



# Influence of nurse performance on children's anxiety and pain during venipuncture procedures: An observational study

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## ABSTRACT

**Introduction:** Venipuncture has been practiced for centuries and is still one of the most common invasive procedures in health care. However, practice varies considerably between countries and between institutions and individuals within the same country. The purpose of this study was to examine the association between nurses' clinical performance and the level of pain and anxiety experienced by children during venipuncture procedures.

**Methods:** Participants were conveniently enrolled in this prospective cross-sectional study, the pain and anxiety levels of 400 children aged 6-12 years old were measured and correlated with measurements of clinical performance by 20 nurses during the venipuncture procedure. A major pediatric hospital in Iraqi Kurdistan recruited patients for 3 months between September 2019 and August 2020.

**Results:** The study found that there was no statistically significant difference in the overall clinical performance of male and female nurses or between those who worked in different departments. However, nurses with a higher level of education, whether working in the public or private sector, had higher levels of clinical performance. The level of pain and anxiety of children during venipuncture decreased significantly in relation to increased levels of nurse performance ( $r$ -values:  $-0.137$  and  $-0.137$ ), which included both their pain-related performance ( $r$ -values:  $-0.224$  and  $-0.229$ ) and their anxiety-related performance ( $r$ -values:  $-0.177$  and  $-0.204$ ;  $p < 0.0001$ ). The factors contributing to higher levels of clinical performance by the nurses during venipuncture procedures were a higher level of education, sufficient sleep and working in the medical department, being older in age, and having longer clinical experience.

**Conclusions:** This study highlights that children's pain and anxiety decreased when nurses' clinical performance levels increased. The levels of pain and anxiety in the children were significantly decreased in those patients who received better clinical treatment from nurses during the venipuncture procedure.

**Keywords:** Nurses; performance; children; pain; anxiety; venipuncture

## INTRODUCTION

Phlebotomy and venous cannulation are the invasive procedures most frequently performed in pediatrics and they are the most distressing (1). During hospitalization, pain and anxiety are common problems among children, due not only to their disease but also to the painful medical procedures, they must undergo (2).

There is no doubt that intravenous procedures are a significant source of pain in children. Health-care providers should aim for proactive solutions to manage this situation (3). Poorly managed pain during venipuncture and IV insertion can have short- (e.g., anxiety, avoidance behaviors,

and somatic symptoms) and long-term (e.g., increased pain sensitivity, anxiety, and avoidance of health care in adulthood) effects.

Unsafe phlebotomy can cause adverse effects in patients; such effects are rare but range from pain or bruising at the injection site to fainting, nerve damage, and hematoma, (4), while errors in form completion and patient identification are common, costly, and preventable (4). Furthermore, failure to manage needle-related pain may increase the workforce, resources, and time needed to complete procedures, thereby reducing the satisfaction of health-care providers concerning the procedures (3). There are many evidence-based pharmacological (e.g., topical anesthetic) and psychological (e.g., hypnosis and distraction) interventions available to manage pain and distress in children undergoing procedures (5,6).

The use of the best practice in phlebotomy decreases risks to both patients and health-care staff (4). The level of

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performance will differ between countries, organizations, and even between people within the same organization (7). Nurses without adequate resources or managerial support may not deliver complete care, and the quality of their care may also be reduced (8). Cooperation with the patient, appropriate equipment, avoidance of contamination, and updating and training courses for nurses are all factors that can improve safety standards and quality of care (4).

Nurses spend more time with the patients than any other health-care provider, and the quality of their care impacts patient outcomes. Improved patient safety can, therefore, be achieved through better nurse performance (9). Research shows that the nurse's working environment frequently fails to match the individual's capacities and strengths and that nurses frequently work under cognitive, perceptual, and physical overload. Working under conditions of cognitive stress and regular interruption, nurses must cope with several tasks simultaneously, while also dealing with inadequate lighting, illegible handwriting, and badly constructed labels (9).

The significance of this study is that, worldwide, there are no studies that examine the precise practices of nurses in relation to children's pain and anxiety during painful procedures, and there are no local studies in Iraqi Kurdistan that examine nurses' practices during such procedures. In Iraqi Kurdistan, health care is provided almost cost free through centralized systems, such as the Ministry of Health services. This is the first Iraqi Kurdistan nursing study that relates the question of children's pain and anxiety to nurses' practices and the quality of the nursing care delivered during the children's venipuncture procedures.

