

## **Effect of an Evidence Based Nursing Intervention on the Early Detection of Pediatric Warning Signs**

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**Abstract:** postoperative children are at risk for clinical deterioration, and it is vital that this risk will be controlled. For this reason, the purpose of this study was to assess the effect of an evidence based nursing intervention on early detection of pediatric warning signs. The design of this study was quasi experimental design. It was conducted at the surgical department in Menoufia University Hospital and Shebin El-kom Teaching Hospital. For data collection, a convenient sample of 33 nurses was obtained from the previous mentioned settings. Instruments of this study were structured interview questionnaire sheet, The Pediatric Early Warning Signs Likert Scale and Observational checklist for nurse's practice regarding application of warning signs scale for postoperative children. The results of this study showed significant improvement in nurses' knowledge and practices after implementation of educational program regarding pediatric early warning signs . For example, total nurses' knowledge scores about pediatric early warning signs were  $16.15 \pm 1.30$  compared to  $24.88 \pm 1.16$  and  $22.06 \pm 1.98$  on posttest and follow-up tests respectively. It was concluded that implementation of evidence based nursing intervention improved nurses' knowledge and practices regarding pediatric early warning signs for postoperative pediatric patients on posttest than on pre test . Also, it led to early identification of clinical deterioration in postoperative pediatric patients. Therefore, this study recommended that ongoing in-service education programs must be designed and implemented at all pediatric units to improve nurses' knowledge and practices concerning care provided for pediatric patients.

**Keywords:** Evidence Based Nursing Intervention, Early Detection, Pediatric Warning Signs.

### **Introduction**

Postoperative complications place postoperative pediatric patients at high risk for deterioration. Thus, monitoring of patients' vital signs is an important component of postoperative observations undertaken for the early detection of complications that may require an intervention which can prevent further clinical deterioration (Botti and Hunt ,1994). According to 2012 national statistics, in Armenia , 5% of pediatric patients developed postoperative complications, 0.21% of them developed an early postoperative emergency within 48 hours after surgery and the incidence of mortality is 0.24% in the first 24hours following surgery (National Information Analytic Centre , 2012) .

Also, Postoperative healthcare team is under constant pressure to discharge patients quickly. This can lead to vital signs being missed and result in a delay in recovery. However, many postoperative complications can be avoided or identified with correct and thorough monitoring of signs and symptoms. Therefore, all health professionals must continually update their theoretical knowledge and clinical skills; those working in postoperative care can do this by relying less on electronic equipment and developing their ability to combine the use of assessment tools with good observational skills; feeling, listening for abnormal sounds and closely observing

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their patients (National Patient Safety Agency, 2007).

Also, they should rely on the evidence based practice (EBP) which use the best available evidence to support clinical decision making (Beyea, 2000; Higgs, Burn & Jones, 2001; Allen et al, 2002). Ultimately , the value of evidence based nursing is to strengthen the provision of nursing care ,based on research , clinical expertise and the needs of the patient to achieve best possible care delivery. The Pediatric Early Warning Score (PEWS), is an evidence-based tool that provides nurses with a mechanism for early detection of clinical deterioration in the pediatric patients. It also could enhance the safety of hospitalized children (CEMACH, 2008).

Therefore, this study was conducted to monitor and assess postoperative children closely to detect any deterioration in their condition and plan relevant postoperative care or implement appropriate pathway (National Patient Safety Agency,2007; National Institute for Health and Clinical Excellence, 2007).Therefore, this study was conducted to assess the effect of an evidence based nursing intervention on early detection of pediatric warning signs.

### **Purpose**

The purpose of this study is to assess the effect of an evidence based nursing intervention on early detection of pediatric warning signs.

### **Research hypotheses**

- 1) Nurses will have higher level of knowledge about the detection of early Warning Signs in children on post test than on pretest.
- 2) Nurses will have higher level of practice related to detection of early Warning Signs in children on post test than on pretest.

