Parental Holding and Positioning to Decrease IV Distress in Young Children: A Randomized Controlled Trial

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Young children are generally restrained in supine position for IV starts, a position that creates fear but is presumed necessary. This study randomly assigned children of ages 9 months to 4 years ($N = 118$) to being held upright by a parent or lying flat on an exam table for their IV procedure. Distress scores as rated by the Procedure Behavior Rating Scale were significantly lower in the upright positioning group ($p = .000$); parents were more satisfied with the upright position, and the upright position did not significantly alter the number of IV attempts needed. The upright position appears to be an effective way to decrease IV distress in young children.

THE SCENE IS only too familiar to pediatric nurses: A young child screams and thrashes as several people hold him down on an examining table while a nurse attempts to insert an IV catheter. This is, unfortunately, the situation in most pediatric hospitals. Assuming little to no cooperation on the child's part and needing a stable extremity for safe IV insertion, nurses have traditionally used restraint with the child supine when performing painful medical procedures. However, being restrained by multiple people and held flat is frightening in and of itself and results in less control and greater distress for the child.

Although nurses are well aware of the negative impact of such positioning, the need for immobilization for safe and accurate IV insertion has outweighed the very real stress such positioning causes. Alternative positioning for painful procedures was described as part of a recommended technique to comfort children experiencing stressful procedures (Stephens, Barkey, & Hall, 1999). The position involves the child sitting up and being held by a parent, which is called "position of comfort." These clinicians have used this positioning in their practice for several years and believe it to be effective; however, little study on its effectiveness has been performed. Furthermore, some nurses have questioned the advisability of this type of positioning in terms of safety and technical accuracy (Boorde, 1998).

REVIEW OF THE LITERATURE

Receiving a needle (IV or injection) is rated by children as one of their most feared medical events (Broome & Hellier, 1987; Hart & Bossert, 1994; Siaw, Stephens, & Holmes, 1986). Research has found long-term traumatic memories for some children receiving painful medical procedures (Chen, Zeltzer, Craske, & Katz, 2000; Stuber, Christakis, Houskamp, & Kazak, 1996). Furthermore, "… an intervention that successfully reduces children's negative memories may alleviate their distress during future stressful events" (Chen et al., 2000, p. 944). Watching their child receive painful medical procedures is also highly traumatic for

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parents (Jay & Elliott, 1990). However, the presence of parents during medical procedures has been found to be helpful in decreasing children's distress (Bauchner, Vinci, Bak, Pearson, & Corwin, 1996). Additionally, the Agency for Health Care Policy and Research, Public Health Service (1992) advocates parental presence during medical procedures with children.

Methods to decrease needle pain have been developed and include the use of buffered lidocaine (Klein et al., 1995) and eutectic mixture of local anesthetic (EMLA) cream (Kennedy & Luhmann, 1999; Luhmann, Hurt, Shootman, & Kennedy, 2004) prior to IV insertion. Various nonpharmacological methods have been found to be effective in reducing children's pain, including procedural pain. Many of these methods employ the use of distracters, such as auditory or visual distracters, bubble blowing, or touch (Caty, Ellerton, & Ritchie, 1997; Maclaren & Cohen, 2005), or cognitive–behavioral strategies, such as guided imagery or stories (Kleiber, Craft-Rosenberg, & Harper, 2001; Pederson, 1995).

Although these interventions help reduce pain, little has been studied concerning patient positioning for IV insertion. It is reasonable to assume that being held flat intensifies fear, and fear is known to increase pain perception (Weisenberg, Aviram, Wolf, & Raphaeli, 1984). It is commonly observed that children being held in this manner begin crying and "fighting" when nothing painful has yet occurred, but do so in anticipation of pain. Experience alone has informed them that an unpleasant event usually follows this type of restraint. Therefore, it is further reasonable to assume that a child sitting up and requiring less restraint may remain calmer and more comfortable during a painful procedure. In a study of children's distress during bone marrow aspiration, children demonstrated more distress when the pelvic bone was used compared to when the sternum was used, and researchers stated that "children who can see what is going on experience less anticipatory distress" (van Aken, van Lieshout, Katz, & Heezen, 1989, p. 427).