Worldwide, and especially in LAMI countries, training courses, workshops, and conferences are seldom provided in hospitals to train nurses in the correct delivery of painful nursing procedures (10). This means that many nurses have poor performance skills because their practice has not been updated through training courses, workshops, seminars, etc. This study aims to examine the association between nurses' performance and the pain and anxiety experienced by children during venipuncture procedures in a pediatric hospital. We hypothesize that low levels of clinical performance by the nurses lead to increased pain and anxiety in the children during painful procedures.

## METHODS

A prospective cross-sectional design was selected for this study. The study method was based on the STROBE guidelines for cross-sectional studies. The setting of the study was the Heevi Pediatric Teaching Hospital. This hospital is the main pediatric hospital in the Duhok Province of Iraqi Kurdistan, and it cares for children in a number of different units, such as the emergency, premature intensive care unit, medical wards, operation room, surgical ward, and intensive care unit. Data collection for this study was conducted in a large pediatric hospital in Iraqi Kurdistan that recruited patients for 3 months between September 2019 and August 2020. The study had two groups of participants. The first was made up of 20 nurses who perform venipuncture on children admitted to the pediatric hospital. The nurses worked in different departments and on different shifts.

They worked either in the medical, surgical, or emergency departments, and they worked either morning, evening, or night shifts. All the nurses worked full time, but their education levels differed, and their clinical performance was measured in the morning shift (8 am-2 pm). The second study population consisted of 400 children who were admitted to the hospital and required venipuncture procedures for their respective medical conditions. These pediatric patients were recruited conveniently from different departments, including medicine, surgery, and emergency departments. Children who were admitted to these departments had some medical conditions such as gastric diseases or children requiring surgery. The nurses included in this study had different educational levels, were of both genders, worked in different clinical departments, and all worked shifts. The clinical departments included were the medical, emergency, and surgical wards. Any nurse from these wards aged 18 years and older was eligible to participate in the study.

The children included in this study were 6-12 years of age and both of genders. Practices of the nurses other than venipuncture procedures were excluded from the study. To reduce possible measurement bias related to nurses' performance, this study excluded patients with chronic pain ( $n = 6$ ), intellectual disability, or mental retardation ( $n = 2$ ), chronic disease ( $n = 10$ ), and critically ill patients in intensive care units because patients may not express their pain and anxiety only during painful procedures. Questionnaires were created for both nurses and children, and general information about the patients or nurses was recorded in the first part of these questionnaires. The general information for nurses included age, gender, educational level, working departments and working shifts, health sector, clinical experience in nursing, experience in pediatric units, training courses are taken, physical activity, alcohol status, smoking, and sleeping hours. The working shifts were categorized as morning (8 am-2 pm), evening (2 pm-8 pm), and night (8 pm-8 am). The nurses had either graduated from high school (completing 3 years of nursing at school), from the institute (completing 2 years of nursing at university), or had a bachelor's degree (completing 4 years of nursing at university). The health sector category indicated whether the nurse worked in the public, private, or in both the public and private sectors. The general information about the patients included age, gender, condition, health status stable, clinical department, and hospitalization duration, recorded in days. The general information about both nurses and patients was recorded before starting the observations of venipuncture procedures.

The severity of the children's pain was measured with the Faces Pain Scale-Revised (FPS-R). The FPS-R is ranked on a scale of 0-10 in which six cartoon characters have expressions indicating "no pain" to "very painful." The children are asked to show how much discomfort they experienced by identifying with a particular facial expression. The procedure is standardized, and the FPS-R scale is considered a valid measure for the level of pain in children (11). Using self-reported pain severity ratings, children rate their pain after venipuncture has ended and been documented by the first author.

Developed by McMurtry et al. (12), the Children's fear scale (CFS) is used to evaluate the anxiety level of 4-10-year-old

children. Five images of cartoon faces are used in the scale. Anxiety level is evaluated by numbers between 0 and 4. The 0 point indicates "no anxiety" and 4 indicates "severe anxiety." The CFS is considered a valid and reliable tool for measuring pediatric fear (12). A self-report anxiety scale was used, and each child was asked to rate their anxiety severity. The child's score was documented by the first author after the venipuncture procedure was complete in the morning shift.

