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Research paper

Assessment of nurses' knowledge and practice regarding the use of transillumination device for establishing venous access

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Abstract

Background: Peripheral venous access is frequently performed in various health care settings. However, babies' veins are smaller and poorly supported by surrounding soft tissue casing further difficulty of insertion compared to adult patients'vein. Transillumination device is recommended for difficult insertion of peripheral veins. Nursing practice should accommodate with evolving health care advancement, and therefore the nurses' are required to develop their knowledge and attitude towards new skill and practice.
Objectives: To assess the level of nurses' knowledge and practice regarding the use of transillumination device for establishing venous access.
Methods: A descriptive study design that was conducted among a sample of 20 Nurses working at Hail General Hospital, KSA. The study tool included a questionnaire sheet of 2 parts as demographic variables and then knowledge and practice regarding use of transillumination device for establishing venous access. Selected nurses were asked to fill up the questionnaire sheet.
Results: The majority 50% of the nurses were under the age group of 31yrs and above. Most of the 95% nurses were bachelor's degree and only 5% was master's degree. The year of experience were majority of nurses 35% had 7-9 yrs. Designation of nurses indicates, almost 50% of the nurses were working as a Charge Nurse, among 45% as staff Nurse and only 5% as Head Nurse.Obviously, 100% of the nurses perform cannulation in first attempt. Before, 65% of the nurses had no awareness of using veinlite. 100% of the nurses used 26G size cannula.Furtherly, 85% assures that they could incorporate transillumination device into practice. The opinion of 65% nurses feel, this device was easy to use.
Conclusion: The study says that, most of the 65% NICU nurses has only average and 35% has good knowledge and practice regarding use of transillumination device for establishing venous access. The nurses have interest in practicing transillumination device and seems to be time saving and effective. Suitable interventional packages need to be given periodically for the effectiveness of qualitative nursing service.

Keywords: *Transillumination device; Intravenous access; Nurse; HGH; KSA.*

1. Introduction

Establishing vascular access is one of the most common procedures carried out in all the department [1].A premature or sick infant may require multiple cannulations during a prolonged stay in intensive or special care and often veins that have previously been used, may need to be re-cannulated [3]. Compared with adults, the veins in babies are smaller and poorly supported by surrounding soft tissue. Position the baby so you can see and have access to all limbs while ensuring that he/she is warm and well oxygenated. Ensure good light, take time and look at the usual sites and choose the option [4]. I have reviewed the pertinent literature and propose a structure algorithmic approach to reduce babies' discomfort and to minimize the time involved in securing venous access. If veins are not prominent and need to be made prominent, gentle slapping of the skin overlying the vein may make it more prominent. The mechanism by which this occur is unclear. This slapping must not be too firm as pain may cause reflex vasoconstriction. Venous prominence is further augmented using tourniquet. Gently wiping the skin with an alcohol swab may help visualization of the vein as the reflection of the light off the skin changes [5], [8]. An average of 2 attempts is necessary to insert a peripheral IV catheter in a critical newborn. Less than half is inserted in the first attempt, about 2/3 is inserted after two tries, and in 5% a catheter is not inserted [10].
Transillumination may help at this stage [6]. The over headed fluorescent lights in the treatment room need to be turned or dimmed off and a clinically designed veinlite PEDI can be placed to visualize the veins [11]. Venous visualization may also be possible, even with hema-toma formation and with previously punctured veins [3].Veinlite is clinically proven to provide a significant improvement in first time success rate over any other method. This results in patient satisfaction, technician confidence, and savings in supplies used. So, what is the optimal solution to quick venous access in a pinch? If you are unable to visually see an accessible vein, reach in your pocket for Veinlite and take the work out of vein access procedures [12].

2. Review of literature

According to Shinde (2007). "The material gathered in literature review should be an integral part of research data. Since what is found in the literature does not only have the influence which is important for formulating the problem and design of research, but also provides useful comparative material, when the data collected in the research is analyzed. [14]"The review of literature in the research report is a summary of current knowledge about a practice, problem and includes what is known and not known about the problem.

