

Impact of Applying the International Safety Standards Training Program on pediatric Nurses Performance in Safe Surgery

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ABSTRACT

Background: The Joint Commission established National Patient Safety Goals to enhance patient safety by assisting healthcare facilities to address specific areas of concern with related to patient safety. **Aim of the study:** This study aimed to evaluate the impact of applying the international standers of safe surgery on pediatric nurses' performance. **Subjects and Methods:** A quasi-experimental design was used to conduct this study, **settings:** the Surgical Departments and Operating Rooms of the Children's Hospital affiliated to Ain Shams University hospitals in Cairo. **Sample:** A purposive sample of (50) nurses who were working at the previously mentioned setting divided to (37) nurses were working at the Pediatric Surgical Departments and (13) nurses were working at Pediatric Operation Room. **Tools of data collection:** A structured Interviewing Sheet to assess characteristics of the study sample and nurses' knowledgerelated to the international safety standards to ensure safe surgery in pediatric surgical departments and operating rooms, observational Checklist (pre/post), to assess the nurses' performance regarding application of the international safety standards on pediatric nurses' performance and training program about the international safety standards to ensure safe surgery. **Results:** There was high statistically significant difference between the studied nurses regarding total performance about international safety standards to safe surgery throughout the intervention, **Conclusions:** The result of the present study concluded that the majority of the studied sample had good total score of knowledge and competent performance regarding The International Stander of Safe Surgery with high statistically significant difference between the studied nurses regarding total knowledge and performance about international safety standards to safe surgery throughout the intervention(with p value, 0.004 and 0.03, respectively) , so that the Application of The International Stander of Safe Surgery had a Positive Impact on Pediatric NursesPerformance.As a result the current study findings supported the study hypothesis. **Recommendation:** strictadherence for implementing WHO surgical safety checklist to ensure pediatric safe surgery.

Keywords: Safe Surgery-International Safety Standers-Performance

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I. INTRODUCTION

Ensuring children safety in the operating room begins before the child enters the operative suite and includes attention to all applicable types of preventable medical errors (including, for example, medication errors), but surgical errors are unique to this environment. Steps to prevent wrong-site, wrong-person, wrong-procedure errors, or retained foreign objects have been recommended, starting with structured communication between the child and his family, the surgeon(s), nurses and other members of the health care team. Prevention of surgical errors requires the attention of all personnel involved in the pediatrics' care (*Alex et al., 2017*).

The Joint Commission International (JCI) has collected data on reported sentinel events since 1995 with wrong-site surgery consistently ranked as the most frequently cited reason. In 2017, the year for which most recent data are available, there were 116 wrong-site surgery sentinel events reviewed. Although specialty specific statistics are not included on the Joint Commission's no surgical specialty is immune from surgical errors Classic examples in the specialty of pediatric include wrong procedures, such as herniation site (*Joint Commission International {JCI}, 2018*).

The pediatric nurse professional should be dedicated to each child and be immediately present throughout each decided operation (pre, during and post-surgery), and should be responsible for the transport of the child to the post-recovery facility (*Smaggus and Weinerman, 2015*).

The pediatric nurse professional should retain overall responsibility for the child during the recovery period and should be readily available for consultation until the child has made an adequate recovery. If responsibility for care is transferred from one surgical nurse professional to another, a "handover standards" should be followed, during which all relevant information about the child history, medical condition, anesthetic status, and plan should be communicated. If aspects of direct care are delegated before, during, or after surgery, that the person to whom responsibility is delegated is both suitably qualified and conversant with relevant information regarding the child and the type of surgery. Where it is impossible for this standard to be attained and the surgeon or other individual assumes responsibility for that, these arrangements should be reviewed and audited by an appropriately trained pediatric nurse professional (*Canadian Nurse Association {CNA}, 2017*).

WHO Surgical Safety Checklist (SSCS) was developed to decrease errors, adverse event and improve interpersonal communication in surgery, the checklist has gone on to show significant reduction in both mortality and morbidity (*World Health Organization {WHO}, 2016*).

Nursing international standards for safe surgery is used in all international hospitals Also, it is considered one of the most promising and effective advances for defining and improving the quality of care for pediatric surgery (*American Academy of Pediatrics, 2011*).