### **Methods**

Research design:

Aquasi-experimental research design was utilized for this study (pre and post test).

Research setting:

This study was conducted at the surgical department in Menoufia University Hospital and Shebin El-kom Teaching Hospital that are available at Menoufia Governorate - Egypt.

Sampling:

A convenient sample of 33 nurses was obtained from the previous mentioned settings (25 nurses from the general surgical ward at Menoufia University Hospital and 8 nurses from the general surgical ward at Shebin El\_kom Teaching Hospital)

Inclusion criteria:

All nurses who provide care for children (at birth-16 years) having surgeries were included in the current study to identify pediatric warning signs to detect the early signs of clinical deterioration.

Instruments: three instruments were utilized for data collection.

**Instrument one: Structured interview questionnaire sheet.** It was designed by the investigator after reviewing related literature. This instrument was divided into two parts:

- **Part one: Social characteristics of studied nurses.** It included questions about age, level of education and duration of experience in pediatric surgical department. .
- **Part two: Nurses knowledge about pediatric early warning signs.** It contained 57 questions about pediatric early warning score (9 questions) behavior (2 questions) , cardiovascular ( 21 questions) respiratory (19 questions) and evidence based nursing intervention

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in early detection of pediatric warning signs (6 questions).

**Scoring system for nurse's knowledge**

Do not know	1
Incomplete knowledge	2
Complete knowledge	3

**Instrument two: The Pediatric Early Warning Signs Likert Scale.** It was developed by Monaghan (2005). It was used for early detection for signs of pediatric patient's deterioration. It contained three domains (behavior, cardiovascular and respiratory). Behavior domain includes two statements, cardiovascular domain included 3 statements and respiratory domain included 5 statements. Scores of each domain ranged from 0 to 3 points. The total score ranged from 0- 9 (2 additional points will be added to the total score in case of receiving quarter-hourly nebulizer or having persistent vomiting following surgery).

**Scoring system for each domain:-**

None	0
Mild	1
Moderate	2
Severe	3

**Total scoring system:-**

None	0-2
Mild	3
Moderate	4
Severe	> 5

**Instrument three: - Observational checklist for nurse's practice regarding application of warning signs scale for postoperative children.** It was developed by the researcher based on review of related literature. It was divided into two parts:

- **Part one: Social characteristics of studied Children.** It included name, age, gender, diagnosis, date of admission and discharge.

- **Part two: Observational checklist for nurses performance regarding recording of warning signs.** It included 9 statements, recording of child name, ward name, date and time of recording, behavior, cardiovascular and respiratory status of the child, calculation of each set of warning signs and all sets of warning signs.

**Scoring system for each observation:-**

Not done	2
Done	1

**Validity**

For validity assurance, four instruments were provided to a jury including one professor of pediatric nursing, two assistant professors of pediatric nursing and two assistant professors in pediatrics. The modifications was done to ascertain their relevance and completeness.

**Reliability**

The reliability of the instruments was done to determine the extent to which items in the questionnaire were related to each other by Cronbachs co-efficiency alpha for the questionnaire (a = 0.97). Pearson correlation co-efficiency was used to test the internal consistency (r=0.02-0.98) for all items of the questionnaire.

**Ethical consideration**

- A verbal consent was obtained from the nurses who will participate in the study.
- An initial interview was done to inform nurses about the purpose, benefits of the study and explain that participation in the study was voluntary and the participants could withdraw from the study at any time without penalty.

**Pilot study**

It was carried out on 4 nurses (10% of

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the sample) after the instruments were developed and before starting the data collection to test the practicability, applicability and to estimate the needed time to fill the instruments. No necessary modifications were done. Therefore, the pilot study was included in the total sample.

