

Original Article

Nurses' learning of Infants' venipuncture based on Kolb's learning theory

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ABSTRACT

Introduction: Learning methods and styles greatly affect both instruction method and perception of the learners. Due to the high rate of infant hospitalization and the need for technical procedures such as venipuncture, it is necessary to provide neonatal nurses with a correct and effective training for correct techniques.

Objective: To determine the learning rate of nurses about venipuncture insertion based on Kolb learning theory. **Method:** A clinical trial was carried out in 2018, recruiting 60 nurses from selected hospitals, affiliated with Isfahan University of Medical Sciences. The participants were given a pretest and then were filmed while performing venipuncture with the exception that those recruited to the intervention group were trained based on Kolb's theory after the pre-test. A post-test was conducted with the whole participants after one month. Then, data were analyzed by SPSS 21 software.

Results: The results showed that the average result in the intervention group was 58.83% before intervention and increased to 78.67% after the intervention. The paired *t*-test also showed a significant difference before and after the intervention ($P < 0.001$). Also, independent *t*-test showed that the mean increase of learning rate of the intervention group was significantly higher after the intervention compared to the control group ($P < 0.001$).

Conclusion: Using Kolb's learning theory, nurses could better learn infants' venipuncture.

1. Introduction

Education and learning have always been considered as a reciprocal process (Du Gas, 2002). Learning is a process of adaptation and coping with the environment. It does not take place in the same way everywhere, and the learners do not learn at a same rate (Ahadi et al., 2009). People react differently in different situations, which may result from their different learning styles. Like mentioned earlier, learning method and style greatly affect learning (BurskeyCynzthia, 2004). In Iran, mentors teach neonatal nurses intravenous insertion or venipuncture as continuing education courses (Curative office of Isfahan University Of Medical Sciences, 2017), but, the problems persist since nurses do not comply with the standards; and the infant suffers during venipuncture. Thus, it seems that Kolb's learning theory may be useful in training the nurses to this procedure.)Diagram 1 and 2).

David Kolb's learning theory is a two dimensional and the most useful learning pattern. It is in four stages each of which represents the individual's type of processing information (Don Clark, 2000). Learning is considered to happen in a cycle with four successive stages. These stages are: 1. DO (concrete experience) 2- WATCH AND LISTEN (reflective observation) 3. THINK (abstract conceptualization) 4- PLAN

(active experimentation) (Gholizadeh and Ghodsi, 2012). Learning methods include reflective observation versus active experimentation and concrete experience versus abstract conceptualization. Kolb specified four divergent, convergent, assimilator, and accommodator learning methods to determine the extend of learning in each individual (Sarpchami and Hossaini, 2004).

Convergent learners learn by thinking about topics and performing practically. Divergent learners, however, learn through concrete experience and observation. Their ability to see different situations from different points and to organize the links as a whole is significant. Learners with accommodator learning styles learn by experimenting and doing. The greatest ability of this group is working with objects and gaining new experiences. Learners with an assimilator learning style learn by thinking and in-depth observation. They organize information very well and use abstract concepts for understanding situations (Meyari et al., 2010).

It is very important to percept painful procedures such as inserting intravenous and train nurses as well (IV), especially in neonatal units. To this end, learning theories can be helpful to improve the quality of care as a result of improved training, especially in specialized units. Whereas the care processes should be carry out according to the

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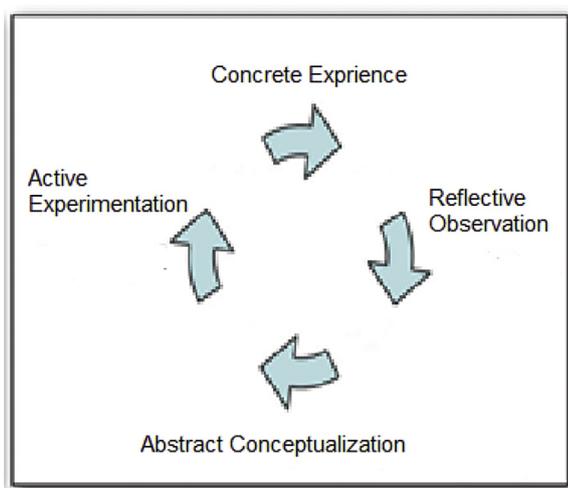


