



# Effect of Educational Intervention on Implementation of Neonatal Safety Standards

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## Abstract

**Background and Aim** Patient safety in the neonatal intensive care unit (NICU) is one of the highest priority issues on the health care quality agenda worldwide. Efforts are needed to improve neonatal safety in NICU. The present study evaluated the effect of educational intervention on neonatal safety.

**Materials and Methods** Quasi-experimental study was conducted in three major hospitals, including the health care workers in their NICU during the period of study from May 2016 to May 2018. Neonatal safety standards were evaluated using an observational checklist after its validation by a pilot study. An intervention educational program was conducted in the three hospitals, followed by a reevaluation of the standards. All staff members (58 physicians and 69 nurses) participated in the three stages of the study.

**Results** The interventional program resulted in significant improvement of the health care workers implementation of the general ( $90.6 \pm 15.1$  vs.  $127.6 \pm 7.02$ ,  $p = 0.016$ ) and specific ( $50.6 \pm 17.1$  vs.  $96.1 \pm 13.2$ ,  $p = 0.04$ ) Egyptian Neonatal Safety Standards.

**Conclusion** Training and increasing the awareness of health care workers of the neonatal safety standards can significantly increase the fulfilment of these standards in both secondary and tertiary care neonatal units.

## Keywords

- patient safety
- Egyptian Neonatal Safety Standards
- neonatal intensive care unit

## Introduction

Patient safety is the absence of accidental injury through the establishment of an operation process to minimize errors.<sup>1</sup> Medical errors usually occur as a result of the failure of the planned action and/or using the wrong plan of action to achieve the goal.<sup>1</sup> Medication errors happen due to inappro-

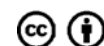
priate use of medication or as a result of inappropriate personal and or system approach, and this can be reduced by taking suitable preventive measures; thus, many organizations started to follow the safety standards to minimize the risk of error.<sup>2–4</sup>

Neonates are in specific need for error-free devices and instruments due to the immaturity of their immune system

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and their prolonged hospitalization.<sup>5</sup> The Egyptian Neonatal Safety Training Network (ENSTN) established the neonatal safety standards (NSS) to minimize the potential risks to patient safety in NICU.<sup>2</sup> These standards help to eliminate the factors responsible for errors<sup>6</sup> and familiarize the staff personnel with patient safety language.<sup>4</sup> Unfortunately, there is a remarkable scarcity of patient safety programs that deal with neonatal and perinatal issues.<sup>7</sup>

Our work aimed at observing the fulfilment of the Egyptian NSS in three major hospitals in Ismailia, Egypt as well as reevaluating these measures after increasing the awareness of health care workers toward the neonatal safety.

## Materials and Methods

This quasi-experimental study was conducted in three major hospitals in Ismailia Governorate, Egypt in the period from May 2016 to May 2018, involving Suez Canal University Hospital, Ismailia General Hospital, and Qantara Gharb Hospital. The study was approved by the Suez Canal University ethical committee (institutional review board approval no.162p/2016), and written consent was obtained from all the participants.

Implementation of NSS (general and specific) was evaluated using an observational checklist developed from the Egyptian NSS by ENSTN.<sup>2</sup> Answers were scored 2 for complete fulfilment, 1 for partial fulfilment, and 0 for the absence of fulfilment of the standards. Prior to the implementation, the checklist was validated through a pilot study.

The preintervention observational stage was for 2 months, while the educational stage took almost 8 months during which multiple workshops and lectures were conducted in the target hospitals to provide basic ENSTN information.

The content of the educational materials was designed by the researchers and reviewed by experts in the neonatology, safety, and infection control. Collectively, three workshops and twelve 60 to 90 minutes lectures were performed. The postintervention stage was then pursued over another 2 months. All staff members (58 physicians and 69 nurses) participated in the three stages of the study. If one or more staff members missed a lecture or a workshop, the missed event was repeated.

