

Practice –Based Guidance For Nurses About The Behavioral Cues Exhibited From Preterm Infants

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Abstract: Cue-based care is the key element in the provision of developmentally appropriate care as it based on observing behavioral cues of preterm infants (PTIs) to collect information concerning each infant's competencies, vulnerabilities, and thresholds. **Aim:** This study aimed to design a practice based guidance module to improve nurses' knowledge and their interventions toward avoidance behavioral cues exhibited from PTIs. **Design:** A quasi-experimental design (pre / post-test) was utilized. **Setting:** the study was carried out at the neonatal intensive care units (NICU) affiliated to Mansoura University Children Hospital (MUCH), Mansoura General Hospital (MGH) and the New General Hospital, Egypt. **Subjects:** A convenience sample of all nurses (N= 91), who were available during the period of data collection were recruited to achieve the aim of the study. **Tools:** Data collection lasted 6 months by using structured questionnaire sheet and observational checklist. The study **Results** revealed poor nurses' knowledge regarding behavioral cues exhibited from PTIs and unsatisfactory intervention toward avoidance behavioral cues preprogram implementation which improved after program implementation and at follow up. **Recommendations:** providing in-service training based on guidance about behavioral cues exhibited from PTIs and providing training program for nurses about developmental care as a proper intervention for avoidance behavioral cues exhibited from PTIs.

Keywords: Behavioral cues, Cue-based care, Nurses, Preterm infants

Date of Submission: 25-09-2018

Date of acceptance: 11-10-2018

I. Introduction

World Health Organization (WHO) defined preterm infants (PTIs) as babies born alive before 37 weeks of pregnancy are completed. They require technologically advanced medical interventions and highly specialized nursing care in order to survive and thrive. Worldwide, yearly about 15 million babies are born preterm¹. In the lower-income countries, on average, 12% of babies are born too early compared with 9% in higher-income countries (WHO, 2015). In Egypt, preterm birth is about 10 % of total live births².

Preterm infants (PTIs) are nurtured in the Neonatal Intensive Care Unit (NICU) which is a highly stressful environment that full of various stimuli that are distressing for PTI and negatively interfere with individual self-regulation and co-regulation processes, which are fundamental for adaptive behavior throughout development and may directly affect the regulatory developmental processes of the PTIs³.

Preterm infants (PTIs) respond to these stimuli in different ways than full term infants because the brain is still developing. They exhibit various communicating behavioral cues which help caregiver know when they are tired and disorganized or feel relaxed, organized and ready to interact. Sometimes, the meaning of these cues is clear to be understood by caregiver, other time caregiver may interpret these cues easily⁴.

Various theories are proposed to understand behaviors of PTI. According to the Synactive Theory of Development these behaviors appear through interaction of five body subsystems that are interdependent. When the preterm infants are not able to adapt to the inappropriate environmental stimulation, they exhibit stress behaviors potentially indicating subsystem disorganization. These behaviors may be defensive or avoidance behaviors, which are expressed through autonomic, motor, state, attention and interaction subsystems⁵.

Moreover, recent studies reported that, PTIs exhibit self-regulatory behaviors when they can successfully adapt to the environmental stimulation indicating stability. Stress behaviors such as yawning, finger splay and hiccups have been observed in PTIs during exposure to environmental stressors (in NICU or home) (sudden noise, bright light) and common NICU procedures (diaper change, nasogastric feeding and bathing and positioning⁶).

Developmental supportive care (DC) is an evidence-based measures and strategies which optimizes the NICU environment and care. It is considered as basic role of NICU nurses which is useful in maintaining the PTI in organized or stable condition as possible and managing the physical care and social environment to

minimize stressors. Developmental care interventions use the behavioral cues of premature infants to develop individualized patient-centered care⁷.