2.1. Literature related to knowledge and practice regarding the use of transillumination device

(Radcliffe et al., 2013). Conducted a comparison trial using Veinlite LED vs standard methods for peripheralintravenousaccess; Examining therapeutic interventions for Perioperative area in University of North Florida, USA. While the clinical trial was going on, carried out research on how to create small pocket devices that could be used by nurses during vein access. Fifty Samples included SRNAs, CRNAs, RNs, nursing students and other advanced practice nurses representing a large range of experience. After being instructed in the use of the Veinlite LED device, health care professionals were asked to assess vein access on a human arm with and without the use of the device. A survey was then administered, asking the participant's opinion of the device and its usefulness.Standard method: included simple palpation and visualization techniques. Interventional method: included the standard methods in addition to the Veinlite LED. From the questionnaire that was answered, the majority of people surveyed stated that the veinlite was helpful. Most also said they would use the veinlite in practice, however, almost all participants asked about the cost of the device and they would use it if provided for them.The finding shows, Participants' intravenous access experience ranged from 31-35 years. 89% [42] of participants agreed that the Veinlite is a useful device in the identification of intravenous cannulation sites. Of the participants, 45% [21] stated the Veinlite actually changed the location of choice of intravenous access of the arm, and 79% [37] of participants would use the Veinlite in practice if it were available to them. The majority of participants, 68%, [32] agreed that the Veinlite was very easy to use. No one felt that the veinlite was difficult to use. Very easy was 68% of the partcipants, Easy 21%, Somewhat easy 11%.

2.2. Literature related to the use of transillumination device

(Perry et al., 2011) conducted a randomized controlled Trial; Efficacy of a Near-Infrared Light Device in Pediatric Intravenous Cannulation from Division of Emergency Medicine, Department of Pediatrics, University of Hawaii John A. Burns School of Medicine, Honolulu, USA. To determine whether the use of a near-infrared light venipuncture aid would improve the rate of successful first-attempt placement of intravenous catheters in a high-volume pediatric emergency department. Patients younger than 20 years with standard clinical indications for IV access were randomized to have IV placement by ED nurses (in 3 groups stratified by 5-year blocks of nursing experience) using traditional methods (standard group) or with the aid of the near-infrared lightsource (device group). If a vein could not be cannulated after 3 attempts, patients crossed over from one study arm to the other, and study nurses attempted placement with the alternative technique. The primary end-point was first-attempt success rate for IV catheter placement. After completion of patient enrollment, a questionnaire was completed by study nurses as a qualitative assessment of the device. A total of 123 patients (median age, 3 years) were included in the study: 62 in the standard group and 61 in the device group. there was no significant difference in first-attempt success rate between the standard (79.0%, 95% confidence interval [CI], 66.8%-88.3%) and device (72.1%, 95% CI, 59.2%-82.9%) groups. Of the 19 study nurses, 14 completed the questionnaire of whom 70% expressed neutral or unfavorable assessments of the device in nondehydrated patients without chronic underlying medical conditions and 90% found the device a helpful tool for patients in whom IV access was difficult. The study concluded, first-attempt success rate for IV placement was non-significantly higher without than with the assistance of a near-infrared light device in a high-volume pediatric ED. Nurses placing IVs did report several benefits to use of the device with specific patient groups, and future research should be conducted to demonstrate the role of the device in these patients.
(Merve Gumusand Zumruit Basbakkak, 2016) evaluated the efficacy of the new technology transillumination device to improve vein access among children in Ege University, Turkey. They carried out a study in our pediatric emergency departments using the light emitting diode-based Veinlite PEDI.A total of 112 pediatric patients were enrolled in the study. Children who presented to the emergency department aged 1 to 10 years old were randomly assigned to the Veinlite PEDI (Veinlite) group or standard of care (SoC) group. The primary outcome measure was first attempt success. Secondary outcome measures were number of intravenous (IV)attempts and time to peripheral intravenous catheter (PIC) placement. A total of 110 patients completed the study: 58 boys and 52 girls. The study indicates that, the first attempt success rate was significantly higher in the Veinlite group compared with the SoC group (92.9% vs 72.2%, $P< 0.004$). In addition, the Veinlite group had a fewer number of attempts compared with the SoC group (1.07 ± 0.54 vs 1.31 ± 0.25,$P= 0.04$). The Veinlite group resulted in a shorter total time of attempts per patient compared with the SoC group (49.98 ± 18.4 vs 59.68 ± 22.5P=0.01). The use of new technology in the Veinlite PEDI assist with peripheral IV access in children, improves the first-time success rate for IV access. Improved visualization of veins also reduced the number of attempts and the time required for PIC placement. These results suggest that the new technology of the Veinlite results in better PIC access.