A study-specific observational scale was developed as a venipuncture procedure checklist based on a review of relevant literature from books, guidelines, and articles describing similar tools (4,13,14). This aimed to address parameters relating to the clinical performance required of nurses working with pediatric patients. In particular, it aimed to evaluate items of performance that related to decreased levels of pain and anxiety during venipuncture procedures. The study-specific observational scale has consisted of 33 items. The items on reducing pain and anxiety in children during procedures included 11 items. Five clinical performance items concerned the nurse's actions as they related to anxiety reduction in the child. Six clinical performance items concerned the nurse's actions as related to pain reduction in the child. The other 22 questions were all about nurses' professional skills and not about reducing children's pain and anxiety during procedures. All items were scored as correctly done, incorrectly done, or not done. The study-specific observational scale was submitted to a group of experts in the field of clinical nursing practice, both internationally and locally, and the comments and suggestions of this expert group were reviewed, and necessary changes were made as indicated. In addition, the face validity concept was used to validate this tool by evaluating the performance of 10 nurses in pilot research, as a study-specific and face validity. The clinical performance of the nurses in the study was measured by the first author during the procedure and recorded on the study-specific observational scale. The first author is a master's level and doctoral student who has worked in pediatric nursing for more than 15 years.

This paper is a part of a Ph.D. program. Ethical approval was received from the Science Research Division, Directorate of Planning, Duhok General Directorate of Health in Duhok, registered as 10092019-6 on September 10, 2019. Authority to report the results of this study was granted in 20072020-3 on August 23, 2020, and reviewed by the committee/manager of the Heevi Pediatric Teaching Hospital. The study was performed according to the modified Declaration of Helsinki. Written consent was, therefore, taken from the nurses recruited to the study before their inclusion. There was no potential risk to the participants in the study. We received verbal consent from the parents of children who participated in the study because we observed only those who were undergoing invasive procedures anyway, and no invasive procedure was applied for the purposes of the study.

The sample size was based on the estimated number of patients who would be admitted into the hospital within the 3 months of the study. According to the number of business hours and admissions of children, we expected that between 900 and 1000 children would be admitted to

the different clinical wards. The sample size was calculated using the Slovin formula.

$$n = \frac{N}{1 + Ne^2}$$

In this regard:

$$n = 900/1+900 \times (0.05 \times 0.05) = 900/3.25 = 277$$

$$n = 1000/1+1000 \times (0.05 \times 0.05) = 1000/3.5 = 286$$

The sample size needed was, therefore, between 277 and 286. However, we increased the sample size to 400 patients to compensate for possible missing information. Twenty nurses performed venipuncture, and each nurse performed the procedure on 15-25 patients in the hospital.

The statistical screening was performed to identify outliers and continuous variables, which included clinical performance, and the general and clinical characteristics of the nurses and patients. The general characteristics of the patients and nurses were presented in means (with std. deviation) or as a number (percentage). The level of anxiety and pain of the patients and the clinical performance of the nurses were determined by means (std. deviation). A comparison of the total clinical performance of the nurses as applied to different children during venipuncture procedures was examined using an independent t-test or one-way analysis of variance (ANOVA). Correlations between the clinical performance of nurses during venipuncture and their general and clinical characteristics were examined using bivariate regression. The role of the general and clinical characteristics of total clinical performance in a fit model was examined using a standard least square with effect leverage. A significant level of difference was determined by  $p < 0.05$ . The statistical calculations were conducted using JMP Pro 14.3 software.

## RESULTS

In this study, 400 children and 20 nurses were included in the study. The mean values of age and hospital stay duration of children were 8.21 years and 2.90 days, respectively. Most of the nurses were female, had a high school diploma, worked in the public sector in pediatric units for 12 years, and did not have the educational training described in Table 1. The study found that the pain-related items were performed incorrectly done or not done at all by the nurses during the venipuncture. The anxiety-related items were also performed incorrectly done or not done at all by the nurses during the venipuncture. Of all the procedures, 60% were performed incorrectly or not at all, and this includes items relating both to pain and anxiety. In addition, pharmacological and pain distracting interventions were identified, more than 98% of potential pain and anxiety-reducing activities observed were performed incorrectly or not at all (Table 2).

