

Effects of Active Participation and Education of Caregivers on Peripheral Intravenous Injections for Their Child

Eunmi Hwang¹, Yeon Sook Kim², & Dongsuk Lee³

¹Kangwon National University Hospital, Gangwon-do, Republic of Korea

²Department of Nursing, California State University San Bernardino, California, U.S.A.

³College of Nursing, Kangwon National University, Gangwon-do, Republic of Korea

Correspondence: Dongsuk Lee, College of Nursing, 1 Gangwondaehak-gil, Seoksa-dong, Chuncheon-Si, Gangwon-do, Republic of Korea.

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Abstract

This study was to determine the effects of active participation and education of caregivers on the pain experienced by their hospitalized children, the anxiety of the caregivers, and the working efficiency of nurses when administering peripheral intravenous (IV) injections to their children. It was found IV injections were the most feared procedures experienced by inpatient pediatric patients. A quasi-experimental design used in which different types of treatment were given to subjects in three groups. All caregivers received brief verbal information about the peripheral IV injection procedure for their child. Those in the control group then stayed outside the treatment room, those in the first experimental group observed the procedure, and those in the second experimental group participated actively in the procedure for their child after additionally receiving written information about it. Hospitalized children's pain level did not differ among the three study groups ($F=1.18$, $p=.323$) while caregivers' anxiety level differed being lowest in the second experimental group ($F=5.98$, $p=.001$). The nursing action duration of performing the intravenous injection was longest and shortest in the first and control group, respectively ($F=5.07$, $p=.003$). This study shows that active participation and education of caregivers decreased the caregiver's anxiety during peripheral IV injections for their children, while the absence of caregivers shortened the duration of performing the IV injection. The outcomes of caregiver anxiety and the duration of the IV injection were worse for caregivers who observed their child without receiving additional education about or participating in the injection.

Keywords: caregivers, consumer participation, education, intravenous injections, pediatric nursing

1. Introduction

1.1 Background

Most hospitalized children feel anxious and experience fear about procedures and treatments, which causes them to feel more pain (Kim, 1998). Jeong (2004) showed that the anxiety and pain experienced by children could potentiate physical, behavioral, and developmental problems that worsen their illness, extend the length of their hospital stay, or delay their recovery from illness. Many studies have found peripheral intravenous (IV) injections to be among the most feared procedures experienced by inpatient pediatric patients (Jung, 2009; Moon, Park, Jo, & Han, 1995; Song, 1991; Stevens, 1990). Seo (2002) stated that such anxiety and fear reduced the self-control of children and caused stressful situations. However, peripheral IV injections are inevitable and recurrent for inpatient pediatric patients (Lee, 2004). Approximately 93% of pediatric patients treated at outpatient clinics were reported to experience more than one vein puncture (Fowler-Kerry & Lander, 1991), while inpatient pediatric patients experienced an average of more than four blood sampling procedures for tests during a hospital stay (Mabe, Treiber, & Riley, 1991).

Peripheral IV injections are not only painful for pediatric patients but also distressing for their watching parents (Duff, 2003; Polkki, Pietila, & Rissanen, 1999). Cho (1995) stated that parents felt pain, pity, worry, sadness, and frustration when observing peripheral IV injections and test-related blood sampling procedures performed on their children in the hospital setting. Mothers typically stay longer with ill children at hospitals than do fathers, since mothers are typically the primary caregivers for children (Hockenberry & Wilson, 2011). Several studies have shown that mothers with

inpatient children experience higher anxiety and depression levels compared to mothers who do not have children in hospitals (Cho & Kim, 1993; Hockenberry & Wilson, 2011; Ro, 1983; Whaley & Wong, 1997).