Diagram 1. Kolb's experiential learning cycle.

existing principles and standards, the nurses need a thorough knowledge about the underlying principles and work procedure. Standards describe the desirable level of function of the nurses, according to which the quality, structure, process and outcome of their work are assessed (Sahebzadeh et al., 2010). Recent studies have shown that countries that use standardized clinical protocols have experienced significant improvement in society's health. Therefore, safety standards and rules must be observed to improve the safety of patients and personnel in hospitals (Khalooei et al., 2013; Fluck and Kumwenda, 2011). Venipuncture is one of the most common painful invasive methods that are repeatedly used to provide fluid and electrolytes, intravenous nutrition and infusions of the drugs needed by the infants (Hosseini et al., 2014). Maintaining standards requires the in-process observation of the procedures. (Hockenberry et al., 2013). Venipuncture standards include using sterile technique, infection prevention, careful skin care and reducing infant's pain during the procedure, based on the evolutionary care philosophy, to prevent adverse outcomes in the future. Ultimately they ensure effective training to the staff and supervision of personnel performance (Verklan and Walden, 2014).

Considering the importance of the above items and Kolb's learning theory; this study was conducted to determine the effectiveness of learning how to perform venipuncture by nurses based on Kolb learning theory with the aim of creating a new educational method.

2. Method

This study is a clinical trial (IRCT31991). The study participants included 60 nurses working in the Neonatal Intensive Care Unit (NICU) at the selected hospitals affiliated to Isfahan University of Medical Sciences who fulfilled the criteria for entering the study.

The learners were identified through a convenience method from among nurses working different shifts on NICU who fulfilled the research criteria. The subjects were randomly assigned to intervention and control groups. For random assignment, in each hospital, the names of 60 nurses who were willing to participate in the research were listed and numbered from 1 to 60. Then, in SPSS, two groups of 30 were randomly generated according to this list, a control and an intervention group.

The inclusion criteria of this study were a bachelor's degree in nursing, at least 6 months of clinical experience, and performing clinical tasks at the time of study; and the criteria for the entry of newborns were lack of any special or critical conditions.

Exclusion criteria included the unwillingness of the nurse to complete the checklist of neonatal venipuncture standards and to be observed by or engage with the researcher. The data collection tool was a

researcher-made two-part checklist. The validity of checklist was confirmed by 10 academic members of the nursing faculty and skilled nurses in a teaching hospital. The first part collects demographic information from the participants and the second part consists of 20 questions in four areas (pain control during venipuncture, cleanliness and sterile technique, observing the principles of venipuncture and examining the complications), and is completed by the researcher. Data collection was done through a check list of venipuncture standards, scored by zero and one (zero = doesn't do, one = does). The maximum score is 20 and the minimum is zero. In this study, after the assessment, the final score was multiplied by 5 and expressed as a percentage.

In order to prevent information leakage between control and intervention groups, the co-researcher started with the control group. The pre-test checklist of each participants was completed. Then, the control group performed their routine tasks for one month time. It should be noted that the researcher did not run any intervention on the control group. Subsequently, a post-test similar to the pretest was completed by the researcher and her colleague.

After completing the pre-test for the participants of the intervention group were filmed while performing venipuncture. Later, in a gathering they were showed their own performances (Stage 1 of the Kolb theory), where they could share their comments and respond to any existing mistakes in their manipulations (Stage 2 of Kolb theory). Subsequently, they came up with requests for training and explanation of the proper technique for venipuncture; and the researcher responded as best she could. Nurses were also asked to comment on improving the process. In order to implement the stage 3 of the theory, the participants were required to think more about their own imperfections and make suggestions to improve their own performance. The researcher tried to put the theory into practice to facilitate better learning, reminding the principles of venipuncture during the process (stage 4 of Kolb theory). Finally, the checklist was completed by researcher's colleague. Regarding ethical considerations, this study was approved by the Ethics Committee of Isfahan University of Medical Sciences and informed consent form for the cooperation of nurses and filming was given to the personnel. It is worth noting that this study was part of a larger study conducted by the researcher at Isfahan University of Medical Sciences.

