

## Effects of Patient Deterioration Early Warning Score System Simulation Training on Nurses' Performance Self-confidence and Satisfaction

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### Abstract

**Aim:** This study aimed to evaluate effects of patient deterioration early warning score system simulation training on nurses' performance, satisfaction and self-confidence. **Methods:** Convenience sample of 40 nurses working in Dawadmi general hospital and willing to participate in the study was included. A Quasi experimental research design pre/post intervention was used. Four tools were used in his study; First tool used to assess nurses' demographic characteristics & their knowledge regarding early warning score system. Second tool used to assess nurses' practice regarding clinical deterioration to safe patients' life. Third tool nurses' satisfaction scale this tool; used to assess nurses' satisfaction to use early warning score system simulation for deteriorated patient. Fourth tool; nurses' self-confidence scale to assess studied nurses' self-confidence in their abilities to using early warning score system simulation for caring of deteriorated patient. **Results:** Studied nurses' total score of knowledge reflect highly significant differences pre and post intervention. Nurses' practice was improved significantly post the intervention; where half of them take good total score in using Early warning scoring system simulation to care for patients post intervention compared with none of them pre and their satisfaction to use early warning score system was improved significantly post intervention with statistical difference was found. There was highly statistical significant difference regarding nurses' self-confidence pre/post intervention **Conclusion:** nurses' practice was improved significantly post the intervention with statistical difference was found. Also nurses' satisfaction and their self-confidence to use early warning score in caring for deteriorated patients was improved significantly post compared to pre intervention

**Keywords:** *Early warning scoring system, nurses' performance, patients' deterioration & Simulation training*

### Introduction

Patients' clinical deterioration observed by a prolonged period of clinical instability which may occur at any time during a patient's illness (Albutt, et.al. (2020). It is a key contributor to inpatient mortality, and its recognition is often underpinned by contextual factors and practice variances (Padilla & Mayo, 2018). Monitoring patient's vital signs is a basic component of care which enable the identification of deteriorating patients and increasing the likelihood of improving patient outcomes (Joshi et al., 2019). It should be detected early and responded appropriately to maintain patient safety. It is necessary to raise situational awareness of patient deterioration (Park & Kim, 2021). If clinical deterioration is not promptly responded it result in; increased length of hospital stay, raise rate of admission to intensive care unit and increased morbidity & mortality (Albutt, et. al., 2020).

Early Warning Score system (EWSS) based on routine measurement of patients' physiological vital signs, if it is outside the expected range it indicates the patient may be deteriorating (Albutt, et. al., 2020). It is a bedside tool developed for early identification of physiological deterioration by establishing numerical values of physiological parameters. It is an instrument for measuring changes or deterioration in Patients'; respiratory rate, oxygen saturation, temperature, blood pressure, pulse/heart rate, patients' response and conscious level. EWSS has been recommended to be applied in all hospitals for saving patients' life (Damayanti et al., 2019). These tools are clinical prediction models which identify the likelihood of patients deteriorating, which is often defined as death or admission to the intensive care unit (Gerry et al., 2020). The EWSS is a simple and easy to use tool at the bedside, which may be of

help in recognizing patients with potential for acute deterioration may be used to timely initiate adequate treatment upon recognition, which may influence the clinical outcomes positively (Alam et al., 2014). This tool toughed through a simulated patient experience is useful to prevent unrecognized deterioration (Warren, et. al., 2021)

Identification of early signs of patients' deterioration is important to reduce mortality, avoidable morbidity, and decrease length of hospital stay which consequently decrease health care costs. Nurses constitute the first line who have greater contact and most of time stay with the patient (Damayanti et al., 2019). They are expected to have skills which enabling them to assess precisely severity of deterioration (Javed, et. al., 2018). They play a central role in implementing an EWSS (Fox & Elliott, 2015). Simulation with EWSS has a positive effect on nurses' ability to recognize, respond & manage clinical deterioration (Orique and Phillips, 2018). Implementation of EWSS simulation increased nurses' technical skills to manage deteriorated patients which raise their feelings of confidence to use EWSS to manage deteriorated patient, empower nurses and improve patient outcomes (Sridhar et al., 2020). Simulation with EWSS can be used as one of the training methods to increase nurses' knowledge and practice and raise nurses satisfaction in caring for deteriorated patients with EWSS and improve their self-confidence in their ability to use EWSS in caring for deteriorated patients (Damayanti et al., 2019).