It is also difficult, stressful, and time-consuming for health-care professionals to insert a needle in a vein and maintain the IV patency for pediatric patients, because the veins of children tend to be more fragile and are covered with a thicker subcutaneous tissues compared to the veins of adults (Kim et al., 1997). Failures of peripheral IV injections and complaints about pain at the IV injection sites cause both nurses and physicians to feel concerned and anxious, and delays their work (Lundgren, 1988). The high cost and time-consuming nature of inserting and maintaining an IV needle in the vein has prompted attempts to develop various ways to decrease the frequency of IV insertion and reinsertion and minimize complications related to peripheral IV injections at most hospitals in South Korea.

The parents of pediatric patients—who are typically their caregivers—play an important role during hospitalization because their anxiety level could be influenced by the comfort level of their children. Accordingly, educating parents about the process of an IV injection beforehand can help them to support their children during such injections (Moon, 2002). However, whether parents should actively participate in the IV injection procedure for their children is still controversial. The study by Lee (1996) strongly supports participation by parents in an IV injection, whereas Park and Park (1995) found that parental participation produces negative results. Kim (2003) stated that support from parents who could not control their anxiety exerted negative effects on children, whereas support from parents who controlled their anxiety led to positive effects on children. This indicates that it is critical for parents to be prepared in order to ensure that they provide positive support during IV injections. It is expected that preparing parents by educating them about the IV injection and participating in the procedure will facilitate them giving positive support to their children, which will in turn reduce both the children's pain and the parents' anxiety, as well as improve the efficiency of the nurses' work.

1.2 Objectives

The aim of this study was to determine the effects of the active participation and education of caregivers on the pain experienced by their hospitalized children, the anxiety of the caregivers, and the working efficiency of nurses during a peripheral IV injection. Thus, the ultimate purpose of the study was to establish guidelines for efficient nursing practices during the peripheral IV injection in pediatric units.

1.3 Hypotheses

This study tested the following four hypotheses:

Hypothesis 1: The pain level experienced by hospitalized children varies among three groups.

Hypothesis 2: The situational anxiety level of the parents or caregivers of hospitalized children varies among three groups.

Hypothesis 3: The duration of the nursing action to perform an IV injection varies among three groups.

Hypothesis 4: The number of the needle insertions required for a successful IV injection varies among three groups.

Accordingly, the different education and degree of a caregiver's participation were provided to three groups. Caregivers in the control group waited outside the treatment room after receiving brief verbal information about the peripheral IV injection for their child. Those in the first experimental group stayed in the treatment room and observed the peripheral IV injection after receiving brief verbal information about the procedure. Caregivers in the second experimental group actively participated in the procedure for their child after receiving a five-minute education session with written materials as well as verbal information about the procedure. The education and caregiver's participation were described in Table 1.

Table 1. Provided instruction contents and participation levels

	Education provided to caregivers	Participation of caregivers during the IV insertion
Control group	Brief verbal information about the peripheral IV injection	Waiting outside the treatment room
Experimental group 1	Brief verbal information about the peripheral IV injection	Staying in the treatment room and observing the peripheral IV injection
Experimental group 2	Brief verbal information about the peripheral IV injection and a five-minute education session with written materials	Actively participating in the IV injection for their child

2. Method

This was a quasi-experimental study designed to examine the influences of the education and the active participation of

parents in IV injection procedures of their hospitalized children on the patients' pain, parents' anxiety, and nurses' working efficiency. This quasi-experimental study had a nonequivalent-control-group posttest-only design (Table 2).

Table 2. Study design

	Intervention	Post-test	Intervention Post-test	Intervention post-test
Control	X0	C1		
Experiment 1			X1	E1
Experiment 2				X2 E2

X0: Brief verbal instruction was given to caregivers and caregivers stayed out of the procedure room

X1: Brief verbal instruction was given to caregivers and caregivers observed the procedure in the procedure room without active participation

X2: Brief verbal instruction and written information were given to caregivers and caregivers stayed in the procedure room with active participation

2.1 Participants

The study participants were pediatric patients who received an IV needle insertion after being admitted to K University hospital located in C city, South Korea from August 11, 2014 to March 31, 2015, and their parents. The G*power program (version 3.1.9) was used to calculate the number of participants (with a power of 0.8, a significance level of 0.05, and an effect size of 0.4) required to detect differences in the average values of the groups using one-way ANOVA. In total, 66 participants (22 participants in each of three groups) were included. The study participants comprised 94 children with the caregiver: 29 in the control group, 34 in the first experimental group, and 31 in the second experimental group. Only one procedure per child was measured in this study. The participation groups were assigned based on their order of admission to the hospital: the first admission group was the control group, followed by the first experimental group and then the second experimental group.