3. Findings

Independent *t*-test showed that after intervention, the increased mean score from observing the standards of infant venipuncture (which indicates the amount of venipuncture learning in nurses) was significantly higher in the intervention group than in the control group ($P < 0.05$) (Table 1).

Additionally, the level of adherence to the standards observed in the intervention and control groups is provided in a frequency distribution table to determine the minimum and maximum compliance with the standards (Table 2).

The frequency distribution table shows that the mean level of observing standards before intervention was under 60% for both groups which increased in the intervention group to 78% and showed a growth about 20%. Of course, this growth is in the mean, and all the questions in the intervention group have grown from 0 to 56%, which indicates the impact of intervention on different issues regarding the level of compliance with the standards of venipuncture.

4. Discussion

The present study was conducted based on Kolb's learning theory and the findings showed that Kolb's learning theory can increase the average score for adhering to the standards of venipuncture in different aspects. The checklist of standards was a part of intervention. The results revealed that the minimum compliance with the standards was related to warming the area of puncture with warm cloths and promoting developmental care by covering the neonate's eyes from light

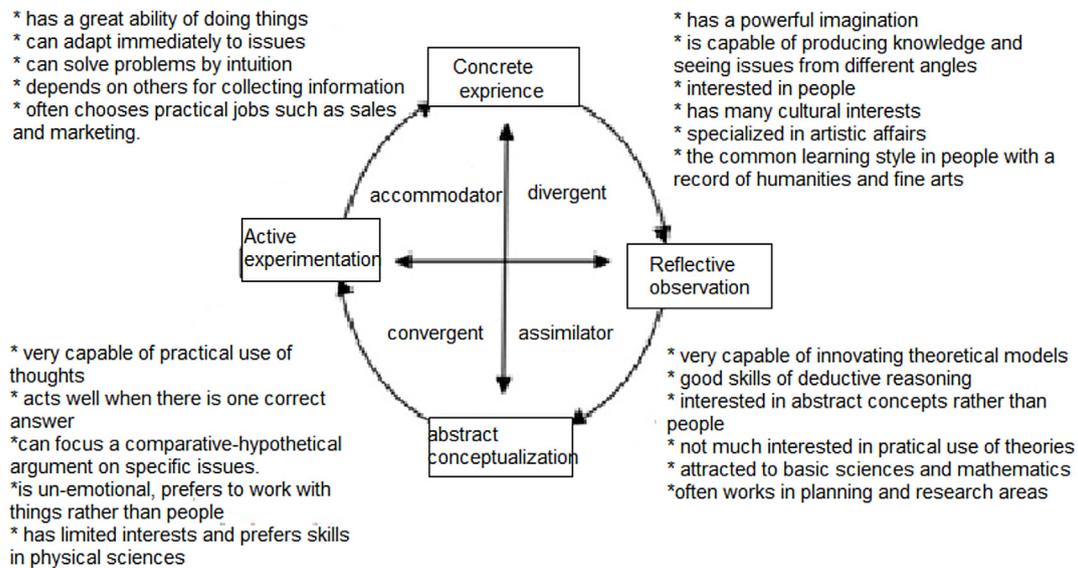


Diagram 2. Kolb's learning methods.

Table 1
Comparing the mean score of observing the standards of infants venipuncture in both groups before and after the intervention.

Time	Intervention		Control		Independent t	
	mean	SD	Mean	SD	t	P
Before intervention	58.83	10.23	59.75	7.75	0.39	0.70
After intervention	78.67	9.82	60.06	8.92	7.68	< 0.001

(less than 10% of nurses in the control and intervention groups followed these stages). The highest rate of compliance with standards were related to “If the needle enters alongside the vein rather than into it, withdraw the needle slightly without removing it completely”, which were done by all the nurses in both groups before the intervention. These stages are the necessary measures without which venipuncture is not possible, and all nurses followed these stages.