### **Procedure**

- 1) Prior to data collection, a written permission to carry out the study was obtained from the director of each setting after submitting an official letter from the Dean of the faculty of Nursing at Menoufia University explaining the purpose of the study and methods of data collection.
- 2) Data collection for this study was conducted for a period of 6 months extending from the 1<sup>st</sup> of November 2016 to the end of April 2017.
- 3) The researcher introduced herself to the nurses who shared in the study , explained the purpose of the study and methods of data collection.
- 4) All pediatric postoperative patient files (from birth -16 years) was reviewed by the researcher for 2 months ago (from the first of September 2016 to the end of October 2016) to assess recording of warning signs in patients files by using instrument three (pretest).
- 5) Then, instrument one was distributed between nurses (pretest). Each data collection interview lasted between 20 to 30 minutes. It took about 2 weeks for all nurses to fulfill the pretest instrument.
- 6) Health education sessions was provided by the researcher to all nurses working in the general surgical wards at Menoufia University Hospital and Shebin El\_kom Teaching Hospital. Nurses received 24 sessions within 6 weeks (4 sessions per week ) . Each session included 2 - 4 nurses. Each nurse received two health education sessions. Each session lasted for 45-

60 minutes. Oral presentations, group discussions, feedbacks were used for health education and explanatory booklets were distributed between nurses. All sessions were conducted in the nursing room in the previously mentioned settings.

**The first session** was about general knowledge related to pediatric early warning signs such as definition of pediatric warning signs, importance of early detection of these warning signs, what are these signs and how to assess these signs.

**The second session** was about evidence based nursing intervention (see appendix...) up on detection of pediatric warning signs and how to use pediatric warning signs scoring system and its algorithm on postoperative children . The researcher provided summary about knowledge provided in the first session. Afterwards, the evidence based nursing intervention was discussed. Direct reinforcement was used in the form of chocolates, pens and staples were distributed between nurses who were able to fulfill data collection sheets.

- 1) The pediatric early warning score sheets and its algorithm (instrument two) were distributed by the researcher between nurses in all postoperative pediatric patient files.
- 2) After one week, reassessment of nurses' knowledge regarding pediatric early warning signs and its scoring system was done by the researcher by using instrument one (post test).
- 3) After 2 months, reassessment of nurses' knowledge regarding pediatric early warning signs and its scoring system was done by the researcher by using instrument one (follow up).
- 4) The researcher reviewed the nurses' recording of pediatric early warning signs that was recorded in all pediatric postoperative patient files (from birth -16 years) for two months

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following the health education by using instrument three (post test).

- 5) A follow up reassessment of nurses' recording of pediatric early warning signs was redone by using instrument three for 2 more months after posttest.

### **Data analysis**

Data was coded and transformed into specially designed form to be suitable for computer entry process. Data was entered and analyzed by using SPSS(Statistical Package for Social Science) statistical package version 22. Graphics were done using Excel program. Quantitative data was expressed as mean & standard deviation ( $X \pm SD$ ) and analyzed by using Friedman test and ANOVA test for comparison between means. Qualitative data was expressed in the form of number and percentage. It was analyzed by using chi-square test ( $\chi^2$ ). Pearson correlation was used for explaining relationship between normally distributed quantitative variable. A statistical significant difference was considered if  $p < 0.05$ . A highly statistical significant difference was considered if  $p < 0.001$ .

### **Results**

**Table (1):** showed mean scores of total nurses' knowledge about pediatric early warning signs on pre, post and follow-up tests. Mean scores on pre intervention were  $16.15 \pm 1.30$  compared to  $24.88 \pm 1.16$  and  $22.06 \pm 1.98$  on posttest and follow-up tests respectively. For this reason, there were highly statistical significant differences between nurses' knowledge at 0.001 % level of statistical significance.

**Table (2):** showed mean scores of total nurses' knowledge about child's behavior postoperatively on pre intervention, post and follow up tests. Mean scores on pre intervention were  $5.30 \pm 0.46$  compared to  $5.87 \pm 0.33$  and  $5.75 \pm 0.43$  on post

and follow-up tests respectively. Therefore, there were highly statistical significant differences between nurses' knowledge at 0.001 % level of statistical significance.