3. Methods

3.1. Study design/ population

A Quantitative research approach was adopted for this study. The researcher selected non- experimental descriptive study design that was conducted in Hail General Hospital, KSA. The study population composed of Registered Nurses in NICU department.

3.2. Sample size and technique

A Convenient sampling technique was used to select the study sample. The Researcher selected 20 registered Nurses from NICU department. All Nurses were asked to fill up a questionnaire sheet to assess the knowledge and practice of use of transillumination device.

3.3. Inclusion criteria

Nurses who have experience more than 1 year will be included in the study.

3.4. Research tools

The researcher used a survey Questionnaire tool which consists of Two Parts. The First Part includes question related to Demographic Variables of the Nurses Age, Professional Qualification, Years of Experience and Designation. The second part includes question related to assess the knowledge and practice regarding use of transillumination device for establishing venous access. The questionnaire was approved by the supervisors after reviewing the available literature and studies associated with use of transillumination device among nurses and then validated.

4. Data collection and procedure

The Researcher prepared a survey questionnaire to assess the nurse's knowledge and practice regarding the use of transillumination device for establishing venous access in HGH, KSA. Total population in NICU department was 25. In that, 20 samples which means 80% were selected by convenient sampling technique who comes under inclusion criteria. The researcher motivates them to practice transillumination device before inserting IV cannula. A Survey questionnaire was given to all the selected nurses. The study tool included a questionnaire sheet of 2 parts as demographic variables and then knowledge and practice regarding use of transillumination device for establishing venous access. Selected nurses were asked to fill up the questionnaire sheet genuinely.
After data collection the data was organized, tabulated, summarized and analyzed according to the objectives and by using descriptive and inferential statistics of the study.

5. Ethical Considerations

Ethical approval was granted by the ethical research committee in Hail Region. Prior to data collection, arrangement with the director of the hospital, Nursing director and Head nurse of NICU departments was considered. All ethical principles was guaranteed through voluntary participation, right for withdraw from the study. Confidentiality and anonymity were assured for both participants' and institutional identity.

6. Data Analysis

Both descriptive and inferential statistics were used through SPSS software program. Measurements included Frequency, Percentage, mean and Standard Deviation to evaluate the nurses' knowledge and practice regarding the use of transillumination device for establishing venous access.

7. Results

7.1. Demographics of the included subjects

A total of 20 participants included in this study Table (1) showed that the majority 50% of the nurseswere under the age group of 31yrs and above, 30% were under the age group of 27-30yrs old and 20%were under 23-26 yrs old. Most of the 95% nurses were bachelor's degree and only 5% was master's degree, No diploma holders present. The year of experience were majority of nurses 35% had 7-9 yrs., 25% had 4-6 yrs., 20% of them had 2-3 yrs and 10 yrs and above the same. Designation includes Almost 50% of the nurses were working as a Charge Nurse, among 45% as staff Nurse and only 5% as Head Nurse.