### Significance of the study

Early detection and prevention of patients' clinical deterioration is a key aspect and first line of a patient's assessment. Nurses are expected to have practical skills enabling them to assess precisely the severity of deterioration for providing early effective intervention which prevent patients' deterioration. A barrier to early recognizing and effectively managing of patients' clinical deterioration signs can raise incidence of patients' bad prognosis finally they may lose their life (Warren et al., 2021). Early detection of manifestation which indicate patients deterioration improve nurses abilities to practice recommended intervention which improve patients outcomes and, raise nurses' self-confidence in their abilities to use EWSS and their satisfaction for using EWSS (Sridhar et al., 2020). So this study aimed to evaluate effects of Patient deterioration early warning score system training on nurses' performance, self-confidence and satisfaction.

### Aim of the study:

This study aimed to evaluate effects of patient deterioration early warning score system simulation

training on nurses' performance, satisfaction and self-confidence.

### Specific objectives:

1. Evaluate effects of intervention on nurses' knowledge regarding Early warning score system.
2. Evaluate effects of intervention on nurses' practice regarding using early warning score system.
3. Evaluate nurses' satisfaction to use early warning score system early warning score system to care for deteriorated patients.
4. Evaluate nurses' satisfaction to use early warning score system early warning score system to care for deteriorated patients.

### Research hypothesis:

1. Nurses' total knowledge score about early warning scoring system is expected to be improved significantly after the intervention.
2. Nurses' practice using early warning scoring system is expected to be improved significantly after the intervention.
3. Nurses' satisfactions regarding using early warning scoring system will be is expected to be improved significantly after the intervention.
4. Nurses' self-confidence regarding their abilities to use early warning scoring system is expected to be improved significantly after the intervention.

## Subjects and Methods

### Research design:

A Quasi experimental research design was used (one group pre/post design).

### Setting:

Nursing educational office of Dawadmi general hospital, Dawadmi, Saudi Arabia.

### Subjects:

Convenience sampling of 40 nurses working in the previously mentioned setting. Inclusion criteria; Only nurses' whom were willing to participate in the study, attend all intervention sessions and complete the questionnaire sheet were included in this study. Exclusion criteria; nurses' who was unwilling to participate in the study, nurses' who not complete the questionnaire sheet or who exposed to similar intervention excluded from the study criteria. Data collected through July–September 2021 according nurses free time and post arrangement with nursing educational office.

### Tools of data collection

Structure questionnaire sheet was developed by researcher post reviewing related literature which has 4 tools:

**Tool I:** A structured questionnaire sheet (It used pre and after the intervention) was developed by researchers after reviewing the related literature. It involved two parts as the following:

1. **Demographic characteristics for nurses include** age, gender, educational level, department, and years of experience.
2. **A predesigned questionnaire** (It used pre and after the intervention). It composed of 5 questions to assess nurses' knowledge regarding EWSS as (EWSS meaning & component, meaning of patients clinical deterioration, clinical signs of patients' deterioration and patients' management). A correct answer give one score while, incorrect answer give zero score. The nurses' knowledge level was categorized as follows: Good level if nurses' total score more than 75%, fair level if nurses' total score of 60-75% but if nurses' total score less 60 % it means poor knowledge level.

**Tool II:** Patient deterioration Early Warning Score System Observational Checklist. It was developed by the researchers in the light of relevant literature review to assess nurses' practice for clinical deterioration to safe patients' life and avoid deterioration complications; it include 7 items (recognize manifestation of deterioration, accurately assess deterioration, notify patients' deterioration, provide emergency care for deteriorated patients, assess patients prognosis, evaluate patients prognosis and notify patients prognosis). Scoring system of nurses' practice: Good practice total score; if studied nurses' demonstrate 90% or more correct practice, satisfactory practice if subjects' practice 60 -< 90% correct practice of total practice but if total practice less than 60% it mean unsatisfactory practice (It used pre and after the intervention).

**Tool III:** Nurses' satisfaction scale: It was developed by the researchers after reviewing the related literatures to assess nurses' satisfaction to use (EWSS) simulation for deteriorated patient through 8 items (It used pre and after the intervention).

**Tool IV:** Nurses' self-confidence scale: It was developed by the researchers after reviewing the related literatures to assess studied nurses' self-confidence in their abilities to use EWSS for caring of deteriorated patient through 3 items (It used pre and after the intervention).

#### **Methods.**

##### **Validity and reliability:**

Content validity was assessed, its' clarity & simplicity and validity was checked by a panel of five experts was invited to review the tools from medical parasitology & epidemiology, psychiatric & mental health nursing who reviewed its clearness, relevance, applicability, comprehensiveness, understanding and easiness for implementation and based on their views modification was applied.

Reliability of the questionnaire sheet was estimated by using cronbach's alpha reliability test showed a positive significance with 0.78 for structured

questionnaire sheet, 0.866 for nurses' satisfaction scale and 0.924 for nurses' self-confidence scale.