This understanding is the rationale for some clinicians recommending upright positioning of the child for IV insertion (Frey, 1997, 2000; Stephens et al., 1999). Stephens et al. presented a model of care for children undergoing IV insertion. Along with adequate parent and child preparation, encouragement of the parent to participate, and use of a treatment room for IV insertion, these authors recommend allowing the child to sit up during the procedure. They begin using this sitting position when the child has head and trunk control, generally between 3 and 5 months. Several variations of the position may be used, but all have the child sitting up and being held by the parent. In many instances, the child is seated on the parent's lap with arms resting on the exam table. According to Stephens et al., children thus positioned are less upset because they maintain a greater sense of control.

Other advantages of this position cited by Stephens et al. (1999) include the following: greater immobility of the child's arm; minimal body movement; a large work area (because the child's body is not taking up space on the table); and the child's movement being restricted by a comforting position of the parent. It is further recommended that one person hold the child while another one holds the child's extremity being used for insertion. In this manner, the child's body movement does not affect the movement of the extremity being used and, therefore, greater stability is achieved.

Two recent studies have looked at upright positioning and IV insertions in young children. Kaher (2003) studied preschool (ages 3–5 years) and school-age (ages 6–7 years) children during IV catheter insertion ($N = 44$) and randomly assigned them to upright or flat position and distraction (bubble blowing) or no distraction. The children indicated pain scores immediately after the procedure, and distress scores were obtained by viewing videotapes after the procedure. There was a trend for preschool children held upright to rate the IV insertion as less painful, and distress scores were lower in both groups (those with and without distraction) held upright; however, none of the scores was significantly different. Additionally, Kaher found no difference in the time it took to start the IV or in the number of personnel needed for the procedure between the groups. Despite nursing fears that extra help would be needed to immobilize the extremity when the child is being held upright, this was not the case.

Cavender, Goff, Hollon, and Guzzetta (2004) studied the effectiveness of parental preparation, upright positioning, and distraction on the level of pain, fear, and distress in children of ages 4–11 years who were undergoing venipuncture ($N = 43$). Children in the experimental group ($n = 20$) were positioned on the parent's lap, and the parents had been trained in providing distraction. Children

in the comparison group (n = 23) received standard care, which included the presence of the parent during the procedure. No significant differences were found between the groups for either pain or fear. Although not statistically significant, distress scores were lower in the experimental group during the procedural and postprocedural periods. However, the sample size was not large, and the researchers stated that a larger sample may be needed to detect the effect.

Therefore, there is anecdotal support for the use of parental holding and upright positioning to decrease IV distress, but there are also concerns regarding the safety and efficacy of this approach. Very little research on this topic has been performed to date. The purpose of this study was to compare the effectiveness of parental holding and upright positioning to the effectiveness of traditional supine positioning in reducing children's distress during IV insertion. Research questions included the following:

1. Does parental holding/upright positioning reduce IV procedural distress in young children?
2. Does parental holding/upright positioning increase parental satisfaction with the IV procedure?
3. Does parental holding/upright positioning effect IV insertion success (i.e., increase the number of IV attempts needed)?
4. How satisfied are nurses with parental holding/upright positioning for IV insertion?

METHODOLOGY

This study was conducted in a Level I trauma emergency department of a pediatric hospital in a large midwestern city. Research assistants trained in data collection explained the study and obtained consent from parents/guardians of eligible study children. Inclusion criteria for study children were as follows: ages of 6 months to 4 years; categorized through triage as requiring urgent or emergent care; needing an IV catheter placed; and had a parent or guardian who was able to give consent. Those families agreeing to participate were randomly assigned to the experimental group or the control group. The sample size was determined using power analysis. The probability of Type I error was set at .05, and power was set at .90. Standard deviation and effect size were determined from a similar study of children's response to venipuncture using the same measure of procedural distress used in this study (Schiff, Holtz, Peterson, & Rakusan, 2001). Using these parameters, a sample size of 120 subjects (60 per group) was predicted to be needed.