Developmentally supportive care involves many strategies which focused on the infant as the central figure in the NICU. These strategies are aimed at increasing the infants' comfort and reducing stress in an individualized manner from admission through discharge. These include, but are not limited to, developmentally supportive positioning and handling, recognizing and responding to infant cues, clustering of care and procedures to promote rest, and offering nonnutritive sucking for self-regulation and pain management⁸.

Aim of the study

Evaluate the effect of implementing a practice based guidance module about the behavioral cues exhibited from preterm infants on nurses' knowledge and their interventions towards the expressed cues.

Research hypothesis:

- Nurses in neonatal intensive care unit have insufficient knowledge about behavioral cues exhibited from PTIs
- Nurses in neonatal intensive care unit don't intervene properly with PTIs during avoidance behavioral cues.
- Designing a guidance module will improve nurses' knowledge and their interventions toward avoidance behavioral cues exhibited from PTIs

II. Subjects & Method

Research design: A quasi-experimental design (pre / post-test) was utilized.

Setting: The study was conducted in the neonatal intensive care units (NICU) affiliated to Mansoura University Children Hospital (MUCH), Mansoura General Hospital (MGH) and the New General Hospital (El-Salam International Hospital previously).

Subjects: A convenient sample of all available nurses who working in the previous mentioned settings during the study period were recruited to achieve the aim of the study n= (91).

Tools and techniques of data collection:

Tool I: A structured questionnaire sheet:

This was designed by the researcher based on reviewing the scientific literature, and it translated into Arabic language to assess nurses' knowledge about behavioral cues exhibited from PTIs, and how they properly intervene with PTIs during avoidance behavioral cues. It divided into: Part 1 Characteristics of studied nurse", Part 2 Nurse's knowledge about behavioral cues exhibited from PTI (before/after applying guidance module) and Part 3 Nurses' knowledge about how to properly intervene with PTIs during avoidance behavioral cues (before/after applying guidance module).

Scoring system:

According to the answers collected from the NICU nurses; a scoring system was applied to interpret nurses' knowledge assessment. The studied nurses' answers were checked and compared with the predesigned model answer that was given a score one grade for correct answer, while zero was given for false, missed or unknown answer. The total scores of studied nurses' knowledge were 22 grades (100%), which categorized into

- Poor knowledge if the obtained score is less than 14 grade (less than 60%).
- Average knowledge if the obtained score is ranged between 14 to less than 17 grades (less than 75%).
- Good knowledge if the obtained score is equal to or more than 17(>75%)

Tool II: Observational checklists:

It consisted of three checklists that adopted from (Mizuno and Ueda, 2006⁹; Hall, 2008¹⁰ & Toso et al. 2015¹¹), and adapted by the researcher, to assess nurses' practices with preterm infants during avoidance behavioral cues before and after applying guidance module. They covered the following items:

- Nesting of PTI
- Applying swaddled baby bath for PTI
- Introducing non-nutritive sucking

Scoring system:

Scores were estimated to assess nurses' performance level related to proper intervention with preterm infants during avoidance behavioral cues (pre, post and at follow up); in which correctly done step was given a score one, while zero was given for incorrectly done and not done. The total scores of studied nurses' practices were 29 grades (100%), which categorized according to mean into:

- Unsatisfactory practice if the obtained score is less than 18 grade (less than 60%).
- Partial satisfactory practice if the obtained score is ranged between 18 to less than 22 grades (less than 75%).
- Satisfactory practices if the obtained score is equal to or more than 22 (more than 75%)

Tool III: Guidance module construction:

A guidance module for NICU nurses was designed by the researcher, revised and modified by the study supervisor based on extensive review of related literature to increase nurses' knowledge about behavioral cues exhibited from preterm infants and teach them how to properly intervene with preterm infants when exhibiting avoidance behavioral cues.

Method

1. Ethical approval was obtained from research Ethics Committee at the Faculty of Nursing - Mansoura University.
2. Tools were developed by the researcher after reviewing the related literature and were tested by jury for their validity and reliability.