##### **Ethical considerations:**

An ethical approval was obtained from by Shaqra University Research Ethics Committee, Shaqra, Saudi Arabia. ERC\_SU\_2021012 at 19-7-1442 (3/3/2021). Saudi Arabia. Confidentially and Privacy of all information was maintained for all subjects and information used for the research purpose only. All subjects signed official consent before participation in the study, researcher instruct them that participation is voluntary and they have the right to get out from the study at any time without explaining their cause. Approval for conducting the study was taken from nursing education office of Dawadmi general hospital, Dawadmi governorate, Saudi Arabia. Privacy of subjects was considered during all stages of data collection.

##### **Pilot study:**

Pilot study was carried out on 4 nurses (10%). It aimed to test the clarity, feasibility and applicability of the study tools also it helped to estimate the required time to fulfill the sheet. Necessary modifications were done by exclusion of some items and consequently they were excluded from the main study.

##### **Patients' deterioration early warning scoring system simulation intervention:**

- It was developed by the researchers based on the results of the pilot study to satisfy the nurses' need and fulfill the study aim. Intervention aimed to; improve nurses' knowledge regarding early warning score system , improve nurses' practice to use early warning score system to care for deteriorated patients and raise nurses' satisfaction to use early warning score system to care for deteriorated patients.

##### **Phases of the intervention:**

- 1) **Assessment phase:** Through this phase the researchers assess subjects' knowledge regarding meaning of patients' clinical deterioration, suspected causes, early manifestation of clinical deterioration, barriers for providing effective care to deteriorating patients' & how to solve this barriers, indicators of patients potential deterioration, most common patients initial complaints, soft signs indicate patients' deterioration, caring for deteriorating patients, meaning of early warning score system, aim of using of early warning score system, importance& component and how to provide care to deteriorated patient through applying early warning scoring system to save patients life.
- 2) **Planning phase:**

- According to subjects' need and the study aim. Intervention was developed to cover knowledge

regarding; meaning of patients' clinical deterioration, suspected causes, whom patients may exposed to clinical deterioration & early manifestations of clinical deterioration, why deterioration not recognized or managed effectively, indicators of patients potential deterioration, most common patients initial complaints, soft signs indicate patients' deterioration, caring for deteriorating patients, meaning of early warning score system, component and how to apply early warning scoring system to save patients life. Practice part; concerned with simulation through videos about; manifestation, stages of patients' deterioration, signs of deterioration, interpretation of patient abnormalities, how to organize patient s' problems according to its priorities, how to state desired outcome, simulation through video regarding management of deteriorated patient and how to evaluate patients' improvement.

- Clinical situation which indicate patients' deterioration was assigned for each subject and they instructed to solve it through using early warning scoring system and their solution for the clinical situation were evaluated by the researchers. assess patients' deterioration, recognizes patients' signs of deterioration, interprets patient abnormalities, organize patient s' problems according to its priorities, state desired outcome, implement action to achieve

outcome goals and how to evaluate patients' improvement.

- 3) **Implementation phase:** Data was collected during July–September 2021. The intervention was discussed in 6 sessions and each session was 50 minutes. Nurses were met each Monday from 1.30 – 2.20 pm according to their free time at meeting room of nursing educational office; 1<sup>st</sup> session for discussing study aim, pre-test format and informed consent format, 2<sup>nd</sup> & 3<sup>rd</sup> sessions used for discussing all theoretical parts of the intervention, 4<sup>th</sup> and 5<sup>th</sup> sessions for demonstrating practical part of the intervention was covered and 6<sup>th</sup> session was used to answer subjects' questions and ending the study.
- 4) **Evaluation phase:** Post- test was conducted at 6<sup>th</sup> session post achieving the study aim to evaluate effect of the intervention on nurses'; knowledge, performance, self-confidence and satisfaction.

#### Statistical analysis:

The collected data were organized, tabulated and statistically analyzed using SPSS version 19. For categorical variable the number and percentage were calculated and differences between subcategories before and after the intervention was tested. Chi square test was used to compare subjects' knowledge, practice, self-confidence and satisfaction level pre and post intervention .The level of significant was adopted at  $p < 0.05$ .