## Statistical Analysis

Data obtained from the present study were statistically analyzed using SPSS 20. Numerical variables were presented as mean and standard deviation. Paired *t*-test was used to compare pre- and postinterventional data. The *p*-value of less than 0.05 was considered statistically significant.

## Results

Implementation of the educational program resulted in significant improvement of almost all general NSS. However, significant differences were achieved in standards 1, 2, 9, and 15 (►Table 1).

In addition, our intervention produced significant improvement of the specific NSS with significant improvement accomplished in standards 1, 7, 12, and 16 (►Table 2). Moreover, the interventional program significantly improved total general standards score, the total specific standards score, and the total overall score (►Table 3).

## Discussion

In the present study, the interventional educational program for the NICU staff members results in significant improvement of the implementation of the NSS.

Neonatal safety in the ICU setting is the cornerstone of health care quality. Refining NSS require a thorough understanding of the systems involved in neonatal care delivery and continuous improvement of these systems.<sup>8</sup> Unfortunately, many neonatal safety concerns are related to various human factors including miscellaneous forms of medical malpractice.<sup>9</sup>

Application of the scientific strategies and methods through education and training proved to be an efficient tool to boost human performance and reduce the risk of medical error, particularly in the sensitive and vulnerable neonatal population.<sup>10</sup>

In this context, the present study showed significant improvement in the implementation of the general and specific Egyptian NSS after an educational program.

The positive impact of training and education on health care professional practice in neonatal and pediatric ICU was acknowledged by a Brazilian study that noted significant improvement of various aspects of clinical practice including adherence to patient safety standards.<sup>11</sup>

Similarly, Murphy et al<sup>12</sup> evaluated the effect of the teamwork and the communication training program on the safety attitude of 350 NICU staffs. They found that over 1 year of training, the safety attitude improved drastically. Arriaga Redondo et al<sup>13</sup> concluded that using safety checklists in most of the health professional NICUs is very useful in avoiding adverse events.

Likewise, the study of Marofi et al<sup>14</sup> assessed the effect of education and training program on rates of nosocomial infections (NIs) as a component of NSS. The authors reported a significant reduction in the rate of NIs related to improved implementation of safety standards after educational intervention.

Another evidence of the value of training comes from the recent work of Stadd et al<sup>15</sup> who noted that staff education and training was associated with lower safety incidents related to the maternal practice of the kangaroo care.

The importance of training was also highlighted by the study of Mirlashari et al<sup>16</sup> who identified the frequency of educational and training courses as a significant determinant of good competence of nurses regarding various aspects of neonatal care including NSS. Moreover, another study recognized the presence of well-trained professionals as a significant predictor of safe feeding practice in NICU.<sup>17</sup>

**Table 1** Implementation of the general Egyptian Neonatal Safety Standards before and after the educational program in different hospitals

Standard number		Before	After	p-Value
1	Providing high quality service care	11.66 ± 2.3	14.66 ± 3.2	0.035
2	Person-centered care for newborn	0.66 ± 0.57	3.66 ± 1.15	0.035
3	Timely care	6.33 ± 1.52	9.0 ± 1.0	0.057
4	Improve the accuracy of newborn infants identification and prevent errors	4.57 ± 1.5	4.57 ± 1.5	0.97
5	Improve the effectiveness of staff communications among NICU caregivers	1.66 ± 0.57	2 ± 0.12	0.42
6	Use medicines safely in NICU	8.3 ± 3.5	10.6 ± 2.5	0.073
7	Elimination of wrong site, wrong patient, and wrong procedures and surgery	2 ± 0.33	3 ± 0.5	0.66
8	Reduced risk of health care acquired infections in NICU	17.3 ± 2.08	23.3 ± 1.15	0.074
9	Reduce risk of newborn harm resulting from accidental fall during care	0.57 ± 0.3	1.15 ± 0.67	0.048
10	Improve the safety of using infusion pump	2 ± 0.5	2 ± 0.5	0.99
11	Use monitor alarms safely for patient stability	4 ± 1.1	5.66 ± 0.57	0.19
12	Accurately and completely reconcile medical care and medications across the continuum of care of the newborn infants	6.66 ± 1.52	9.33 ± 1.15	0.15
13	Ensure safety timely immunization. Reduce the risk of respiratory syncytial virus	0.5 (0.2)	1.6 (0.57)	0.18
14	Reduce the risk of fires in NICU	3 ± 2.64	5.6 ± 1.52	0.15
15	Identify patient safety risks/focused risk assessment	0.5 ± 0.2	4.3 ± 1.1	0.023
16	Improve recognition and response to changes in a patient's condition	1.33 ± 0.57	2 ± 0.11	0.18
17	Care of newborn infants must ensure the use of the well-functioning machines	6.66 ± 1.52	8.66 ± 2.08	0.071
18	Utility system has to be maintained	13 ± 1.7	15 ± 1.1	0.079
19	Measurement of neonatal care	3.33 ± 0.57	3.66 ± 1.15	0.42