**Table (3):** showed mean scores of total nurses' knowledge about child's cardiovascular status postoperatively on pre, post and follow-up tests. Mean scores on pre intervention were  $44.78 \pm 2.99$  compared to  $57.55 \pm 1.52$  and  $55.36 \pm 4.7$  on post and follow-up tests respectively. There were obvious highly statistical significant differences between nurses' knowledge at 0.001% level of statistical significance.

**Table (4):** showed mean scores of total nurses' knowledge about child's respiratory status postoperatively on pre, post and follow-up tests. Mean scores on pre intervention were  $44.78 \pm 2.99$  compared to  $57.55 \pm 1.52$  and  $55.36 \pm 4.7$  on post and follow-up tests respectively. There were obvious highly statistical significant differences between nurses' knowledge at 0.001% level of statistical significance.

**Table (5):** showed mean scores of total nurses' knowledge about evidence based nursing intervention in early detection of pediatric warning signs postoperatively on pre, post and follow-up tests. Mean scores on pre intervention were  $14.18 \pm 1.38$  compared to  $17.81 \pm 0.39$  and  $17.33 \pm 1.19$  on post and follow-up tests respectively. There were obvious highly statistical significant differences between nurses' knowledge at 0.001% level of statistical significance.

**Figure (1):** showed nurses' recording of pediatric early warning signs on post and follow up tests. As indicated in the figure, nearly the majority of post-operative pediatric patients had no early warning signs on post and follow up tests.

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**Table (1):** Mean scores of total nurses' knowledge about pediatric early warning signs on pre, post and follow-up tests.

<i>Total knowledge</i>	Pre test (n=33)	Post test (n=33)	Follow-up test (n=33)	Friedman test
<b>X ± SD</b>	16.15 ± 1.30	24.88 ± 1.16	22.06 ± 1.98	51.18**

NB: \*\*P <0.001

**Table (2):** Mean scores of total nurses' knowledge about child's behavior postoperatively on pre, post and follow-up tests.

<i>Child's behavior</i>	Pre test (n=33)	Post test (n=33)	Follow-up test (n=33)	ANOVA test
<b>X ± SD</b>	5.30 ± 0.46	5.87 ± 0.33	5.75 ± 0.43	23.15**

NB: \*\*P <0.001

**Table (3):** Mean scores of total nurses' knowledge about child's cardiovascular status postoperatively on pre, post and follow-up tests.

<i>Heart and blood a vessels</i>	Pre test (n=33)	Post test (n=33)	Follow-up test (n=33)	ANOVA test
<b>X ± SD</b>	44.78 ± 2.99	57.55 ± 1.52	55.36 ± 4.7	49.80**

NB: \*\*P <0.001

**Table (4):** Mean scores of total nurses' knowledge about child's respiratory status postoperatively on pre, post and follow-up tests.

<i>Respiration</i>	Pre test (n=33)	Post test (n=33)	Follow-up test (n=33)	Friedman test
<b>X ± SD</b>	39.97 ± 2.95	50.09 ± 1.35	48.36 ± 3.90	43.18**

NB: \*\*P <0.001

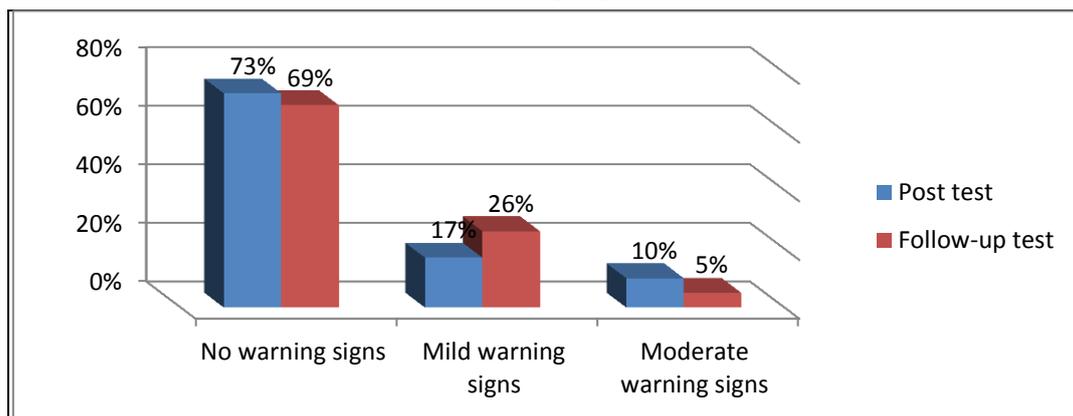
**Table (5):** Mean scores of total nurses' knowledge about evidence based practice in early detection of pediatric warning signs postoperatively on pre, post and follow-up tests.