Table 1: Demographics of included Nurses

S. no	Demographic variables	Frequency F	Percentage %
1.	Age		
	a)23 - 26years	4	20
	b)27 - 30years	6	30
	c)31 years and above	10	50
2.	Professional Qualification		
	a)Diploma in Nursing	-	-
	b)Bachelor in Nursing	19	95
	c)Masters in Nursing	1	5
3.	Year of Experience		
	a)2-3	4	20
	b)4-6	5	25
	c)7-9	7	35
	d)10 and above	4	20
4.	Designation		
	a) staff Nurse	9	45
	b)Charge Nurse	10	50
	c)Head Nurse	1	5

Distribution of study samples knowledge regarding the use of transillumination device practice.
Table (2) showed the distribution of the nurses regarding the use of transillumination device practices as majority 60% of the nurses has venipuncture practice more than 5 years , most of them 70% has primary employent in NICU department, 90% of them found that veinlite was helpful in identifying vein for cannulation. By using veinlite 85% of them had changed cannula site choice; which means blindprick avoided. Obviously, 100% of the nurses perform cannulation in first attempt. Before, 65% of the nurses had no awareness of using veinlite. 100% of the nurses used 26G size cannula and 80% of them preferred upper limb for successful cannulation. Furtherly, 85% assures that they could incorporate transillumination device into practice. The opinion of 65% nurses feels, this device is easy to use.

Table 2: Distribution of Study Samples Knowledge Regarding the Use of Transillumination Device Practice

Sl. No.	Survey Questionnaire regarding transillumination device practice	Frequency F	Percentage %
1.	How long have you been practicing venipuncture?		
	<1 yr.	1	5
	1-5 yr	7	35
	> 5 yr.	12	60
2.	In what type of unit was your primary employment immediately prior to entering graduate?		
	ER	1	5
	Medical-surgical	5	25
	PICU	1	5
	NICU	13	65
3.	Did you find the veinlite device helpful in identifying veins for cannulation?		
	Yes	18	90
	No	2	10
4.	Did use of the veinlite device change your site cannulation choice?		
	Yes	17	85
	No	3	15
5.	Did you perform cannulation in first attempt?		
	Yes	20	100
	No	-	-
6.	Do you aware of using veinlite before?		
	Yes	7	35
	No	13	65
7.	Which size of guage used for successful cannulation?		
	24G	-	-
	26G	20	100
8.	In which site you performed successful cannulation?		
	Lower limb	4	20
	Upper limb	16	80
9.	Would you incorporate this device into your practice?		
	Yes	17	85
	No	3	15
10.	In your opinion was the transillumination device?		
	Not at all easy to use	1	5
	Somewhat easy to use	6	30
	Easy to use	13	65
	Very easy to use	-	-

Table 3: The level of knowledge regarding the use of transillumination device practices among Nurses for establishing Venous access.

Table 3: Reveals That 65% of the Nurses Had the Average Knowledge and Practice and 35% of Nurses Had Good Knowledge and Practice Regarding the Use of Transillumination Device in Establishing Venous Access.

Domain	Poor		Average		Good	
	F	%	F	%	F	%
Level of Knowledge and Practice	-	0	13	65	7	35

8. Score interpretation

8.1. Level of knowledge score

Poor knowledge	<9
Average knowledge	10-20
Good knowledge	21-25

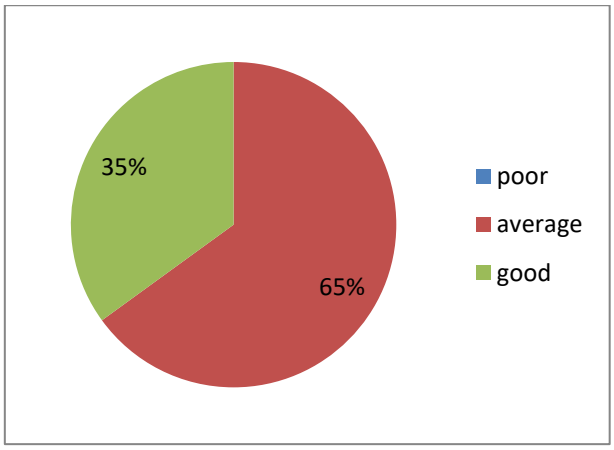

Fig. 1: Graphical Representation of Level of Knowledge and Practice.