After giving consent and prior to the IV procedure, parents completed a brief prequestionnaire that obtained demographic data and general information on the child's past experience with health care. All IV insertions were performed by staff registered nurses using standard equipment; the IV procedure itself did not vary between groups. It was a standard of care in the emergency department to use a skin anesthetic for IV insertion, either buffered lidocaine or ELA-Max (a fast-acting form of EMLA), and the use of these was at the discretion of nurses starting the IV. Research assistants notified the nurse of the position to be used just prior to the procedure and then videotaped the procedure for later analysis by blinded observers. One cassette per child was used and was identified by a code number only. The videotape was started just before the procedure when the child was placed on the parent's lap or on the table, and the videotape was stopped after the IV was complete (including the taping of the IV) or, if unsuccessful, after the removal of the IV.

Children in the control group were positioned supine on the exam table with restraint provided by other staff as needed, at the discretion of the nurse (Figure 1). Children in the experimental group were positioned upright and held by a parent or a family member (Figure 2). The child was either held on the parent's lap with the arm on the exam table or held sitting up on the exam table with the parent holding the child around the trunk. Additional restraint of the child and/or of

Figure 1. Child positioned flat for IV insertion.

Figure 2. Child held upright by parent for IV insertion.

the extremity being used was provided as needed by additional hospital staff. For both groups, at least one family member or guardian needed to be present during the procedure because parental presence may otherwise have been a factor in children's distress. Child life specialists participated in the procedure upon the request of the nurse; research protocol neither prohibited nor mandated their involvement, but their presence was noted when it occurred. For children in both groups, if the IV was not successfully inserted after two attempts, the child's position could be changed at the discretion of the nurse to facilitate the procedure. The first two IV attempts were videotaped; if more than two attempts were needed, the number of attempts was noted but further attempts were not videotaped. After the procedure, the nurse inserting the IV completed a questionnaire, and the parent/guardian completed a satisfaction questionnaire.

Distress Score

Children's distress was scored using the Procedural Behavior Rating Scale—Revised (PBRS-R) by Katz, Kellerman, and Siegel (1982). The PBRS-R is an observational measure of acute behavioral distress, including anxiety, fear, and pain. The instrument consists of 11 distress behaviors: cry, cling, pain, scream, stall, flail, refusal position, restrain, muscular rigidity, emotional support, and request for termination. These are scored as present or absent over three periods of the procedure, and total PBRS-R scores can vary from 0 to 33, with higher scores representing greater distress. In this case, the three periods were defined as: preprocedure (from the placing of the child in position for the IV to any needle insertion); procedure (from needle insertion [buffered lidocaine, if used, or IV catheter] to IV placement), and postprocedure (from IV placement to secured IV site). The PBRS-R has been used with children ranging in age from 7 months to 20 years. Interrater reliability was reported as .81–.93. The scale has been shown to correlate significantly with other measures of behavioral distress, including self-report (Jacobsen et al., 1990; Katz, Kellerman, & Ellenberg, 1987; Katz, Kellerman, & Siegel, 1980).

Three pediatric registered nurses who were not emergency department staff were selected as research assistants. These nurses were blinded to the study purpose and were trained in using the PBRS-R; they viewed the videotapes at their convenience at a later time to determine distress scores. Three random samples of tapes (10% of total) were scored by two independent observers to obtain a measure of interrater reliability, which was found to range from .88 to .90.

Parent Satisfaction

Parents rated their satisfaction with the IV procedure immediately after it was completed using a questionnaire of five items asking parents to rate their level of satisfaction from 1 = *least satisfied* to 5 = *most satisfied*. The items were as follows: the parents' comfort in participating; their satisfaction with their level of involvement; their satisfaction with the IV position used; and their satisfaction with the staff's ability to help decrease their child's pain/fear and to provide emotional support. These items were obtained from the Parent Perceptions of Specialty Care (PPSC) developed by Naar-King, Siegel, Smyth, and Simpson (2000). The full PPSC was developed using 324 parents attending specialty pediatric clinics. The instrument consists of 18 items on 3 factors (general satisfaction, worth, and access). The Cronbach's α for the entire scale was .92, and criterion validity was established by correlations with measures of child and staff satisfaction in the same programs.