<i>EBP</i>	Pre test (n=33)	Post test (n=33)	Follow-up test (n=33)	Friedman test
<b>X ± SD</b>	14.18 ± 1.38	17.81 ± 0.39	17.33 ± 1.19	52.92**

NB: \*\*P <0.001

**Figure (1):** Nurses' recording of pediatric early warning signs on post and follow up tests.

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### **Discussion**

In both the United States of America (USA) and the United Kingdom (UK), it has long been recognized that adults and children are dying unnecessarily in hospital. A study conducted in the UK identified 26 to 43% of 957 pediatric deaths were found to be either avoidable or potentially avoidable (Confidential Enquiry into Maternal and Child Health, 2008). A recurrent theme throughout much of the literature on death in children is the failure of health care professionals to recognize the deterioration of severely ill children (Pearson et al., 2011). Therefore, early recognition and management of physiological deterioration is essential (Oliver et al., 2010).

Therefore, the pediatric early warning system tools were developed to alert staff to decline in clinical status of patients using predetermined criteria so that needed intervention and resources (e.g., staff, equipment, medications) are made available to care for children before their health status deteriorates further (Akre et al., 2010).

The current study hypothesized that nurses will have higher level of knowledge about the detection of early warning signs in children on posttest than on pretest. It also hypothesized that nurses will have higher level of practice related to detection of early warning signs in children on post test than on pretest.

In relation to hypothesis one: that nurses will have higher level of knowledge about the detection of early Warning Signs in children on posttest than on pretest, the present study illustrated that regarding nurses' knowledge about pediatric early warning signs (PEWS) on pre intervention, post and follow-up tests, the findings showed that the overall level of nurses' knowledge was significantly improved with the intervention on post and follow-up tests.

However, it could be inferred that the program helped nurses to improve their knowledge about pediatric early warning signs that confronted them during their work in pediatric surgical unit. This could be rationalized as the researcher used different educational strategies (oral presentations, group discussion, feedbacks and explanatory booklets).

This result was in line with Akdogan et al., (2017) who conducted a study about "Assessment of the effectiveness of a ventilator associated pneumonia prevention bundle that contains endotracheal tube with subglottic drainage and cuff pressure monitorization" and Kellough et al., (2017) who conducted a study about "Ventilator care bundles and their effectiveness in reducing the incident of ventilator-associated pneumonia in intensive care units". They found that there was a significant improvement in nurses' compliance with VAP-prevention guidelines

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following education and training. The educational strategies included classroom presentations, class discussion, and videotapes. The participants were provided with hard copies of the presentation's slides.

In addition, these results were also supported by Carolina et al., (2017) who conducted a study about "Long-term benefits of education by emergency care nurses at discharge of patients with a trial fibrillation" illustrated that a nursing intervention in the emergency care setting could contribute to a long-term beneficial impact on health outcomes. The intervention consisted of a basic explanation about the arrhythmia and its treatment, precautions and warning signs, a training to take their pulse and an individualized informational leaflet.