The following inclusion criteria were applied for the pediatric patients: (1) aged 40–84 months and able to understand the pain assessment tool for presurgery staged children and self-assess their pain level, (2) admitted via the outpatient department, and (3) parents agreeing to participate in the study. The inclusion criteria for the parents of the hospitalized children were (1) able to understand the questionnaire content of the study and answer it independently, and (2) agreeing to participate in the study.

2.2 Type of Experimental Treatment

The control group comprised parents who received a brief verbal explanation about the IV injection procedure and remained outside the treatment room where their child received an IV injection (which is the current practice at K university hospital). Any parents who refused to stay out of the treatment room were allowed into the room but then were excluded from the study. The first experimental group comprised parents who received the brief verbal explanation about the procedure and entered the treatment room to watch the IV injection procedure for their child. These parents were not allowed to provide any support to their child during the treatment. The second experimental group comprised parents who received a 5-minute education session along with handouts about the IV injection procedure and entered the treatment room to physically, emotionally, and verbally support their child during the procedure, such as by hugging and holding them. Handouts for educating the parents were developed based on research articles and health-care-professional books, with the contents including the necessity of IV injection, precautions of maintaining the IV patency, and the influences of parental support on children. All of the contents were verified by three health-care professionals: a nursing professor, a physician, and a head nurse.

2.3 Data Collection

After receiving approval from the IRB of K University hospital, data were collected from the study participants (the hospitalized children and their parents) after the parents had agreed to participate. To minimize moderator variables such as a nurse competency in administering an IV injection, because this affects the dependent variables, the same nurse performed the IV injections in all of the hospitalized children participating in the study. This nurse had been working in the pediatric ward for 5 years.

Data were collected by two nurses responsible for IV injections for pediatric patients in K University hospital. They were trained regarding the research tools, measuring tools, and procedures of data collection during August 4 and 5, 2014 in order to increase the interrater reliability. The collected data included general characteristics of the caregivers and children, pain levels in children, anxiety levels in caregivers, and the nurses' working efficiency when performing IV injections.

Data from the control group were collected first, followed 5 days later by data collection from the first experimental group. The data were collected from the second experimental group at 5 days after data collection from the first experimental group was completed. This protocol was used to avoid those in the control group being exposed to the experimental treatments during the hospital stay (Table 1). Five-day intervals were used because the average length of a hospital stay is 3–4 days.

2.4 Measurement Tools

Parents with hospitalized children were interviewed about their general characteristics, including demographic data, the experience of hospitalization and IV injection procedures, and their concerns.

Pain was assessed using the Faces Pain Rating Scale (FPRS). This scale is Likert scale from 0 to 5: no pain is 0 and the worst pain is 5. The Cronbach's alpha in the study by Baker and Wong (1988) was 0.74. The assessment was performed by children using the FPRS at 10 minutes after they received the IV injection. A child exhibiting normal development can perform self-reporting by the age of 4 years, and this study included children aged 40–84 months based on the results of a preliminary study. The preliminary study involved 20 hospitalized children aged 36–84 months at a children's hospital located in C city from September 30 to October 11, 2013 in order to examine the appropriateness of the FPRS and determine the most appropriate time to assess pain after a procedure. The appropriateness of the FPRS was then confirmed by testing 20 children with the same age range at a day-care center located in C city. The FPRS was recorded by one person in both preliminary and main studies in order for consistency.