3- A Pilot study was occurred to ensure the clarity and applicability and replication of the questionnaire. It will be applied on ten percent of sample.

4-Validity:-The study tool was constructed by the researcher based on reviewing of the related literature, and then reviewed by five experts from different departments. These experts assessed the research tool to ensure the applicability, clarity, completeness, comprehensiveness, and meaningful.

3-Ethical consideration

- 1- Ethical approval was obtained from research Ethics Committee at the Faculty of Nursing - Mansoura University.
- 2- An agreement for participation of the subjects was taken verbally before inclusion and after the aim of the study explained to them.
- 4-the researcher must ensure the confidentiality of the information and used it only for the research purpose.
- 5-The result was used as a component of the necessary research for master study as well as for future.

Fieldwork

Data collection period:

- Data collection extended over a period of six months from first of September 2017 to first of February 2018.
- The researcher started by introducing herself to the nurses and giving them a brief idea about the aim and nature of the study.
- The framework of the study was carried out according to 4 phases as the following:

i) Assessment phase

- Each nurse was interviewed before applying guidance module in order to collect nurses' data baseline using the study tool (1) part (1).
- Assessment of nurses' knowledge about behavioral cues exhibited from PTIs and their interventions with PTIs during avoidance behavioral cues was performed using a tool (1) part (2)
- Assessment of nurses' practices regarding avoidance behavioral cue was performed using a tool (II).

ii) Planning phase

- Based on the finding of assessment phase goals, priorities, and expected outcomes were formulated to meet nurses' practical needs and knowledge deficit regarding behavioral cues of PTIs.
- In this phase, three sessions were planned by the researcher for nurses' to increase nurses' knowledge about behavioral cues exhibited from PTIs and teach them how to properly intervene with PTIs during avoidance behavioral cues.

iii) Implementation phase

- The practice-based guidance module was implemented in 3 sessions (didactic & practical).
- Each session (didactic & practical) took about 45 minutes to discuss its items, taking into consideration attention span of nurses.
- Each session started at 11 am for morning shift and at 4 pm for afternoon shift.
- The studied nurses were divided into groups; number of each group varied (with an average 8-10 nurse in each session). During the sessions, the researcher used questions, group discussion, PowerPoint presentation and other different teaching methods as brain storming, demonstration and re-demonstration.
- Number of sessions in each week was three sessions.
- Guidance colored booklet was given to each nurse after the assessment phase (throughout the sessions) for attracting her attention, motivated her and help her for reviewing its content when needed.
- The researcher observed nurses' practices pre and post applying guidance module in the morning and afternoon shifts using a tool (II).
- During each session the researcher used brief, clear and simple words and at the end of each session a brief summery e given by the researcher.

iv) Evaluation phase

- Each nurse was interviewed separately after applying educational module for doing post- test in order to evaluate her knowledge and practices by using tool(I) part (2) & tool (II) in two different times :
 - a) Immediate post-test (post1)
 - b) Follow up test (post 2): after three months from immediate post-test.

Statistical analysis:

All statistical analyses were performed using SPSS for windows version 20.0 (SPSS, Chicago, IL). Data were tested for normality of distribution prior to any calculations. Continuous data were normally distributed and were expressed in mean \pm standard deviation (SD). Categorical data were expressed in number and percentage. Chi-square test was used for comparison of variables with categorical data. Statistical significance was set at $p < 0.05$.

III. Results

Table 1: This table presented that, all of studied nurses are females. About 64% of them aged between 20 <30 years old. In relation to their workplace, 44% of them work in MUCH. As regards to the nurses' years of experiences, about 34.1% worked from 5 years to <10 years. As regard to marital status, data reveled that, 79.1%, of the studied nurses are married, while 80% only of them having children.