However, this study revealed that the lowest level of nurses' knowledge was on pre test. This finding could be due to the absence of teaching courses about PEWS since their graduation from nursing school and lack of years of experience in pediatric nursing. This result was in line with the National Patient Safety Agency (NSPA, 2010) which conducted a study about "Laparoscopic surgery: failure to recognize post-operative deterioration". It highlighted the failure of the postoperative health care team to recognize post-operative deterioration in patients following laparoscopic procedures until circulatory collapse or septic shock develops.

Also, these results were consistent with the National Confidential Enquiry into Patient Outcome and Death (NCEPOD, 2011) which conducted a study about "Knowing the Risk. A Review of the Peri-Operative Care of Surgical Patients". It mentioned that the postoperative patients whose condition was deteriorating were not always identified and referred for a higher level of care.

In the same context, Healthcare Commission (2009) which conducted a study about "Investigation into Mid Staffordshire NHS Foundation Trust". Commission for

Healthcare Audit and Inspection "mentioned that nurses often failed to recognize the clinical urgency of patient deterioration and the medical staff was criticized for not reviewing patients in a timely manner and not documenting evidence of acceleration to senior colleagues.

In addition, these findings agreed with Keogh (2013) who conducted a study about "Review into the quality of care and treatment provided by 14 hospital trusts in England ". They found that mortality rates were high between ward patients related to failure of performing timely and adequately observations of patients. Therefore, all hospitals should rapidly insert the use of an early warning system and have clinically appropriate acceleration procedures for deteriorating high-risk patients.

On the contrary, Schmid et al., (2007) who conducted research about " failure to rescue: a literature review" and Tait (2010) who conducted a study about "nursing recognition and response to signs of clinical deterioration" illustrated that nurses play a key role in the early identification of pediatric deterioration and subsequent management. As the first responder to a child's deterioration, a nurses' clinical skill, experience, and knowledge will directly influence the patient outcome. This could reflect the importance of providing educational program for nurses regarding pediatric early warning signs.

Also, these results were consistent with Hammond et al., (2013) who conducted a study about "The effect of implementing a modified early warning scoring (MEWS) system on the adequacy of vital sign Documentation". They recommended that the Pediatric Early Warning score (PEWS) should be used to increase the health care team awareness of the child with increased risk for deterioration.

Regarding nurses' knowledge about assessment of child' behavior, respiratory status and cardiopulmonary status postoperatively on pre intervention, post and

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follow-up tests. This study revealed that the lowest level of nurses' knowledge was on pretest. This result was consistent with Pearson (2006) who conducted research about "Why children die: a pilot study. Confidential Enquiry into Maternal and Childhood Death". He found that many nurses and clinical support workers have not been taught a structured approach of assessment. Also, they found that nurses did not use the correct method for performing some clinical assessments such as measuring respiratory rate, capillary refill time and assessing level of consciousness. Also, they found that only 67% of nurses could accurately measure respiratory rate and only 25% of nurses could identify and palpate a pulse rate. This finding might be due to absence of teaching courses about standard clinical assessment since their graduation from nursing school and few years of experience in pediatric nursing.

On the contrary, these results were in consistent with the Royal College of Nursing (2007) in its study "Standards for assessing, measuring and monitoring vital signs in infants, children and young people". It recommended that monitoring of vital signs should not be restricted to respiratory rate. The fundamental assessment should include depth, rhythm, work of breathing, use of accessory muscles and symmetrical chest movement as well as auscultation of lung fields using a stethoscope.

Regarding nurses' knowledge about evidence based nursing intervention in early detection of pediatric warning signs (PEWS tool) postoperatively on pre intervention, post and follow-up tests. The current study illustrated that approximately all nurses did not have any knowledge about evidence based nursing intervention (PEWS tool) in early detection of pediatric warning signs postoperatively on pre intervention. This result was in consistent with Gardner et al., (2006) who conducted a study about "The value of modified early warning score (MEWS) in surgical in-patients: A prospective observational study" in England.

They found that the use of the modified early warning score (MEWS) allowed the staff to identify and detect deteriorating cases early and provided intervention more quickly that prevented delays in treatment.