Anxiety was assessed using two assessment tools that Likert scale instruments. Parents assessed their anxiety from two aspects: trait anxiety and situational anxiety. Trait anxiety was measured using the Korean version of the tool reported by Spielberger (1972). The Korean version was developed by Kim (1978). The Cronbach's alpha was 0.82 in the study by Kim (1978) and 0.87 in this study. This scale consisted of 20 questions in 4-point Likert scale ranging from 20 to 80 and higher score means higher anxiety. Situational anxiety was assessed using the visual analog scale developed by Huskisson (1974). This scale ranged from 0 to 10: no anxiety was 0 and highest anxiety was 10. Trait anxiety was assessed when the data on the general characteristics of parents and children had been collected. Situational anxiety was assessed at 5 minutes after a successful IV injection.

The working efficiency of nurses was assessed based both on the duration and the number of attempts required to achieve a successful IV injection. The duration was measured using a timer by the researcher. The timer was started when a tourniquet had been applied to the child after he or she was in the correct position, and stopped when the IV injection was completed or blood had been collected in the specimen tube. The number of unsuccessful IV injections was also counted.

2.5 Statistical Analysis

The collected data were analyzed using SPSS (version 18.0 for Windows). The following descriptive statistics were used to quantify the general characteristics of the participants: numbers, frequencies, percentages, means, and standard deviations. The homogeneity of the three groups was analyzed by ANOVA and the chi-square test. ANCOVA was used to analyze differences in the means of dependent variables among the three groups: ANCOVA models adjusted for the age of the child. The cutoff p value for statistical significance was chosen as $< .05$.

3. Results

3.1 Homogeneity of Study Participants

3.1.1 General Characteristics of the Parents

The general characteristics of the parents with hospitalized children included the caregiver's relationship to the child, religion, education, occupation, family structure, time spent with children, anxiety of disease, feeling condition, parenting, knowledge of disease, trait anxiety, and age. The general characteristics of the participating parents or caregivers did not differ significantly among the three groups (Table 3).

Table 3. General Characteristics of Caregivers (n=94)

Variables	Categories	Control (n=29)	Experiment 1 (n=34)	Experiment 2 (n=31)	X ² or F	p
		n(%)	n(%)	n(%)		
Relationship	Mother	24(82.8%)	30(88.2%)	24(77.4%)	3.81	.702
	Father	3(10.3%)	3(8.8%)	5(16.1%)		
	Other	2(6.9%)	1(3.0%)	2(6.5%)		
Religion	Christian	6(20.7%)	7(20.6%)	2(6.5%)	10.78	.095
	Other Religions	7(24.1%)	5(14.7%)	12(38.7%)		
	None	16(55.2%)	22(64.7%)	17(54.8%)		
Education of caregiver	≤ Middle School	1(3.4%)	4(11.8%)	1(3.2%)	7.30	.294
	High School	14(48.3%)	9(26.5%)	13(41.9%)		
	≥ University	14(48.3%)	21(61.8%)	17(54.9%)		
Occupation	No	16(55.2%)	18(52.9%)	20(64.5%)	0.98	.613
	Yes	13(44.8%)	16(47.1%)	11(35.5%)		
Family Structure	Big Family	4(13.8)	6(17.6%)	5(16.1%)	0.17	.917
	Small Family	25(86.2%)	28(82.4%)	26(83.9%)		
Time to Spend with Family	Always	28(96.6%)	33(97%)	30(96.8%)	5.36	.498
	Every Weekends	0(0%)	0(0%)	1(3.2%)		
	Every Month	1(3.4%)	1(2.9%)	0(0%)		
Anxiety of disease	Very Anxiety	5(17.2%)	7(20.6%)	2(6.5%)	5.07	.535
	Anxiety	19(65.5%)	17(50.0%)	18(58.1%)		
	Usual	4(13.8%)	8(23.5%)	8(25.8%)		
	Never	1(3.4%)	2(5.9%)	3(9.7%)		
Feeling	Bad	4(13.7%)	4(11.8%)	9(29%)	6.79	.560
	Usual	24(82.8%)	27(79.4%)	20(64.5%)		
	Good	1(3.4%)	3(8.8%)	2(6.5%)		
Parenting	Strict	10(34.4%)	8(23.5%)	6(19.4%)	6.29	.391
	Normal	14(48.3%)	18(52.9%)	13(41.9%)		
	Generous	5(17.2%)	8(23.5%)	12(38.7%)		
Knowledge of disease	Very well	12(41.4%)	8(23.5%)	30(96.8%)	11.88	.157
	Average	13(44.8%)	24(70.6%)	1(3.2%)		
	Never	4(13.7%)	2(5.9%)	0(0%)		
Trait anxiety	M±SD	39.55±9.99	42.41±7.62	40.10±14.60	0.61	.546
Age (years)	M±SD	36.31±6.14	38.15±6.68	39.23±7.60	1.39	.255