A non-significant difference was found between overall venipuncture performance as applied to male and female patients, calculated through a t-test ( $p = 0.112$ ). In addition, a one-way ANOVA showed that the overall performance of venipuncture was similar among patients admitted to the different pediatric wards ( $p = 0.112$ ). Similar patterns were found for overall venipuncture performance by both male

**TABLE 1.** General characteristics of patients, nurses, and their outcomes

Patients (n=400)	Frequency distribution		95% CI
	Mean	SD	
Patient's age (6-12 years)	8.21	1.51	8.06-8.36
Hospitalization day (3-6 days)	2.90	1.34	2.77-3.03
Patients (n=400)	Frequency distribution, n (%)		95% CI
Patient gender			
Male	204 (51.0)		46.3-55.8
Female	196 (49.0)		44.3-53.8
Child department of admission			
Medical department	321 (80.3)		76.5-84.3
Emergency department	69 (17.3)		13.8-20.8
Surgical department	10 (2.5)		1.0-4.3
All children had the stable condition during data collection			
Characteristics (n=20)	Frequency distribution, n (%)		95% CI
Age (25-57 years), mean (SD)	39.40 (10.85)		38.21-40.48
Nurses' experience in nursing (3-28 years)	12.35 (7.91)		11.57-13.12
Working in pediatric departments (3-28 years)	12.0 (7.70)		11.24-12.75
Sleeping (4.5-8 hours), mean (SD)	6.35 (1.35)		6.23-6.50
Characteristics (n=20)	Frequency distribution		95% CI
	Mean	SD	
Gender			
Male	4	20.0	16.0-23.8
Female	16	80	76.3-84.0
Education levels			
High school	13	65.0	60.3-69.0
Institute	5	25.0	21.0-29.3
College	2	10.0	7.2-13.0
Working department			
Medical ward	13	65.0	60.5-69.5
Emergency	3	15.0	11.5-18.5
Surgical ward	4	20.0	16.0-24.3
Working sector			
Public	15	75.0	71.3-79.8
Both public and private	5	25.0	20.3-28.7
Outcomes	Frequency distribution		95% CI
	Mean	SD	
Child's anxiety (range: 1-4)	3.05	0.95	2.95-3.14
Child's pain (range: 3-9)	7.42	1.87	7.23-7.60
Total clinical performance score (range: 1-33)	5.10	2.71	4.86-5.38
Anxiety-related performance score (range: 0-5)	1.44	1.25	1.32-1.56
Pain-related performance score (range: 0-6)	1.92	1.42	1.78-2.06

All nurses were not received educational training, were nonsmokers, had no physical activity, and were non-alcoholics. SD: Standard deviation, CI: Confidence interval

and female nurses, and among nurses working in different departments. However, nurses with a higher level of education had a significantly higher level of overall venipuncture performance, as did those who worked in both the public and private sectors (Table 3).

Study results showed that nurses' clinical performance in reducing anxiety and pain improved as a result of their increasing experience in nursing generally and in the clinical unit specifically (Figure 1). The levels of pain and anxiety in the children were significantly decreased in those patients who received better clinical treatment from nurses during the venipuncture procedure. However, the clinical performances of nurses also improved in relation to increased hours of sleep (Table 4).

The study showed that total clinical performance was modified by the nurse's education, hours of sleep, department in

which they worked, the nurse's age, and work experience in the clinical nursing sector. Other factors did not affect their total clinical performance (Table 5).

## DISCUSSION

Nurses' clinical performance plays an important role to manage the discomfort of painful procedures such as pain and anxiety. It is assumed that low levels of clinical performance by the nurses lead to increased pain and anxiety in the children during painful procedures. The present study shows that the nurses' total clinical performance and overall performance relating to the reduction of anxiety and pain were of a low level, resulting in increased pain and anxiety among the children during venipuncture. The nurses' performance improved significantly with increased nursing experience and with experience in the pediatric clinical