Regarding nurses' knowledge about evidence based nursing intervention in early detection of pediatric warning signs (PEWS algorithm) on pre intervention, post and follow-up test . The present study showed that the majority of nurses had poor knowledge regarding evidence based nursing intervention in early detection of pediatric warning signs (PEWS algorithm) on pre intervention. This result was inconsistent with Demmel et al., (2010) who conducted a study about "Implementation of the pediatric early warning scoring system on a pediatric hematology/oncology unit". They illustrated that it was critical to use the PEWS scoring tool in order to ensure that staff take immediate action as the score indicated. To address this, researchers have demonstrated that having an interdisciplinary algorithm that defines specific steps to be taken according to a child's early warning score facilitated collaborative clinical decision-making among team members.

Also, this result agreed with Gardner et al., (2006) who conducted a study about " the Value of Modified Early Warning Score (MEWS) in Surgical In-Patients: A Prospective Observational Study " at Addenbrooke's hospital .They found that the Modified Early Warning Score in association with a call-out algorithm was a useful and appropriate risk-management tool that should be implemented for all surgical in-patients.

In relation to hypothesis two: that nurses will have higher level of practice related to detection of early warning signs in children on post test than on pretest, the present study illustrated that regarding nurses' practice related to detection of early warning signs in children (PEWS) on pre intervention, post and follow-up tests , the findings showed that the overall level of nurses' practice was

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significantly improved with the intervention on post and follow-up tests . It was inferred that the program helped nurses to improve their practice regarding recording of pediatric early warning signs.

This result was in line with Wood et al.,(2014) who conducted a study about " Our approach to changing the culture of caring for the acutely unwell patient at a large UK teaching hospital: A service improvement focus on Early Warning Scoring tools ".They reported that quantified improvement has occurred in accurate recording of EWS observations . Sustained improvement has been achieved in performing 4-hourly observations for the first 24 hours of admission with a relative improvement of greater than 50% from 65% to 96%.

Bedsides , these results came in agreement with Nursing and Midwifery Council (2015) which conducted a study about " The Code: Professional standards of practice and behavior for nurses and midwives". It was reported that good record keeping was essential for effective monitoring and interpretation of vital signs and provision of safe and effective care. It was also mentioned that nurses must keep clear and accurate records relevant to their practice.

However, the resent study revealed that on pre intervention none of nurses recorded PEWS. This result was consistent with Oliver et al., (2010) who conducted research about "Observations and monitoring: Routine practices on the ward". They noted a lack of consistency by nurses in recording vital signs, which was essential for successful completion and application of early warning system tools. After providing educational sessions on the Cardiff and Vale Paediatric Early Warning System (C&VPEWS), an observational study was conducted to determine if nursing staff were recording a complete set of vital signs as required. Data collected on 1,000 children revealed that a complete set of observations required for the C&VPEWS to activate successfully were only documented in

52.7% of patients. The authors emphasized that for C&VPEWS implementation to be effective, improved adherence to documenting observations was critical.

Also, these results were in agreement with Hogan (2006) in their study "Why don't nurses monitor the respiratory rates of patients?". He found that lack of completing and recording vital signs a barrier to successful use of early warning system scores. For example, one finding noted that the respiratory rate of children was only completed 50% of the time .

### **Conclusion**

Based on the finding of the present study and the research hypotheses, it concluded that implementation of the evidence based nursing intervention improved nurses' knowledge and practices regarding pediatric early warning signs for postoperative pediatric patients on post and follow-up tests than on pretest. Also, it contributed to early detection of pediatric early warning signs on post and follow-up tests than on pretest.

### **Recommendations**

Based on the findings of the present study, the following recommendations are suggested:

- 1) Ongoing in-service education programs about PEWS should be designed and implemented at all pediatric units to improve nurses' knowledge and practices on the basis of nurse's actual needs.
- 2) PEWS tool should be integrated into the newly devised in-patient pediatric observation chart in all pediatric units.

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