Table 1. Number and Percentage Distribution of Studied Nurses According to their Characteristics n=(91)		
Characteristics	N	%
Age (years)		
20 to <30	59	64.8
30 to <40	32	35.2
Mean \pm SD =	28.06 \pm 5.06	
Gender		
Male	0	0.0
Female	91	100.0
The NICU Workplace		
Mansoura University Children Hospital (MUCH)	40	44.0
Mansoura General Hospital	25	27.5
El-Salam International Hospital	26	28.6
Years of experiences		
<1 year	15	16.5
1 year to > 5 years	30	33.0
5 years to >10 years	31	34.1
> 10 years	15	16.5
Marital status		
Married	72	79.1
Single	16	17.6
Divorced	3	3.3

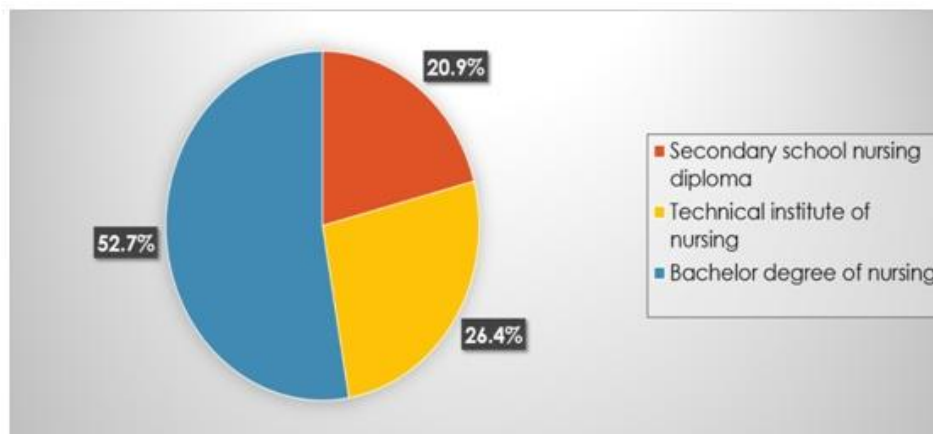


Figure1. The level of education of studied nurses

Figure1 illustrated that 52.7% of studied nurses had bachelor degree of nursing. Meanwhile, 20.9% of them had secondary school nursing diploma.

Table 2: As regards nurses' total knowledge, this table presented that there was a statistical significance differences in relation to satisfactory nurses' knowledge about behavioral cues of PTIs before module implementation, immediately post and at follow up 0.0%, 60.4% & 61.5% respectively, with statistical significance differences at $p < 0.001$.

Table 2.Number and Percentage Distribution of Studied Nurses' Total Knowledge Regarding Avoidance Behavioral Cues of Preterm Infants Before module Implementation, Immediately Post and at Follow up (n= 91)

Nurses' total knowledge	Pre		Post		Follow-up		Chi square test	
	N	%	N	%	N	%		P value
Poor (<60%)	31	34.1	0	0.0	0	0.0		
Average (60<75%)	44	48.4	14	15.4	22	24.2		
Good (>75%)	16	17.6	77	84.6	69	75.8	120.804	<0.001**
Mean ±SD	12.3 ±3.6		18.4 ±1.6		18.0 ±1.7		171.982	<0.001**

**** Highly Statistical Significant at $p < 0.001$**

Table 3: As regards nurses' total practices, this table presented that there was a statistical significance differences in relation to satisfactory nurses' practices about nursing care during avoidance behavioral cues of preterm infants before module implementation, immediately post and at follow up 17.6%, 84.6% & 75.8% respectively, with statistical significance differences at $p < 0.001$.