3.1.2 General Characteristics of the Children

The general characteristics of the pediatric participants included their sex, BMI (body mass index), number and rank of siblings, personality, activity, caregiver person, IV injection history, and admission history. The mean age was the only of these characteristics that differed significantly among the three groups ($F=6.40$, $p=.003$): the pediatric participants were oldest in the first experimental group and youngest in the second experimental group. Therefore, the three groups were verified as homogeneous based on their characteristics with the sole exception of the average age of the hospitalized children (Table 4).

Table 4. General Characteristics of Pediatric Patients (n=94)

Variables	Categories	Control (n=29) n(%)	Experiment 1 (n=34) n(%)	Experiment 2 (n=31) n(%)	X ² or F	p
Age(month)	Mean(SD)	63.90±13.37	65.30±12.45	53.94±15.34	6.40	.003
Sex	Boy	18(62.1%)	19(55.9%)	16(51.6%)	0.67	.715
	Girl	11(37.9%)	15(44.1%)	15(48.4%)		
BMI	Mean±SD	15.46±1.58	15.95±2.20	15.60±2.44	0.45	.637
Sibling	1	7(24.1%)	6(17.6%)	12(38.7%)	8.23	.411
	2	17(58.6%)	20(58.8%)	16(51.6%)		
	Over 3	5(17.2%)	8(23.5%)	3(9.7%)		
Rank	Eldest	16(55.2%)	18(52.9%)	23(74.2%)	5.89	.435
	Second	9(31.0%)	13(38.2%)	6(19.4%)		
	Blow third	4(13.7%)	3(8.8%)	2(6.5%)		
Personality	Easy going	16(55.2%)	18(52.9%)	25(80.6%)	7.07	.132
	Picky	12(41.4%)	14(41.2%)	6(19.4%)		
	Dull	1(3.4%)	2(5.9%)	0(0.0%)		
Activity	Shy	1(3.4%)	4(11.8%)	3(9.7%)	2.86	.582
	Normal	10(34.5%)	14(41.2%)	9(29.0%)		
	Very active	18(62.1%)	16(47.1%)	19(61.3%)		
Caregiver	The person himself	24(82.8%)	28(82.4%)	27(87.1%)	0.58	.965
	etc	5(17.2%)	6(17.7%)	4(13%)		
Injection History	None	9 (31.0%)	8(23.4%)	5(16.1%)	4.68	.791
	1-2	10 (34.5%)	14 (41.2%)	14 (45.2%)		
	3-5	6 (20.7%)	7 (20.6%)	7 (22.6%)		
	Over 5	4 (13.7%)	5 (14.7%)	5 (16.1%)		
Admission History	None	9(31.0%)	10(29.4%)	5(16.1%)	8.56	.381
	1-2	8(27.6%)	16(47.1%)	17(54.8%)		
	3-5	9(31.0%)	6(17.6%)	5(16.1%)		
	Over 5	3(3.4%)	2(5.8%)	4(12.9%)		

3.2 Hypothesis Verification

The findings for the four study hypotheses can be summarized as follows:

1) There were no significant differences in the pain level of the children among the three groups ($F=1.18$, $p=.323$) (Table 5). Thus, hypothesis 1 was not supported.