## Results:

**Table (1): Demographic characteristics of studied nurses (N=40)**

Variables	Number	%
<b>Age in years:</b>		
• 20< 30	11	27.5
• 30< 40	19	47.5
• 40 and more	10	25.0
<b>Gender:</b>		
• Male	12	30.0
• Female	28	70.0
<b>Education :</b>		
• Doctorate	1	2.5
• Master	3	7.5
• Diploma	5	12.5
• Bachelor	31	77.5
<b>Years of experience:</b>		
• 1<3 year	12	30.0
• 3<6 years	8	20.0
• 6<10 years	10	25.0
• 10 years and more	10	25.0

Variables	Number	%
<b>Department:</b>		
• ER	3	7.5
• ICU	7	17.5
• Obstetric	4	10.0
• Medical	4	10.0
• Surgical	6	15.0
• Pediatric	6	15.0
• AKU	1	2.5
• Outpatients	5	12.5
• Nursery	2	5.0
• Nursing education.	2	5.0

**Table (2): Distribution of total score of studied nurses' knowledge regarding patient deterioration early warning score system simulation training (pre & post intervention) (n=40)**

Items	Pre - intervention		post - intervention		X <sup>2</sup>	P
	N	%	N	%		
Good	7	17.5	22	55.0	31.55	.000*
Fair	18	45.0	11	27.5		
Poor	15	37.5	7	17.5		

\*Statistically significant differences

**Table (3): Distribution of total score of studied nurses' practice regarding using early warning score system to care for deteriorated patients (pre & post intervention) (N=40)**

Clinical performance	Pre - intervention		Post - intervention		X <sup>2</sup>	P
	N	%	N	%		
Good	0	0.0	20	50.0	40.000	.000*
Satisfactory	20	50	19	47.5		
Unsatisfactory	20	50	1	2.5		

\*Statistically significant differences

**Table (4): Distribution of studied nurses' satisfaction to use EWSS early warning score system (pre & post intervention) (N=40).**

Studied nurses' satisfaction to use EWSS	Pre - intervention		Post - intervention		X <sup>2</sup>	P
	Agree	Not agree	Agree	Not agree		
1. It encouraged me to think.	85.0	15.0	95.0	5.0	2.023	.155
2. It was relevant to my needs.	83.0	17.0	100	0.0	4.835	.028*
3. It increased my self-confident.	87.0	13.0	100	0.0	.447	.504
4. It activated my decision-making skills.	81.0	19.0	100	0.0	.114	.736
5. It activated team rapid response.	82.0	18.0	100	0.0	4.935	.018*
6. It used to safe patients' life.	85.0	15.0	100	0.0	9.925	.027*
7. It provided effective emergency care.	82.0	18.0	100	0.0	11.930	.001*

\*Statistically significant differences

**Table (5): Distribution of studied nurses' self-confidence to use early warning score system (Pre & Post intervention). (N=40)**

Self-confidence to use early EWSS	Pre - intervention			Post - intervention			X <sup>2</sup>	P
	Not confident	Somewhat confident	Moderately confident	Somewhat confident	Moderately confident	Very confident		
- Assess patients' deterioration	18.0	80.0	2.0	15.0	50.0	35.0	35.080	000*
- Identify patients' problems.	15.0	80.0	5.0	15.0	52.5	32.5	30.623	000*
- Manage patients' problems effectively	15.0	78.0	7.0	15.0	52.0	33.0	31.427	000*

\*Statistically significant differences

**Table (1):** Regarding demographic characteristics of studied nurses in table one; about half of them aged from 30< 40years (47.5%), 70% were female , 77.5% had Bachelor degree of nursing and 50 % from them had 6 years and more work experience .

**Table (2):** Reflect statistically significant differences between pre -test, where 55% from studied nurses' had good total score of knowledge level post the intervention compared only with 17.5% pre - intervention.

**Table (3):** Reflect statistically significant differences in studied nurses' total score of practice pre and post the intervention; where half of them post have good score in their total practice using EWSS to care for deteriorated patients compared with none of them pre the pre - intervention.

**Table (4):** Shows statistically significant differences regarding studied nurses' satisfaction to use EWSS pre and post the intervention; where all of them post the intervention reported that EWSS; was relevant to my needs, activated team rapid response, used to safe patients' life and provided effective emergency car at emergency compared to before the intervention with; 83.0%, 82.0%, 85.0% &82.0% for the above mentioned items respectively.

**Table (5):** Reflect statistically significant differences regarding studied nurses' self-confidence to use EWSS before and after intervention; where post -test 35.0% was very confident to use EWSS in assessing patient, 32.5% was very confident to use EWSS in identifying patients' problems and 33% was very confident to use EWSS in managing patients' problems effectively compared with none of the them pre the intervention which reflect effect of intervention before and after intervention.