**TABLE 2.** Nurses' performance score related to pain and anxiety performance score

	Item performing score, n (%)		
	Correctly done	Incorrectly done	Not done
<b>Pain-related performance score (n=400)</b>			
Accurate assessment of vein access and selection of the most optimal vein and site for insertion (palpation, visualization, fluoroscopy, or ultrasound)	160 (40.0)	164 (41.0)	76 (19.0)
Using pharmacological approaches to managing pain during venipuncture (local anesthetic)	0 (0.0)	0 (0.0)	400 (100.0)
Position the patient's arm/hand in a comfortable, extended position that provides sufficient access to the planned insertion site	162 (40.5)	136 (34.0)	102 (25.5)
Clean/disinfect the solution from the puncture site and let it dry for 30-40 seconds	143 (35.8)	181 (45.3)	76 (19.0)
Use a non-dominant hand to apply traction to the skin linearly or circumferentially to stabilize the vein	151 (37.8)	123 (30.8)	126 (31.5)
Position the needle hub upward and insert the needle into the skin at a 15-40° angle proximal to the vein	153 (38.3)	171 (42.8)	76 (19.0)
<b>Anxiety-related performance score (n=400)</b>			
Greet patient in a friendly and formal manner and introduce self to parents and patient	157 (39.3)	131 (32.8)	112 (28.0)
Explain the procedure to the child and family, relative to the child's age, and understanding	138 (34.5)	114 (28.5)	148 (37.0)
Communication and discussion with the patient and parents and be prepared to answer any questions they may have	148 (37.0)	172 (43.0)	80 (20.0)
The child was restrained and distracted with the help of a nurse or others during the procedure	5 (1.3)	271 (67.8)	124 (31.0)
Keep the patient in a comfortable position (quiet environment and presence of parents)	131 (32.8)	149 (37.3)	120 (30)

**TABLE 3.** Comparisons of total clinical performance score of nurses applied to different children during venipuncture procedures

Patients' characteristics (n=400)	Total clinical performance		p	Effect size (Cohen's d)
	Mean	SD		
<b>Gender</b>				
Male	5.31	2.80	0.112 <sup>a</sup>	0.21
Female	4.88	2.60		
<b>Child department admission</b>				
Medical department	5.25	2.72	0.112 <sup>b</sup>	0.28
Emergency department	5.18	2.74		
Surgical department	4.53	2.60		
<b>Nurses' characteristics (n=20)</b>				
	Total nursing performance		p	Effect size (Cohen's d)
	Mean	SD		
<b>Gender</b>				
Male	4.81	3.02	0.286 <sup>a</sup>	0.14
Female	5.17	2.62		
<b>Level of education</b>				
High school	4.91	2.93	0.023 <sup>b</sup>	0.37
Institute	5.15	2.07		
College	6.17	2.40		
<b>Working department</b>				
Medical	5.25	2.72	0.112 <sup>b</sup>	0.28
Emergency	5.18	2.74		
Surgical	4.53	2.60		
<b>Working sector</b>				
Public	4.76	2.81	<0.000 <sup>b</sup>	0.55
Both public and private sector	6.13	2.08		

<sup>a</sup>An independent t-test and <sup>b</sup>one-way ANOVA were performed for statistical analyses. The first choice was considered the reference in calculating the effect size. SD: Standard deviation

**TABLE 4.** Correlations of clinical performance score of nurses during venipuncture with general and clinical characteristics

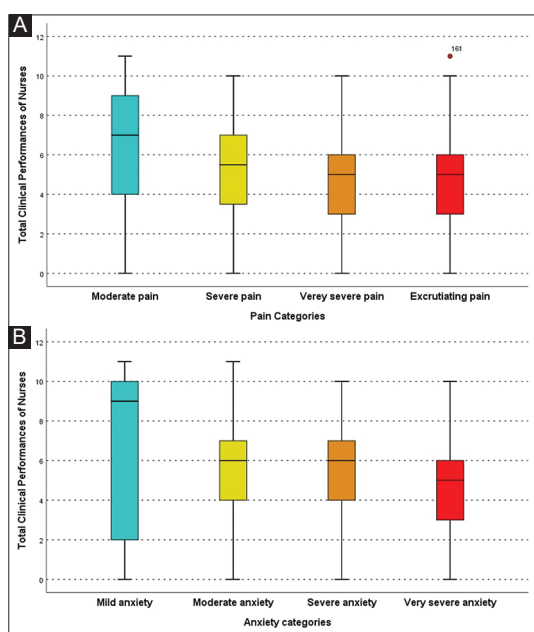
Characteristics (n=400)	Clinical performance r value (95% CI)		
	Total performance score	Anxiety-related performance score	Pain-related performance score
Clinical experience in nursing	0.342 (0.252-0.456)	0.164 (0.067-0.259)	0.146 (0.49-0.240)
Working experience in the pediatric unit	0.325 (0.234-0.410)	0.150 (0.053-0.245)	0.164 (0.0670-0.258)
Sleeping h	0.265 (0.171-0.353)	0.274 (0.180-0.362)	0.305 (0.213-0.391)
Children' anxiety	-0.137 (-0.232--0.040)	-0.204 (-0.230--0.108)	-0.229 (-0.320-0.134)
Children's pain	-0.137 (-0.231-0.040)	-0.177 (-0.271-0.080)	-0.224 (-0.31--0.129)