Table 3.Number and Percentage Distribution of Studied Nurses' Total Practices Regarding Behavioral Cues of PTIs Before module implementation, Immediately post and at Follow up. (n= 91)

Nurses' total practices	Pre		Post		Follow-up		Chi square test	
	N	%	N	%	N	%		P value
Unsatisfactory (<60%)	91	100.0	0	0.0	0	0.0		
Partial satisfactory (60<75%)	0	0.0	36	39.6	35	38.5		
Satisfactory (>75%)	0	0.0	55	60.4	56	61.5	273.035	<0.001**
Mean ±SD	6.2 ±1.9		22.1 ±1.7		22.2 ±1.8		2390.346	<0.001**

**** Highly Statistical Significant at $p < 0.001$**

Table4: In relation to nurses' knowledge about behavioral cues of preterm infants and their practices pre, immediate post and at follow up module implementation, this table proved that there was no relation between knowledge and practices pre module implementation but there is a positive relation immediately after and at follow up module implementation at $p < 0.001$.

Table 4. Relation Between Studied Nurses' Knowledge About Behavioral Cues of PTIs and Nurses' Practices Toward Avoidance Behavioral Cues Pre, Immediate post and at follow up Module Implementation

knowledge	Pre						post						Follow up					
	Poor		Average		Good		Poor		average		good		Poor		average		good	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
unsatisfactory	31	100	44	100	16	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Partial	0	0.0	0	0.0	0	0.0	0	0.0	14	100	22	28.6	0	0.0	22	100	13	18.8
satisfactory	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	55	71.4	0	0.0	0	0.0	56	81.2
X2							25.278						46.423					
P value	N S						<0.001						<0.001					

IV. Discussion

One of the current study findings revealed that, more than two thirds of studied nurses' were aged between 20 to less than 30 years old, this result was incongruence with Mohammed, Bayoumi and Mahmoud (2014)¹², who conducted a study about "The Effect of Developmentally Supportive Care Training Program on Nurses' Performance and Behavioral Responses of Newborn Infants" and stated that, more than half of studied nurses aged from 20 to less than 30 years old.

The result of this study revealed that, all of studied nurses are female. This finding came in line with Milette, Richard, and Martel (2005),¹³ who conducted a study about "Evaluation of a developmental care training programme for neonatal nurses" and reported that all of participants are females.

In relation to the educational level of the studied nurses, the present study showed that, nearly half of them had a bachelor degree in nursing science, these finding goes in the same line with the results of a study conducted by El-Nagar, Lawend and Mohammed (2013)¹⁴, who conducted a study about "Impact of Neonatal Nurses' Guidelines on Improving their Knowledge, Attitude and Practice toward Kangaroo Mother's Care " in the NICU at El-Mansoura university children hospital, Egypt, and found that more than half of studied nurses had Bachelor degree in nursing science.

On the other hand, this result was in disagreement with Mohammed et al., (2014), who conducted a study about "The effect of developmentally supportive care training program on nurses' performance and behavioral responses of newborn infants" and Milette, Richard, and Martel (2005), who conducted a study about "Evaluation of a developmental care training programme for neonatal nurses" who stated that, more than two thirds of participants were graduated from secondary school of nursing. The study finding support the interpretation in the scope of high qualified nurses are usually distributed in special care units that provides critical care according to the system of Ministry of High Education.

The result of the current study clarified that, about one third of studied nurses have between five to less than ten years experiences working at NICU. This finding is in agreement with the study of Ahmed, Mohammad, Assiri and Ameri (2013)¹⁵, who conducted a study about "Effect of instructional sessions on nurses' and doctors' knowledge and practice regarding developmental care in NICU in Abha City" who reported that about one third of studied nurses spend between five to less than ten years experiences working at NICU. The finding of present study might be due to nurses distributed in special care units that provide critical care usually not turned over to be more experienced in their work in critical care units.

As regards the nurses' total knowledge about behavioral cues exhibited from preterm infant and proper intervention during avoidance behavioral cues, the present study revealed that less than one quarter of studied nurses had good knowledge pre module implementation which improved to three quarters immediate post and at follow up.

This result is in accordance with Mosqueda-Peña et al., (2016)¹⁶ who conducted a study about "Impact of a developmental care training course on the knowledge and satisfaction of health care professionals in neonatal units" and reported that two thirds of health care practitioners working in neonatal units in Madrid have an acceptable level of knowledge of DC, which improves significantly after taking a theoretical-practical course aimed at improving the application of DC. From the researcher point of view, this finding may be due to nurses were interested in the topic and value the information presented to them.