In the first stage of Kolb's theory (doing or concrete experience), the

problematic and obscure realities attract the learners' mind, in such a way that it enters a new experience completely without bias. In the present study, when the researcher showed the film to the staff, it was found that nurses were only focused on the path of the vein during the process, and did not pay attention to the infant's position, pain control, observance of standards such as disinfection of the insertion site, washing hands, wearing gloves, etc. In the second stage (watch and listen or reflective observation), nurses, saw their errors by watching the film, they looked at the subject from different angles and thought about the collected information; more than half of the subjects stated that they did not pay attention to the pain of the baby. In the third stage of Kolb's theory (think or abstract conceptualization) nurses achieve an insight about their experiences in the form of hypotheses. After watching the film and thinking about it, the nurses believed that they should use methods that minimize the pain of the baby, such as getting help from the mother and her presence during the venipuncture process, sucking a sucrose or milk-stained pacifier, holding the baby, etc. so that the baby is not injured and the venipuncture can be done faster and

Table 2
Frequency distribution of obeying neonatal venipuncture standards in the two groups before and after intervention.

Row	Items	Control		Intervention	
		Pre-test (%)	Post-test (%)	Pre-test (%)	Post-test (%)
1	Order physician for venipuncture	63.33	70	63.33	80
2	Preparing the equipment and putting them in the tray	30	33.33	26.67	83.33
3	Washing hands	26.67	26.67	50	66.67
4	Wearing gloves	36.67	40	56.67	93.33
5	Pain control by the pacifier	43.33	30	36.67	86.67
6	Doing developmental care	6.67	16.67	6.67	13.33
7	preparing tubes	100	96.67	96.67	100
8	Detecting the vein by using tourniquet	90	83.33	96.67	100
9	Warm the area of puncture with warm cloths	3.33	10	13.33	56.67
10	Choosing an appropriate size of intravenous cannula	90	86.67	80	93.33
11	Apply alcohol to the entry site and allow to air dry	70	63.33	50	73.33
12	Fixing the insertion site	100	100	100	100
13	If the needle enters alongside the vein rather than into it, withdraw the needle slightly without removing it completely	100	100	90	93.33
14	Performing standard procedures in case of hematoma or bleeding	93.33	100	86.67	96.67
15	Checking catheter openness and needle excision in case of successful puncture	96.67	100	86.67	93.33
16	A maximum of two retries for venipuncture	63.33	60	36.67	53.33
17	Appropriate fixing the catheter	73.33	76.67	40	63.33
18	Discard the needle in the special bin	96.67	100	56.67	80
19	Document date, time, catheter size, catheter placement, patient tolerance and pain control interventions	100	90	63.33	80
20	Checking the catheter for displacing	90	93.33	40	66.67

better. In the final stage of the theory (plan or active experimentation), the learner can use the formed hypotheses for solving problems and making decisions. In this study, after watching the film and discussing it, the researcher attended the NICU for a month, and reminded the nurses of the points that were not followed or less well observed by the personnel during venipuncture, so that after a while the nurses noticed the positive effects of these measures. According to Kolb's experiential learning theory, the participants in the reported sessions collect information by observing their recorded performance and that of others while treating the infant, and use them in similar situations, which can be a reason for improving their compliance with the standards of venipuncture in this study and similar studies (Gardner et al., 2015).

Similarity, in a study conducted by Nasirzadeh et al., in 2013, it has been shown that using learning styles to educate students and modifying teaching-learning methods based on learning style can be effective in improving learning. This descriptive cross-sectional study was carried out on 407 students of Guilan University of Medical Sciences. A demographic questionnaire and Kolb's learning theory were used (Nasirzadeh et al., 2013). Thus, results of this study can be used by nurses for improving venipuncture techniques.

Another study by Azizi et al., in 2001 in Qazvin reported that most of the subjects had assimilator and converging learning styles and that the learning style of individuals was influenced by the environment and learning method, which, of course, requires more research. Therefore, a variety of teaching methods should be used in providing all students an opportunity to learning. This research was carried out with a survey on all medical students of Qazvin University, using a questionnaire of demographic information and Kolb learning style checklist (Azizi et al., 2001). Results of this study showed that new methods of learning are more effective than traditional methods of learning. So, we can use from this study to increase nurse's learning.