p<0.0001 for all correlations. Bivariate regression was performed for all statistical analyses. CI: Confidence interval

**TABLE 5.** Role of general and clinical characteristics on total clinical performance score in a fit model

Controlling factors (n=400)		Log worth	p
Nurses' education	29.043		0.001
Sleeping hours of nurses	12.253		0.001
Working departments	5.436		0.003
Age of nurses	2.351		0.003
Clinical experience in nursing	2.132		0.008
Sector	1.515		0.052
Gender of nurses	0.675		0.399
Experience in the pediatric unit	0.247		0.516
Child's hospitalization	0.072		0.807

The standard least square with effect leverage was performed for statistical analysis. The red bold numbers show the controlling factors to the total clinical performance of nurses during venipuncture procedures

**FIGURE 1.** Comparisons of clinical performances of nurses in patients with different pain levels (A) and different anxiety levels (B).

unit, as well as with increased hours of sleep. The pain and anxiety scores were significantly lower in pediatric patients who received venipuncture from nurses with better clinical nursing performance.

According to the checklist (study-specific observational scale) developed for the evaluation of venipuncture procedures in this study, the nurses in this hospital did not follow either local or international guidelines for painful procedures; nor had they received any educational program in the hospital related to painful procedures, such as training, seminars, or lectures aimed at improving their skills and performance and the patients' outcomes. The majority of the nurses did not use analgesics or distraction techniques during the painful procedures. In the developing countries, international and local guidelines recommend the inclusion of both pharmacologic and non-pharmacologic techniques to be used with children during painful procedures (15,16). In the absence of these techniques, pain and anxiety are increased in pediatric patients during venipuncture.

To the author's knowledge, no similar studies are available, and therefore, no comparisons can be made with this study. However, these results indicate that a substantial percentage of venipuncture procedures are performed incorrectly

or are not performed within an acceptable range according to standard teaching. Others have found that there is a correlation between nurses' clinical performance and their educational qualifications, training, experience in pediatric units, and sleep hours when providing nursing care to pediatric patients (17). The poor results of the present study may be due to a lack of nursing skills relating to the various aspects of phlebotomy. In addition, they may be due to inadequate basic education, a lack of orientation and in-service training programs, and the reduced sleep hours of the nurses, all of which impact their clinical performances in the pediatric wards.

The education of nurses plays a significant role in improving their performance in clinical care and improved education has led to a decrease in complications resulting from nursing tasks. According to Lu et al. (18), the educational level of nurses influences their views and experiences of their working lives, pointing to a need for a clinical development ladder for nurses. The educational levels in the present study showed that most nurses had completed a low level of nursing education in school. They also showed that nurses with a higher level of education (nursing college) demonstrated a range of correct clinical procedures as a result of the acquired knowledge and skills, they were able to put into practice.

Regarding training courses for nurses, the present study showed that in-service nursing training is poor. A study shows a positive relationship between training courses and nurses' clinical performance in caring for patients (17). Moreover, this study finds that nurses who have received specific training perform better than those who have not received training. From the authors' observations, training in painful procedures will improve nurses' performance and patient outcomes (by reducing pain and anxiety during procedures). The seminar method was also found by Ahmed et al. (19) to be very effective in terms of patient safety, nursing errors reduction, and overall quality improvement.

Regarding the relationship between the sleep hours of nurses and quality of care and patient outcomes, Stimpfel et al. (17) showed that short sleep duration is significantly associated with lower ratings of quality of care and patient outcomes (17). The results indicate that nurses who have difficulty staying awake on the job are more likely to report an error. In agreement with Stimpfel et al., we found that short sleeper nurses have a lower score in clinical performance on giving venipuncture care to pediatric patients.