In addition, the nursing standards about pediatric safe surgery involve international-based guidelines, developed for nurses who care for children in surgical unit that allow the nurse to initiate safe interventions to prevent surgery errors and complications (*Bonnaig et al., 2014*).

Global burden of disease report in 2015 showed that a significant proportion of the disability in the world is due to conditions that are treatable by wrong site surgical intervention. WHO estimated that 11% of the 1.5 billion disability-adjusted lives are due to diseases treatable by surgery. Problems associated with surgical safety are well recognized in developed and developing countries alike. In the developing world, the poor state of infrastructure and equipment, unreliable supplies and quality of medications, shortcomings in organizational

management and infection control, difficulties in the supply and training of nursing staff about the stander of safe surgery (*WHO, 2017*).

Significance of the study:

The analysis of several studies finds that there isn't enough data on deaths due to medical and nursing errors specially for children undergoing surgical intervention, nursing and medical errors from unsafe surgery may be the third leading cause of death. Death certificates don't capture enough information, study finds that it seems that every time researchers estimate how often a nursing who work in surgical units mistake contributes to a hospital child's death, the numbers come out worse. In 2010, WHO, the Office of Inspector General for Health and Human Services said that wrong surgery at surgical department contributed to the deaths of 180,000 childin Middle East region.

While in Egypt, there is no recorder about how many cases died because of unsafe surgery. But the files of the children described many unsafe procedure applied to the children at pediatric surgical unite, when the researcher asked about the causes most of the physician reported that this may be due to the wrong signs, sites, child Identification, that were the responsibility of the nurse in the surgical unit this errors caused due to unsafe surgery included (time in-out).

II. AIM OF THE WORK

This study aimed to evaluate the Impact of Applying the international standards of safe Surgery on pediatric nurses' performance through:

- 1- Assessing knowledge and performance of pediatric nurses regarding applying the international standards of safe Surgery.
- 2- Applying the international standards of safe Surgery for studied nurses.
- 3- Evaluating the impact of applying the international standards of safe Surgery on pediatric nurses' performance.

Research Hypothesis:

This study assumed that:

Application of the international safety standards training program will have a positive impact on pediatric nurses' performance to ensure children safe surgery .

III. SUBJECTS & METHODS

The subjects and methods of the current study discussed under the following four (4) designs:

I. Technical Design.

II. Operational Design.

III. Administrative Design.

IV. Statistical Design.

I. Technical Design

It was included: The research design, setting, subjects and tools for data collection.

Research Design:

A quasi-experimental design was used to conduct this study.

Setting:

This study was conducted at the Surgical Departments and Operating Rooms of the Children's Hospital affiliated to Ain Shams University hospitals in Cairo. The surgical departments consist of two units and one operation room for each unit as the following description:

The first department in the second floor of the children hospital consists of one operating room (it contains 2 partitions for two operations) and one room for pre and post operative cases, which contains 6 beds, in addition to the surgical PICU for post-operative critical cases.

The second department for the one day surgery in the third floor of the Children's hospital consists of one operation room for one surgical case only and two rooms for pre /post-operative children, the first room contains 8 beds and the second one contains two beds.

Subjects:

A purposive sample of (50) nurses who are working at the previously mentioned setting divided to (37) nurses were working at the Pediatric Surgical Departments and (13) nurses were working at Pediatric Operation Room, with the following criteria :

1. Nurses from both genders regardless their age, experiences and qualification.
2. Nurses, who work with the children undergoing of any type of surgery (pre, during, or post)
3. All available children after confirmed decision for surgical intervention regardless the type of surgery.

Tools of data collection

Data were collected through use of the following tools:

First Tool: A structured Interviewing Sheet: (pre/post)

It was designed by the researcher and reviewed by the supervisors, after reviewing the relevant literature. It was written in a simple Arabic language to assess the following parts:

Part I: Characteristics of the study sample

- a. Nurses' characteristics included: Age, sex, position, level of education, years of experiences, and training about stander of safe surgery.
- b. Children's characteristics included: Age, gender, position, level of education, medical and surgical history (diagnosis, type of surgery, past history, and family history)

Part II: This tool used to assess nurses' knowledgerelated to: The international safety standards to ensure safe surgery in pediatric surgical departments and operating rooms (20 Questions) as the following:

