret, and apply IPEWS. Demographic characteristics had minimal influence on outcomes, suggesting the intervention was effective across different participant groups.

Recommendations: IPEWS should be integrated into routine pediatric nursing practice to support early recognition of clinical deterioration and improve patient safety. Ongoing education through training programs, workshops, and competency assessments is recommended to enhance nurses' knowledge and skills. Incorporating IPEWS into nursing curricula may further strengthen evidence-based pediatric care.

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REFERENCES

- Soeteman M, Kappen TH, Van Engelen M, Marcelis M, Kilsdonk E, van den Heuvel-Eibrink MM, et al. Validation of a modified bedside Pediatric Early Warning System score for detection of clinical deterioration in hospitalized pediatric oncology patients: A prospective cohort study. *Pediatr Blood Cancer* 2023;70(1):e30036.
- Agulnik A, Muniz-Talavera H, Pham LT, Chen Y, Carrillo AK, Cárdenas-Aguirre A, et al. Effect of paediatric early warning systems (PEWS) implementation on clinical deterioration event mortality among children with cancer in resource-limited hospitals in Latin America: A prospective, multicentre cohort study. *Lancet Oncol* 2023; 24(9):978-88.
- Bracken A, Lane S, Siner S, Jones D, Lambert C, Mehta F, et al. Assessing the performance of paediatric early warning scores to predict critical deterioration events in hospitalised children (the DETECT study): A retrospective matched case-control study. *BMC Pediatr* 2025;25:520.
- Reuland C, Shi G, Deatras M, Ang M, Evangelista PPG, Shilkofski N. A qualitative study of barriers and facilitators to Pediatric Early Warning Score (PEWS) implementation in a resource-limited setting. *Front Pediatr* 2023;11:1127752.
- Abed MM, Al-Wily MAS. Evaluation of an instructional program on nurses' knowledge of the pediatric postural drainage guidelines. *J Curr Med Res Opin* 2024;7(4):2363-70.
- Ameen EM, Nasr MH, Bakr ZH. Nurses' performance regarding care of patients with chronic obstructive pulmonary disease on nebulizer therapy. *Egypt J Health Care* 2022;13(4):1114-25.
- Anwar Abd ElAziz M, Eldien Abd Elhafez NG, Youssef Sayed S. Effect of nursing educational program on nurses' knowledge and practices regarding pandemic COVID-19 in isolation unit. *Egypt J Health Care* 2021;12(4):248-63.
- Ernawati E, Ariani SP, Pramunika P. Effectiveness of the Early Warning Score in enhancing nurses' responsiveness to critical patients: A quasi-experimental study in the emergency department. *J Appl Nurs Health* 2025;7(3):442-50.
- Hsiao BH, Tzeng YL, Lee KC, Lu SH, Lin YP. Impact of an educational program on improving nurses' management of fever: An experimental study. *Healthcare (Basel)* 2022;10(6):1135.
- Huang L, Cheng L, Sun Y, Nian F, Tao T, Wu J, et al. Effective evaluation of nursing intervention based on Pediatric Early Warning Score for pediatric patients in the respiratory department. *Evid Based Complement Alternat Med* 2022; 2022:3769851.
- Ismail Mohammed F, Abo Zaid DE, Abdallah Mohamed Amer S. Effect of implementing early warning scoring tools on early detection of abnormal signs in pediatric oncology units. *J Nurs Sci Benha Univ* 2025;6(1):143-64.
- Mohamed Naeem Badr B, Khalil NS, Mukhtar AM. Effect of the National Early Warning Score education program on nurses' knowledge at an emergency hospital. *Med Leg Update* 2021; 21(4):260-68.
- Musa MH, Mirza ZM. Evaluation of short training program on nurses' knowledge and practice regarding vital signs measurement. *Kufa J Nurs Sci* 2024;14(1).
- Olowo S, Luwaga R, Niyonzima V. Effect of an educational intervention on nurses' knowledge regarding use of Modified Early Warning Score in recognition of critical illness. *Open Access Emerg Med* 2025;17:215-32.
- Tinôco JDS, Cossi MS, Fernandes MIDCD, Paiva AC, Lopes MVO, Lira ALBDC. Effect of educational intervention on clinical reasoning skills in nursing: A quasi-experimental study. *Nurse Educ Today* 2021;105:105027.
- Singh G, J JS. Impact of educational interventions on ICU nurses' knowledge regarding early mobility. *Int J Adv Res Nurs* 2025;8(2):952-58.
- Mohamed RA, Alhujaily M, Ahmed FA, Nouh WG, Almowafy AA. Exploring the potential impact of applying web-based training program on nurses' knowledge, skills, and attitudes regarding evidence-based practice: A quasi-experimental study. *PLoS One* 2024;19(2):e0297071.
- Burke S. Pediatric Early Warning Scores (PEWS) Tool Implementation. Zenodo 2021. <https://scholarworks.calstate.edu/downloads/8623j5844>
- Ibrahim RH, Ali SMM, Al Mukhtar SH. An observational study of stress and coping among ICU nurses in Iraq through the lens of the Lazarus and Folkman model. *J Holistic Nursing Science* 2025;12(2):172-82
- Neema RMJA, Ibrahim RH. Learning in Color: A Cross-Sectional Study on Learning Styles, Motivation, and Academic Excellence in Nursing Education. *Nursing Res Pract* 2026;2026(1)
- Alneama RMJ, Ibrahim RH. An integration of Benner's theory to explore the learning styles and motivation as predictors of academic achievement among nursing students in Iraq. *Journal of Holistic Nursing Sci* 2025;12(1):95-104.