The patients' pain and anxiety were related to the nurses' competence as indicated by the following clinical performance indicators.

Dougherty and Lister (20) demonstrated that the selection and accurate assessment of children's veins affect their perception of pain during venipuncture. According to the authors of this study, only a few nurses correctly selected and assessed the vein of the child for venipuncture. Evidence-based interventions encourage the use of topical anesthetics as a pharmacological option since they are non-invasive and offer good anesthetic results (5). For the management or elimination of pain, this is a national standard of care for pediatric patients (4). Despite the clear evidence for this interventional step as a clinical service for venipuncture, none of the nurses in this study used topical anesthetics to relieve pain in children.

Guidelines recommend that the skin at the venipuncture site should be cleaned with a sterile disinfectant, starting at the center and moving downward and outward over an area of at least 2 cm square, and should be allowed to dry completely for at least 30 seconds (21). In our study, most nurses cleaned the site, but very few allowed the alcohol to completely dry, so the children felt discomfort after a disinfectant solution penetrated the punctured area.

To ensure atraumatic skin entry and to reduce pain (20), the needle should be positioned with the hub upward and be inserted into the skin at a 10-30° angle proximal to the vein. The upward bevel of the needle makes it easier to insert the needle into the skin and causes less pain to the patient. In this study, only a few nurses performed this step correctly, which resulted in higher pain levels for patients. Based on the guidelines of the World Health Organization (4), a child in a comfortable position with his/her arm extended and anchored and tightened skin at the puncture site experiences less pain. In contrast, the needle insertion may become more difficult and increase the pain. Only a few nurses in this study followed this step correctly. This point could be one of the risk factors for increasing pain among children.

Concerning the preparation of the patient, Perry et al. (22) stated that the provision of clear and comprehensive information relating to a procedure significantly reduces patient anxiety. In addition, the patient's cooperation reduces their anxieties through the child or parent understanding the procedure. To prevent fear and anxiety, it is important to inform patients about procedures before they undergo them as part of nursing. Only a few of the nurses in this study have followed this important step, which is regrettable.

Some studies have evaluated the role of positive and effective communication by nurses with patients in addressing their concerns and helping to alleviate their anxiety (23,24). In this study, only a few nurses communicated well and correctly with their patients. In addition, the role of the presence of a family member during a painful procedure in decreasing a child's anxiety has been mentioned in some studies (25,26). However, the parental presence was too rarely observed in our study.

There is strong evidence that distraction techniques such as squeezing a softball, balloon inflation, and distraction cards are effective in reducing children's perceived pain

and anxiety during needle insertion (27). The findings of this study indicate that the nurses did not distract the children adequately during the venipuncture in most of the observations. The nurses in this study had not received any training nor did apply recent international guidelines to improve their knowledge and practice in this area. This could be an explanation for why pediatric distress was increased.

### **Strengths and limitations**

The researchers attempted to include a representative sample of the targeted population in this study. This is the first study conducted in Iraqi Kurdistan to stimulate this issue in medical settings to pediatric patients. In addition, we tried to include the most important factors related to pain and anxiety in children. The scope of the study could be expanded to multiple hospitals. However, it would be hard to make a between-study comparison due to different study designs, places, and patient comorbidities. We did not include the number of venipuncture procedures received by the patients before data collection. In addition, we did not use the DIVA scale to measure the difficulty of venipuncture procedures.

### **CONCLUSIONS**

We showed that higher clinical performance by nurses is associated with a lower level of pain and anxiety in children during venipuncture procedures. The clinical performance of nurses is improved through increased nursing experience and by working in a pediatric unit. The low educational background of nurses contributed to children's pain and anxiety.

### **RECOMMENDATIONS**

It is recommended that pediatric hospitals plan appropriate training courses on venipuncture procedures. The training courses could cover pharmacological and non-pharmacological techniques and help in improving the knowledge skills of nurses to alleviate the children's pain and anxiety during painful procedures. In addition, a brief education module for nurses focusing on fear and pain mitigation and showing how to use a few simple techniques is important. Future studies can be conducted in multiple settings, country wide, to provide a more accurate picture of the effect of clinical performance on pain and anxiety during the venipuncture procedure.

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### **DECLARATION OF INTERESTS**

There are no conflicts of interest.

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