1. Definition safety surgical
2. Safety surgical goals
3. Methods of child identification
4. Preoperative assessment
5. Operation consent
6. Nursing role preoperative
7. Nursing role during child transfer to operating room
8. Nursing role in hand over
9. Appropriate time for time out
10. Responsible for time out
11. Items of time out
12. Correct Child
13. Correct Procedure
14. Correct Site
15. Surgical site marker
16. Protect child from leaving any foreign object in the body
17. Surgical counting before peritoneal closure
18. Incident report
19. Nursing role during child transfer from operating room
20. Nursing role immediately postoperative
21. Nursing role during child discharge

Scoring system

According to the responses obtained from nurses, a scoring system was followed to assess the nurse's knowledge each question scored by one for correct answer and each incorrect answer was scored as zero .

Total scoring:

The score of questions were summed-up and the total divided by number of the items, giving a mean score. These scores were converted into a percent score which classified as follows:

- Score from $0 < 85$ referred to poor knowledge
- Score from $85 < 95$ referred to average knowledge
- Score from $95 \leq$ referred to good knowledge .

Second Tool: Observational Checklist (pre/post): It was adopted from (*Joint Commission of International Safety {JCI}, 2017*) and updated by {JCI}, 2018).to assess the nurses' performance regarding

application of the international safety standards on pediatric nurses' performance (13 standards) to ensure safe surgery including:

1. Admission phase to surgical unit.
2. Preoperative care phase.
3. Handover.
4. Child safety during surgery .
5. Child safety during anesthesia preparations.
6. Child identification .
7. Ensuring the right place surgical intervention.
8. Protect child from leaving any foreign object in the body.
9. Surgical counting.
10. Child transferring from OR .
11. Immediate post-operative care.
12. Routine post-operative care.
13. Discharge phase care.

Scoring system:

The right step was scored as one, and the wrong step was scored zero. The score of steps were summed-up and the total divided by number of the steps, giving a mean score. These scores were converted into a percent score was classified as the following:

Total scoring:

-Score from $0 < 95$ referred to incompetent performance.

-Score from $95 \leq 100$ referred to competent performance.

Third Tool: Training program about the international safety standards to ensure safe surgery:

The researcher was established nursing program according to the international safety standards about ensure safe surgery, based on actual needs assessment of the studied sample. Each nurse was assessed twice pre and post implementation of international safety standards to ensure safe surgery using the previously mentioned tools.

II- Operational Design:

Preparatory phase:

This phase included reviewing of literature nurses' knowledge about international standards about safe surgery. This served to develop the study tools for data collection. During this phase, the researcher also visited the selected places to be acquainted with the personnel and the study settings. Development of the tools was under supervisors' guidance and experts' opinions considered.

Face and content validity:

Content validity: It was ascertained by a group (5) of the experts in pediatric nursing and medical fields; to test the content validity by reviewing the tools clarity, relevance, comprehensives, and simplicity; their opinions elicited regarding the format, layout, consistency, accuracy, completeness and minor modifications were done;reliability was tested statistically.

Content reliability: The tool was tested to ensure that an assessment tool produces stable and consistent result overtimes reliability of the study tools used Alpha Cronbach test (0.86).

N : is equal to the number of items and r - the bar is the average inter-item correlation among the items.

Pilot Study

Pilot study carried out on 10% (5 nurses) of nurses were working at the previously mentioned setting to test the applicability of the constructed tools and the clarity of the included questions related international safety surgery standards. The pilot has also served to estimate the time needed for each subject to fill in the questions. According to the results of the pilot, some corrections such as rephrasing and added questions performed as needed. The pilot participants were not included in the main study sample .

Fieldwork

The actual field work of this study was carried out over 6 month's period stated from the beginning of January 2020 till the end of June 2020. The researcher was available in the study setting three days per week in the morning shift. Each nurse was interviewed individually to gather the necessary data of the study. As regards the nurses' practices, it was assessed by the researcher throughout their daily care in the study setting .

The present study was conducted in four phases:

Preparatory phase:

The tool of data collection development: A review of the past and current related literature covering various aspects of international safety surgery, using available books, periodicals, articles and magazines. The objectives were to get acquainted with the research problem to develop the study tools.