2) There were significant differences in the situational anxiety levels of the parents or caregivers among the three groups ($F=5.98$, $p=.001$) (Table 5). Thus, hypothesis 2 was supported. Post-hoc Scheffe's test revealed that the situational anxiety level was lowest in the second experimental group (Table 6).

Table 5. Comparison of Pediatric Patients Pain Score by ANCOVA* (n=94)

Characteristic	Division (n)	Mean±SD	F	p
Pain	Contrast (n=29)	4.62±2.23	1.18	.323
	Experiment 1 (n=34)	5.41±3.12		
	Experiment 2 (n=31)	4.65±2.50		

* covariate: age of pediatric patients (month)

Table 6. Comparison of Caregiver's Situation Anxiety Score By ANCOVA* (n=94)

Characteristic	Division(n)	Mean±SD	F	p	Scheffe
Anxiety under Situation	Contrast (n=29) ^a	4.49±3.20	5.98	.001	c < a=b
	Experiment 1 (n=34) ^b	5.12±3.19			
	Experiment 2 (n=31) ^c	2.52±2.10			

* covariate: age of pediatric patients(month)

3) There were statistically significant differences in the duration of a successful IV injection among the three groups ($F=5.07$, $p=.003$) (Table 7), being shortest for the control group and longest for the first experimental group. Thus, hypothesis 3 was supported.

Table 7. Comparison of the Time to Succeed Intravenous Injection for a Pediatric Patient by ANCOVA* (n=94)

Characteristic	Division(n)	Mean±SD	F	p	Scheffe
Success Time	Contrast (n=29) ^a	54.62±32.89	5.07	.003	a < b
	Experiment 1 (n=34) ^b	85.00±41.45			
	Experiment 2 (n=31) ^c	81.61±55.49			

* covariate: age of pediatric patients(month)

4) There were no significant differences in the needle insertion frequency among the three groups ($F=1.41$, $p=.245$) (Table 8). Accordingly, hypothesis 4 was not supported.

Table 8. Frequency to Succeed Intravenous Injection for a Pediatric Patient by ANCOVA* (n=94)

Characteristic	Division (n)	Mean±SD	F	p
Insert frequency	Contrast (n=29)	1.07±0.26	1.73	.183
	Experiment 1 (n=34)	1.20±0.59		
	Experiment 2 (n=31)	1.03±0.18		

* covariate: age of pediatric patients(month)

4. Discussion

This quasi-experimental study used a nonequivalent control group posttest-only design to examine the effects of the active participation and education of caregivers on the pain experienced by hospitalized children, the anxiety of their caregivers, and the efficiency of the work performed for nurses administering IV injections in children. It was found that the active participation and education of caregivers did not influence the children's pain level or the number of times a needle had to be inserted for the IV injection to be successful. However, the caregivers' anxiety and the duration of the IV injection were affected by the active participation of caregivers in education regarding the procedure.

In this study, providing education to caregivers or having them participate in the IV injection did not reduce the pain experienced by the children. Park and Park (1995) also demonstrated that participation by parents did not affect children's pain levels. However, Lim (2002) found that the level of pain experienced by children during IV injections differed significantly between the group with education via animation and the group without education. In contrast, Moon (2002) showed that providing education to mothers about the IV injection decreased children's pain level. It is assumed that these discrepancies among studies are attributable to variations in the methods used to assess pain; for example, McGrath (1990) used behavior observation scales, self-report scales, and physiological-measure scales to assess children's pain. Ryu (2003) emphasized the reliability and validity of the assessing tool and considered the age of children as an influencing variable.

Based on the above-mentioned results, a preliminary study was conducted for children at a day-care center and K University hospital pediatric ward to confirm the most appropriate age group for using the FPRS, which is a self-report scale. This preliminary study confirmed that children aged 40 months or older were able to verbally express their pain, and so the present study limited the included pediatric participants to this age group. In the study by Song (1991), observers assessed the degree of pain, while Cho and Ahn (2013) also had parents and nurses assess the pain levels of the included children by using the FPRS and a pain behavior checklist, respectively. Therefore, it is possible that the actual pain level experienced by the children differed from the pain levels assessed by the parents or observed by nurses in previous studies.