## Discussion

Using Early Warning Score assists in detection of patients with deterioration and help in identify patients at risk of further deterioration to practice effective care and maintain patients' safety so this study aimed to evaluate effects of patient deterioration early warning scoring system simulation training intervention on Dawadmi general hospital nurses' knowledge and performance. From above results studied nurses' total score of knowledge in table 2 reflect highly significant differences before and after intervention so the first research hypothesis was accepted positively. The current finding supported with **Damayanti, et. al., 2019** who mentioned that; EWSS has been recommended as a tool for early identification of deterioration also; **Connel et. al., 2016** who reported; educational interventions improve learner outcomes when used with medium to high-fidelity simulation regarding, **Warren et. al., 2021**, who found Modified Early

Warning Score tool is useful to prevent unrecognized deterioration and **Elder, 2015** who discover significant improvement in nurses' knowledge after a simulation based educational intervention. Regarding **Javed et. al., 2018** who reported post -test achieved better results in post-tests and found improvement in nurse's knowledge and **Janakaraj, 2020** who found posttest scores showed that nurses' knowledge and understanding about MEWS had significantly increased.

From the above mentioned results; studied nurses' practice was improved significantly post the intervention as clear from table three so the second research hypothesis was accepted positively and nurses' practice using EWSS was improved significantly after the intervention. The current finding supported by **Damayanti, et. al., 2019** who reported simulation by early warning score improve nurses' clinical performance. Regarding **Saab et. al., 2017** review suggests that EWSS educational intervention succeeded in increasing nurses' confidence and clinical performance and **Elder, 2015; who** reported simulation intervention effective in improving nurses' self-confidence level and care provided from them. As clear from **Stayt, et. al., 2015** mentioned simulation based education may be an effective strategy in developing the skills and knowledge required to achieve this clinical competence and **Norris, 2018** who found that clinical simulation is an ideal teaching methodology for early identification and management of patient deterioration and assisted in successful demonstration of patients' rescue competencies and increase self-confidence scores.

In table 4; Nurses ' satisfaction to use early warning score system was improved significantly post the intervention with statistical difference was found which lead to acceptance of third research hypothesis; agreed with this results **Ahmed, et. al, 2019; who** found using simulation scenario improved students' critical thinking and reach their higher satisfaction with highly statistically significant differences was found between study and control groups and **Saied, 2017; who** found satisfaction with simulation was also positively correlated with pediatric nurses' self-confidence. **Stafseth, et. al, 2015; who** reported nurses' described increased confidence in the recognition of deteriorating patients and management of such situations increase their communication ability and raise their satisfaction regarding **Damayanti, et. al., 2019; who** found simulation increase nurses' clinical performance, and raise nurses satisfaction in caring for deteriorated patients, as listed by **Sridhar et. al., 2020; who** declare implementation of EWS scores increased nurses' confidence feelings, satisfaction, empower them and

improve patient outcomes and Saab, et. al., in 2017; who found EWSS programmes in increasing nurses' confidence which consequently improve their satisfaction.

The fourth study hypothesis had been accepted and nurses' self-confidence to use EWSS improved significantly post the intervention as appear in table 5; current finding supported by Hogg & Miller, 2016 whom mentioned that using enhanced form of simulation increase realism and gives medical students greater confidence in recognizing and responding to clinical deterioration also Elder, 2015; who supported the above mentioned results and found a significant improvement in nurse self-confidence after a simulation, regarding Ahmed, et. al., 2019 whom declare that using the simulation scenario improved students' critical thinking and increased their self-confidence with highly statistically significant differences were found between study and control groups. Zohra, Ahmed, et. al., 2018; whom support the above results and found post -test improvement in nurse's knowledge and their self-confidence, also Stafsetha, et.al., 2015 whom declare that nurses described increased confidence in recognition and management of deteriorated patients, also Damayanti, et. al., 2019; who reported use of the EWSS increases subjects' confidence in responding to deterioration and Norris, 2018; who found clinically significant improvement in self-confidence of subjects' post the intervention.

#### Study limitation:

Limitation related to small sample size where studied nurses' were only 40 nurses who willing to participate and complete the study.

#### Conclusion:

Studied nurses' total knowledge score and practice improved significantly post the intervention. Nurses' satisfaction was improved significantly post the intervention with statistical difference and their self-confidence regarding their abilities to use EWSS was improved significantly post the intervention.

#### Recommendations:

- Ongoing comprehensive training for nurses regarding the recognition and management of a deteriorating patient to ensure safe delivery of urgent high quality care for patients life and decrease burden on hospital intensive care units.
- Nurses should be trained carefully to use EWSS for longer time to become completely satisfied about their abilities and efficiently to discover patients' problems efficiency and provide effective care.

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#### Conflict of interest:

The Authors declare that there is no conflict of interest.

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