Assessment phase:

In this phase, the researcher was used the constructed tools in collecting the data about nurses' knowledge and performance related to international standards about safe surgery (pre-test). The purpose of the study and its expectations were explained by the researchers to the studied nurses before starting interviewing and data gathering.

Planning phase:

After determining objectives of the international standards about safe surgery, the international stander about safe surgery was designed by the researchers in Arabic language in the light of the literature review. It was revised, organized and the content was prepared according to nurses' educational needs.

Implementation phase:

This phase consumed 8 weeks, two days per week to explain international standards about safe surgery. Different methods of teaching were used as group discussion, demonstration and re-demonstration. Suitable media was used such as real posters and booklet.

Evaluation phase:

This phase aimed to evaluate the effect of implementation the international standards about safe surgery. One post-test administrated to the study nurses were immediately performed after completion of the international safety standards training program on pediatric nurse's performance in safe surgery to evaluate the retention of knowledge and practices regarding applying the international safety standards on pediatric nurses' performance to ensure safe surgery.

III. Administrative Design

Approval obtained through on issued letter from the Dean of Faculty of Nursing, Ain Shams University to the Medical and Nursing Directors of the previously mentioned study setting. The letter included the title, aim and the expected outcome of the study to obtain their approval to conduct the study.

Ethical considerations

The research approval obtained from the faculty ethical committee before starting the study. Verbal approval obtained from the nurses before inclusion in the study; a clear and simple explanation given according to their level of understanding, physical and mental readiness. They secured that all the gathered data was confidential and used for research purpose only. The nurses informed that they are allowed to choose to participate or not in the study and they have the right to withdraw from the study at any time.

IV. Statistical Design:

Data collected from the studied sample was revised, coded and entered using PC. Computerized data entry and statistical analysis were fulfilled using the Statistical Package for Social Sciences (SPSS) version 22. Data were presented using descriptive statistics in the form of frequencies, percentages. Chi-square test (2) / Fisher exact test used for comparisons between qualitative variables and correlation coefficient was used to test correlation between variables. The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, the p-value was considered significant as the following:

- P value <0.05 was considered significant.
- P value <0.001 was considered as highly significant.
- P value >0.05 was considered insignificant.

IV. RESULTS

Table (1): Distribution of the studied nurses according to their socio-demographic characteristics (n=50)

Characteristics of nurses	No	%
Age in years		
20<25	4	8
25<30	16	32
30<35	17	34
35<40	10	20
≥40	3	6
Mean ± SD	33.6±4.2	
Gender		
Female	32	64
Male	18	36
Qualification		
Diploma	17	34
Technical nursing institute	28	56
Nursing bachelor	5	10
Years of experience		
1-5	10	20
6-10	17	34
≥11	23	46
Mean ± SD	14.2±3.2	

Table (1) shows that, 34% of the studied nurses their age ranged between 30<35 years with mean 33.6±4.2 Almost two thirds (64%) of the studied nurses were females and more than half (56%) of them were technical institute. Regarding years of experience, the above table illustrates that, 46% of them had more than 11 years of experience.

Figure (1): Distribution of the studied subjects according to their previous training (n=50)



Figure (1) shows that the 65% of the studied nurses didn't attended previous training related to safe surgical procedures.

Figure (2): Distribution of the studied nurses according to their units (n=50)



Figure (2) shows that the 74% of the studied nurses working in pediatric surgical ward and 26% of them working in pediatric OR.

Table (2): Distribution of the characteristics of the studied children (no=50)

Characteristics of children	No	%
Gender		
Male	27	54
Female	23	46
Age \ year		
< 1	3	6
1 <3	8	16
3 <6	7	14

6 <9	12	24
9 <12	9	18
12 <15	5	10
≥15	6	12
Mean ± SD	(7.6±0.4)	
Level of educational		
Nursery school	15	30
Primary school	22	44
Preparatory school	9	18
Secondary school	4	8

Table (2) shows that, 54% of the studied children were boys, 24% of them were in the age group 6 to 9 years old, and 44% of them were in primary school

Table (3): Distribution of the studied nurses regarding total knowledge about the international safety standards to safe surgery throughout the intervention (no=50)

Total Knowledge	Pre		Post		X ²	P Value
	No	%	No	%		
Good	7	14	35	70	11.10	**0.004
Average	33	66	12	24		
Poor	10	20	3	6		

() Highly statistically significant at p <0.01**

Table (3) clarifies that, there is high statistically significant difference between the studied nurses regarding total knowledge about international safety standards to safe surgery throughout the intervention (p<0.01).