Abbreviation: NICU, neonatal intensive care unit.

**Table 2** Implementation of the specific Egyptian Neonatal Safety Standards before and after the educational program in different hospitals

Standard number		Before	After	p-Value
1	Provide patient pathways	8.33 ± 2.3	12.0 ± 2.0	0.032
2	Ensure safe transfer for newborn infants	4.66 ± 1.15	5.6 ± 1.5	0.423
3	Care of the newborn immediately after birth	3.33 ± 0.58	4.0 ± 0.1	0.18
4	Newborn infants with low Apgar's score at 5 minutes should not go home till checked by senior neonatologist	2.0 ± 0.1	3.0 ± 1.0	0.22
5	Oxygen must be considered as serious drug when treating newborn infants	5.66 ± 1.15	7.3 ± 1.15	0.13
6	Ensure safe invasive maneuvers when indicated for care of newborn infants	2.33 ± 1.52	3.33 ± 1.15	0.42
7	Resuscitation of newborn infants by expert staff	5.33 ± 1.52	6.66 ± 1.15	0.05
8	Encourage noninvasive ventilation in DR and in NICU	2.0 ± 0.1	3.0 ± 1.0	0.225
9	Proper use of surfactant	0.33 ± 0.57	0.66 ± 1.15	0.423
10	Judicious use of medications that have effect on quality of life	0.66 ± 0.57	1.0 ± 0.1	0.423
11	All newborn infants who have been admitted to NICU must subject to fundus examination, hearing evaluation, and skull ultrasound before discharge	0.66 ± 0.57	1.0 ± 0.1	0.423
12	Initiation of breastfeeding	3.33 ± 0.57	6.0 ± 0.23	0.015
13	Scheduling the optimum timing of discharge from NICU or nursery or other health care facilities	3.03 ± 1.15	3.33 ± 0.57	0.98
14	Prevent total parenteral nutrition errors	2.33 ± 2.5	2.66 ± 1.05	0.423

(Continued)

**Table 2** (Continued)

Standard number		Before	After	p-Value
15	Improve the accurateness of respiratory care, resuscitation-related, and ventilator care-related errors	1.6 ± 1.15	2.5 ± 0.57	0.225
16	Prevent diagnostic errors among neonatal population	5.0 ± 1.73	6.66 ± 2.08	0.038

Abbreviations: DR, delivery room; NICU, neonatal intensive care unit.

**Table 3** Overall implementation of Neonatal Safety Standards before and after educational intervention

	Before	After	p-Value
General standards score	90.6 ± 15.1	127.6 ± 7.02	0.016
Specific standards score	50.6 ± 17.1	96.1 ± 13.2	0.04
Total overall standards score	141.3 ± 32.1	196.67 ± 19.34	0.021

## Conclusion

The present study shows the efficacy of the educational intervention on the implementation of the Egyptian NSS. Further studies are recommended to evaluate the influence of these interventions on the neonatal morbidity and mortality rates.

### Funding

None.

### Conflict of Interest

None declared.

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