5. Conclusion

According to the results of this study, training nursing personnel based on David Kolb's theory and its stages can improve nurses' learning and observation of the standards. Concrete experience, reflective observation of their performance, abstract conceptualization and active experimentation, which are the four stages of Kolb's theory of learning, besides holding training sessions and recording videos of the performance of nurses during venipuncture, were the measures that proved helpful in learning this skill by nurses. It is suggested that in future studies, this training method is used with a larger population and sample size. The limitation of this study was nurses' reluctance to be filmed; however, after clarifying the research objectives and performance by some of them, they showed more willingness to cooperate.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jnn.2019.04.002>.

References

- Ahadi, F., Abed Saeedi, J., Arshadi, F., Qorbani, R., 2009. Nursing students learning style. *Sci. J. Semnan Univ. Med. Sci.* 12 (2), 141–147.
- Azizi, F., Khanzadeh, A., Hosseini, M., 2001. Study of learning styles based on Kolb's theory in medical students of Qazvin University of Medical Sciences in 2001. *Iran. J. Med. Educ.* 7, 87–88.
- Burskey Cynzthia, M., 2004. Assessment of Learning Styles at the Eastern Caribbean Institute of Agriculture and Identification of Teaching Methods Used by Instructors. Thesis of Agriculture at West Virginia University.
- Curative office of Isfahan University Of Medical Sciences, 2017. Standard of accreditation for hospitals. Section 5. *Infect. Control* 2 (3), 34–37.
- Don Clark, Q., 2000. Learning styles. How we go from the unknown to the known. <http://learningstyles.com>.
- Du Gas, B.W., 2002. Principles of patient care: holistic approach in nursing. In: *Trans Prozan Atashzadeh Shorideh, et al. edit malahat nikravan, Tehran: Golban.*
- Fluck, R., Kumwenda, M., 2011. Renal association clinical practice guideline on vascular access for haemodialysis. *Nephron Clin. Pract.* 118 (1), c225–c240.
- Gardner, S.L., Carter, B.S., Enzman-Hines, M.I., Hernandez, J.A., 2015. *Merenstein & Gardner's Handbook of Neonatal Intensive Care*, eighth ed. Elsevier Health Sciences, St. Louis, Missouri.
- Gholizadeh, R., Ghodsi, A., 2012. Study of learning styles in explaining self-efficacy of high school students. *J. New Educ. Think.* 8 (3), 67–84.
- Hockenberry, M.J., Wilson, D., Wong, D.L., Baker, A., Barrera, P., Askin, D.F., 2013. *Wong's Nursing Care of Infants and Children Multimedia Enhanced Version*. Mosby/Elsevier.
- Hosseini, M.B., Jodeiri, B., Mahallei, M., Abdoli-Oskooi, S., Safari, A., Salimi, Z., 2014. Early outcome of peripherally inserted central catheter versus peripheral IV line in very low birth weight infants; Feyz. *J. Kashan Univ. Med. Sci.* 17 (6), 561–567 January.
- Khalooei, A., Mehdipour Rabori, M., Nakhaee, N., 2013. Safety condition in hospitals affiliated to Kerman university of medical Sciences. *J. Health Dev.* 2 (3), 192–201.
- Meyari, A., Sabouri Kashani, A., Gharib, M., Beiglarkhani, M., 2010. [Comparison between the learning style of medical freshmen and fifth-year students and its relationship with their educational achievement]. *SDME* 6 (2), 110–118.
- Nasirzadeh, F., Heidarzadeh, A., Shirazi, M., Farmanbar, R., Monfared, A., 2013. Assessing learning styles of students in guilan university of medical Sciences. *Res. Med. Educ.* 6 (1), 29–39.
- Sahebzadeh, M., Hosseini, M., Javadinejad, N., Farzandehmeh, A., 2010. The study of equipment, safety, hygiene, personnel standards and their correlation with employee performance in surgery department of the educational hospitals in Isfahan 2009–2010. *Bimarestan J.* 10 (2), 76–88.
- Sarpchami, R., Hossaini, S., 2004. Relationship of learning styles with educational progress of nursing students in Qazvin. *J. Qazvin Univ. Med. Sci.* 8 (1), 64–67.
- Verklan, M.T., Walden, M., 2014. *Core Curriculum for Neonatal Intensive Care Nursing*. Elsevier Saunders.