Table (4): Distribution of the studied nurses according to their total performance throughout intervention (no= 50)

Items	Pre		Post		X2	P Value
	No	%	No	%		
Competent	19	38	30	60	4.84	*0.03
Not Competent	31	62	20	40		

(*) Statistically significant at $p < 0.05$

Table (4) clarifies that, there was high statistically significant difference between the studied nurses regarding total performance about international safety standards to safe surgery throughout the intervention ($p \leq 0.05$)

V. DISCUSSION

Patient safety is defined as the absence of harm or accidental injury during the provision of health care. Patients' safety culture is an issue for all countries that deliver health services. In recent years, the number of studies about this topic has increased, showing high rates of errors in the healthcare field, and causing reflection and discussion for the implementation of changes in this situation worldwide (*Weiser and Berry, 2013*).

Patient safety goals include, safety of using medications; infection control; implement best practices to surgical site infections; minimize mistakes in surgery; make sure that the correct surgery is done on the correct patient and at the correct place on the patient's body and identify patient safety risks (*Thomas et al., 2014*).

Pediatrics is a specialty which requires the double care for the patients, not only because of the meaningful differences in anatomy, treatment response, possibility of diagnostic procedures than in internal medicine, but also because of the limited communication with the patient, often unable to voice their complaints or precisely describe and locate the symptoms (*Runciman et al., 2011*).

Pediatric surgery evolved from general surgery as its sub-specialty, dealing mostly with congenital malformations, abdominal wall defects, chest wall abnormalities and childhood tumors. Pediatric surgery also differs significantly from adult surgery, mostly in terms of healthcare infrastructure, with lower risk of per-operative death (except congenital cardiac and newborn surgery), however with still high risk of per-operative adverse events (*Oliveira et al., 2018*).

The rates of adverse events are still lower than in adults, but we can't exclude the possibility of post-operative life-threatening events in pediatric surgery. Pediatric nurses the first care provider in hospitals, has crucial role in forming the safety culture. Therefore, their understanding of workplace safety would help in evaluating programs to promote pediatric patient safety culture (*Matlow et al., 2012*).

Determining perceptions of nurses about patient safety culture is also extremely important since it can result in identifying factors threatening pediatric patient safety and estimating the preparation and participation of nurses in promoting pediatric safety (*Patterson et al., 2016*).

Therefore this study aimed to evaluate impact of applying the international safety standards training program on pediatric nurse's performance in safe surgery.

The current study showed that, almost three quarters of them worked in pediatric surgical ward, and more than two thirds of them were females and did not attend previous training programs related to safe surgical procedures, this could be attributed to increased workload. Also more than half of them had technical nursing institute qualification, meanwhile more than one third of them had more than 11 years of experience and their age ranged between (25<30 years old)

This was supported by the study of *Toso et al., (2016)*, who studied "Patient safety culture in hospitals within the nursing perspective " revealed that, the age of more than one third of the studied nurses ranged between (25-30 years old).

But this wasn't in accordance with *Richter, (2017)*, whose study was about " Hospital disaster prepared: Meeting the requirement or preparing for the worst/ pre-hospital and disaster medicine" concluded that, more than half of the studied nurses had diploma as an educational level and three quarters of them were females.

The current study revealed that, more than half of the studied children were boys, one third of them were ranked as the first child in their family. Also more than one third of them had hernia, and less than half of them were in primary school (**table 2 & figures 3 and 4**).

This was in agreement with *Norton and Range, (2019)*, who conducted a study about "Implementing a pediatric surgical safety checklist in the operating room and beyond " showed that, half of the studied children were boys, and one third of the were ranked as the first child in the family.

Operation room nurses play important roles in the surgical team, such as executing care tasks, attending to safety aspects and serving as coordinators. They prepare the pediatric patient for the surgical procedure, such as positioning, performing infection prevention measures, preparing instruments and assisting surgeons (*Aveling et al., 2017*).