One of the findings of the present preliminary study was that it was unclear whether the children's behavior response to the IV injection was driven by pain or fear, because these responses varied according to their personality and their previous experiences with IV injections. During the preliminary study, some children showed very irritable behaviors such as screaming or kicking before the injection, but then a very low pain level when their pain was assessed after the injection. Meanwhile, others scored their pain as very high even though they did not show irritable behaviors and followed directions well before the injection. When asked about the reason for their irritable behaviors, the children stated they were not hurt but scared. It is therefore possible that previous studies did not adequately discriminate pain from fear because their assessments of pain were based on observations of the children's behavior. This means that a self-report type of pain scale needs to be used for children who are old enough to express their pain, rather than interpreting their observed behavior responses as the pain level.

The second experimental group in this study exhibited the lowest anxiety level, being associated with active

participation by parents and them supporting their children. This indicates that providing parents with sufficient information about the IV injection process and their own participation helped parents to reduce the anxiety of their children. Bae and Lee (2001) reported that mothers who had received information about invasive treatments for their hospitalized children exhibited significantly lower situational anxiety than mothers who were not provided with this information. Lee (2010) also demonstrated that the anxiety of parents decreased when they were educated about invasive procedures that their children were undergoing. Parents often feel helpless, fear, and anxiousness when they only observe painful procedures performed on their children, which can negatively influence the children's development (Kim, 1996; Palmer, 2003). Accordingly, it can be concluded that the active participation of parents and providing them with adequate education can support them emotionally and reduce their anxiety, which is also supported by the results of the present study.

This study found that the duration required to successfully achieve an IV injection was shortest for the control group and longest in the first experimental group. If this duration is considered to reflect the nurse's working efficiency, the control group had the highest efficiency whereas the first experimental group had the lowest efficiency. Park and Park (1995) found consistent results, with their nonparticipating parent group having a shorter duration of IV injection than the participating parent group. This supports that the participation of parents could result in nurses needing to take more time and effort when injecting IV needles and maintaining the patency of the IV route (Mudge, Forcier, & Slattery, 1998). Participation by parents also induces substantial stress, concern, and anxiety in nurses, which will have the effect of delaying their work (Lundgren, 1988). However, the finding of no difference in the needle insertion frequency among the three study groups might have been due to the same nurse performing all IV injections in this study so as to control the dependent variables affected by nurse competency.

In common situations, however, any nurse is assigned to insert IV to a patient, which can cause different frequencies of the needle insertion. For instance, a nurse who feels uncomfortable with anxious caregivers may need to insert the IV more frequently than those who do not. Therefore, there is the limit to generalization of this study.

4. Conclusion

This study is significant because researchers had children express their pain level, rather than having researchers measure pain levels. It was found that the anxiety level of caregivers was lowest when they actively participated in and were educated about IV injections to their children. However, providing caregivers with education regarding the IV injection did not affect the pain levels experienced by their hospitalized children. It took the longest time for the nurse to achieve an IV injection when the caregiver was merely observing their child, whereas this was shortest when the caregiver was outside the treatment room. On the other hand, the number of attempts required for successful needle insertion during an IV injection did not differ among the study groups.

The following suggestions can be made based on the design and the findings of this study:

- 1) Future studies with more participants are needed to be able to generalize the present results.
- 2) The pain level of children did not differ among the three groups, but there remains a need to control children's anxiety when measuring pain levels in order to ensure that the actual pain level is being measured.
- 3) Future studies should explore factors that positively influence caregiver management and improve the work efficiency of nurses.
- 4) Future studies should investigate the frequencies of needle insertion and the duration required to complete an IV injection in order to improve the work efficiency of nurses.
- 5) Future studies should investigate whether specific nurses should be assigned to perform IV injections for pediatric patients.

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