Mean and Standard deviation of transillumination device practices among Nurses.

S. no	Mean	Standard deviation
1.	19.9	11.13

9. Discussion

Intravenous Access is a very important, difficult, and painful procedure implemented frequently in NICU interventions. Often, a nurse is not able to find a vein, especially in preterm and infants(3). To overcome this problem, transillumination devices have been developed(7). This study was conducted to assess the nurse's knowledge and practice regarding use of transillumination device for establishing venous access (9).

The present study indicates about the demographic variables, thatthe majority 50% of the nurses were under the age group of 31yrs and above, 30% were under the age group of 27-30 yrs old and 20%were under 23-26 yrs old. Most of the 95% nurses were bachelor's degree and only 5% was master's degree, No diploma holders present. The year of experience were majority of nurses 35% had 7-9 yrs., 25% had 4-6 yrs., 20% of them had 2-3 yrs and 10 yrs and above the same. Designation includes Almost 50% of the nurses were working as a Charge Nurse, among 45% as staff Nurse and only 5% as Head Nurse.

Recent study showed that, they surveyed after instruction and demonstration on use of Veinlite. Participants' intravenous access experience ranged from 31-35 years. 89% (42) of participants agreed that the Veinlite is a useful device in the identification of intravenous cannulation sites. Of the participants, 45% (21) stated the Veinliteactually changed the location of choice of intravenous access of the arm, and 79% (37) of participants would use the Veinlite in practice if it were available to them. The majority of participants, 68%(32) agreed that the Veinlite was very easy to use. No one felt that the veinlite was difficult to use. Very easy was 68% of the partcipants, Easy 21%, somewhat easy 11%

This study represents that, regarding the use of transillumination device practices as majority 60% of the nurses has venipuncture practice more than 5 years , most of them 70% has primary employent in NICU department, 90% of them found that veinlite was helpful in identifying vein for cannulation. By using veinlite 85% of them had changed cannula site choice; which means blindprick avoided and started practising transillumination device.Obviously, 100% of the nurses perform cannulation in first attempt because they were well experienced in NICU.So, literature says; thatsuccess of the first attempt was significantly higher in the transillumination device(8). Before explaining about transillumination device, 65% of the nurses had no awareness of using veinlite. 100% of the nurses used 26G size cannula and 80% of them preferred upper limb for successful cannulation. Furtherly, 85% assures that they could incorporate transillumination device into practice. The opinion of 65% nurses feels, transillumination device was easy to use. 30% was somewhat easy to use. Only 5%felt that the veinlite was difficult to use; which means these nurses needs additional training and practice.

The study reveals thatmajority 65% of the nurses had the average Knowledge and practice, remaining 35% of nurses had good knowledge and practice regarding use of transillumination device for establishing venous access.

Literature's prove that use of transillumination device is effective for performing intravenous access in first attempt(6). The Nurses working in the NICU department need to know about the use of venous access devices. Staff should know how to use and its techniques to prevent further harming the neonates. These methods can be obtained by improving knowledge and practice with the help of education given at periodical intervals.By conducting this study in the region of Hail, may create a new knowledge and practice to clinical setups.

10. Conclusion

In this study, most of the 65% NICU nurses has only average and 35% has good knowledge and practice regarding use of transillumination device for establishing venous access. Such studies will improve the knowledge and practice of staff nurses through continuous motivation, trainingand Evidenced-Based technologies. Suitable interventional packages need to begiven periodically for the effectiveness of qualitative nursing service.

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