The researcher point of view that nurses in surgical units coordinate the lists, communicate with other team members, and monitor progress in the surgical procedures and report to management. Also, they are present, circulating, and have the opportunity to initiate actions if needed. It would also be appropriate to investigate their experiences and knowledge (*Bergs et al., 2015*).

This study has yielded important insight into the Nurses experiences and opinions of patient safety, responsibility, and safety culture.

The current work mentioned that, there was high statistically significant difference between the studied nurses regarding their total knowledge

In the study of (*Broome et al., 2019*), which was about "Nursing performance and Perception by implementing team steps "revealed that, there was high statistically significant difference between the knowledge of the studied nurses concerning methods of child identification pre and post program implementation.

This confirms the importance of applying educational interventions to the surgical nursing staff to improve their knowledge regarding safe surgical culture.

This was approved by the study of *Bleakley et al., (2012)*, which was about “Towards culture change in the operating theatre: Embedding a complex educational intervention to improve teamwork climate “ concluded that, structured interventions for education and training are essential for the medical surgical team specially nursing staff to provide a strong safety culture.

Nursing is present in all stages of the per-operative period, being considered the main team and agent of change for the transformation of the health system, in order to make it safer. In the surgical environment, nurses play a key role in ensuring that best care practices provide patient safety (*Silva, 2017*).

Concerning the studied surgical ward staff nurses total performance regarding the international safety standards to safe surgery, the current study mentioned that, there was a statistically significant difference

This was in accordance with the study of *Duarte et al., (2015)*, which was about “Adverse events and safety in nursing care“, mentioned that, educational interventions improved the performance of the studied nurses for safe surgery with statistically significant difference throughout the intervention.

This was in agreement with *Haynes et al., (2014)*, who conducted a study about “Changes in safety attitude and relationship to decreased postoperative morbidity and mortality” revealed that, there was statistically significant difference regarding the studied nurses performance concerning preoperative care phase, routine post operative care, and discharge phase pre and post structured interventions.

Retained surgical bodies (RSB) are any foreign bodies left inside the patient after the operation and in general, a further procedure is necessary. The consequence of foreign bodies after surgery may manifest in different forms immediately after the operation, months or even years after the surgical procedure (*Pires et al., 2017*).

Surgery is challenging, with the risk of retained surgical bodies increasing particularly with the use of numerous instruments, retractors and surgical sponges. Before every operation instruments are counted by the scrub nurse and as a standard procedure, they are counted at the end of the procedures to ensure that they have all been accounted for, and nothing has been left behind in the patient (*Stawicki et al., 2013*).

The current study revealed that, there was statistically significant difference regarding the studied nurses performance concerning protecting the child from leaving any foreign object in the body throughout intervention.

This was in agreement with the study of *Gibbs et al., (2012)*, which was about “Preventable errors in the operating room: retained foreign bodies after surgery “ concluded that, skilled surgical nurses were the keys to ensure a safe operation and good postoperative outcomes, this raised the importance of educational programs to improve nursing skills.

Continuing education for health team specially nursing staff is critical for patient safety and quality of care. Its importance is to increase nurse performance in the operating room, and to apply measures of risk management and prevention of harm to the patient (*Wegner et al., 2016*).

VI. CONCLUSION & RECOMMENDATIONS

Conclusion

The result of the present study concluded that the majority of the studied sample had good total score of knowledge and competent performance regarding The International Standard of Safe Surgery (ISSOS) with highly statistically significant difference between the studied nurses regarding total knowledge and performance about international safety standards to safe surgery throughout the intervention (with p value, 0.004 and 0.03, respectively) , so that the Application of the international standards of safe surgery had a positive impact on pediatric nurses performance. As a result the current study findings supported the study hypothesis.

Recommendations

In the light of the current study, the following recommendations are suggested:

- 1- Strict adherence for implementing WHO surgical safety checklist to Ensure pediatric safe surgery..
- 2- Further studies should be conducted to study risk factors barriers contributing to use of ISSOS at PSU
- 3- Availability of multidisciplinary team of ISSOS in order to educate, train, evaluate and follow up the performance of the nurses regarding ISSOS at pediatric care units.

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