Also, these finding is agreed with Maguire, Bruil, Wit & Walther (2007)¹⁷ who conducted a study about "Reading preterm infants' behavioral cues: An intervention study with parents of premature infants born < 32 weeks" and reported that, there was significant improvement in the post test score concerning knowledge of preterm infants behavioral cues for caregiver who underwent the training.

In the same line, Liaw, Yuh & Chang (2004)¹⁸ conducted a study about "preliminary study of the associations among preterm infant behaviors" and reported that staff knowledge and awareness of cue-based care was improved after the implementation of a training program. The present study finding could be attributed to the lack of learning resources for nurses to up-date their knowledge.

On other hands, this is contrary to Hannah (2010)¹⁹ who conducted a study about "Awareness of preterm infants' behavioral cues: a survey of neonatal nurses in three Scottish neonatal units" and reported that, majority of studied nurses were knowledgeable about behavioral cues exhibited from preterm infant. From the researcher point of view, this may be due to difference in sample size.

Concerning total nurses' practices regarding avoidance behavioral cues, this study indicated that, module implementation positively affect nurses' practices. This finding is supported by several Egyptian studies done by Mohamed and Waly (2018)²⁰, Fayed et al., (2016)²¹ and by Mohammed et al., (2014), who found a significant difference in nurses' practices at NICU before and after educational program.

Moreover, this finding is similar to a recent European study conducted at France, by Pierrat et al., (2016)²² about " Translating neurodevelopmental care polices into practice: the experience of neonatal ICUs" who reported that, neurodevelopmental practices increased in units with specific neurodevelopmental care training and supportive policies. The researcher added that, this finding might be explained in the light of the fact that, lack of proper education, inadequate resources and inappropriate supervision might be affect negatively on nurses' practices.

The present study portrayed that, there was no relation between nurses' knowledge about behavioral cues exhibited from PTIs and their practices toward avoidance behavioral cued before module implementation. This finding is in the same line with Liawet al., (2004), who found that the respondents recognized the importance of cue-based care but they were inhibited from incorporating this concept into daily practice. The researcher might be relay that to lack of collaboration and supervision.

As regards the relation between nurses' knowledge and practices immediately after and at follow up module implementation, the result of present study proved that, there was a significant positive association between nurses' knowledge and practices immediately after and at follow up module implementation with a highly statistical significant difference.

This result is supported by Ahmed et al., (2013), who conducted a study about "Effect of instructional sessions on nurses' and doctors' knowledge and practice regarding developmental care in NICU in Abha City" and stated that, there was significant difference in the relationship between nurse' knowledge and their practices. This result reflects that, nurses' knowledge act as an important and independent factor in carrying out practice regarding developmental care.

V. Conclusion and Recommendations

Based on the findings of the current study, it is concluded that there was an improvement in nurses knowledge and practices about behavioral cues exhibited from PTIs and proper intervention during avoidance behavioral cues after implementation of guidance module either immediately post or at follow up than before its' implementation.

Accordingly, the study recommended that:

- Providing on job training based on practice for nurses about behavioral cues exhibited from PTIs.
- Providing training program for nurses about developmental care as a proper intervention for avoidance behavioral cues exhibited from PTIs.
- Orientation of newly appointed nurses about the current concept of PTI care
- Introducing the concept of behavioral cues exhibited from PTIs on nurses curriculum

Further studies:

- Replication of this study with larger sample size at different NICUs so that, the result could be generalized and compared for difference between Egypt and other countries.

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Sara Ali Mohamed Idrees. "Practice –Based Guidance For Nurses About The Behavioral Cues Exhibited From Preterm Infants"." *IOSR Journal of Nursing and Health Science (IOSR-JNHS)*, vol. 7, no 5 , 2018, pp. 01-08