Nurse Satisfaction

Information on the reason for IV insertion, the site used, the anesthetic used, the number of IV attempts needed, the presence of child life specialists during the procedure, the distraction used, and the number of family members present during the procedure was obtained after the procedure. Furthermore, the nurses were asked to rate their satisfaction with the child's position for IV insertion

Table 1. PBRS-R Mean Scores

Position	Total PBRS-R	T_1	T_2	T_3
Flat	9.4407	2.7119	4.0169	2.7119
Upright	6.4746	1.5763	3.4237	2.000

on a scale from 1 = *least satisfied* to 5 = *most satisfied* and to state if their technique needed to be altered due to the position used.

RESULTS

One hundred thirty-five subjects were recruited for the study, but 17 of these were not used for the analysis; therefore, the total sample size comprised 118 subjects. Reasons for not being able to use the data included the following: video recording errors (seven); wrong age of subject (four); incomplete forms (two); no legal guardian (one); did not need IV (one); child became critically ill (one); mother refused flat position (one). In the last case, the mother of the child had been willing to participate until she found that her child was to be included in the control group, at which time she withdrew her child from the study. There were 59 subjects in each group, with 56 male and 62 female subjects. The ages ranged from 9 months to 47 months, with a mean age of 23.8 months. The control group had 30 Caucasian, 27 African-American, and 2 Asian subjects. The experimental group had 32 Caucasian and 27 African-American subjects.

There were no significant differences found between the two groups on the following factors: age, gender, previous IV experience, previous hospitalizations, anesthetic used for IV, IV site, child life specialist involvement, distraction used, or the number of family members in the room during the procedure.

Table 3. Parent Satisfaction Scores

Item	Very Dissatisfied	Dissatisfied	Unsure	Satisfied	Very Satisfied	*p*
Pain management						
Control	3.4	1.7	6.8	20.3	66.1	.563
Upright	3.4	3.4	5.1	16.9	71.2	
Emotional support						
Control	1.7	3.4	1.7	23.7	69.5	.610
Upright	0	1.7	1.7	23.7	72.9	
Parent involvement						
Control	3.4	0	10.2	27.1	55.9	.124
Upright	3.4	1.7	1.7	25.4	67.8	
Position						
Control	3.4	3.4	5.1	27.1	57.6	.034
Upright	3.4	1.7	5.1	13.6	76.3	

The mean scores of distress as measured by the PBRS-R were lower in the experimental group in all three periods, as well as on the total score. The total mean score for the control group was 9.4407, as compared to the experimental group's 6.4746 ($p = .000$). All three period scores (T_1 = preprocedure; T_2 = procedure; T_3 = postprocedure) were significantly lower in the experimental group, indicating less distress for children held by parents in an upright position. All mean PBRS-R scores are presented in Table 1, whereas Table 2 presents an analysis of variance of the means. The effect size for the difference in distress scores was found to be 0.66 (9.4407 − 6.4746 ÷ 4.49196 [*SD*] = 0.66).

PPRS-R scores were analyzed for children who needed a second IV attempt ($n = 29$). Although distress scores were lower in the experimental

Table 2. Analysis of Variance of PRBR-R Scores, by Position

Source	*df*	*F* Sum of Squares	Mean Square	*F*	*p*
T_1					
Between groups	1	38.042	38.042	13.683	.000
Within groups	116	322.508	2.780		
Total	117	360.551			
T_2					
Between groups	1	10.381	10.381	4.161	.044
Within groups	116	289.390	2.495		
Total	117	299.771			
T_3					
Between groups	1	14.949	14.949	5.521	.020
Within groups	116	314.102	2.708		
Total	117	329.051			
Total					
Between groups	1	259.543	259.543	14.328	.000
Within groups	116	2,101.254	18.114		
Total	117	2,360.788			

Table 4. Nurse Satisfaction with Position

Position	Least Satisfied	Not Satisfied	Neutral	Satisfied	Most Satisfied	*p*
Flat	0	1	6	9	42	.000
Upright	6	9	12	7	25	

group, none of the scores was statistically significant (p = .829). However, this was a small subsample of the total.

Parents in both groups reported feeling comfortable participating in the procedure, and there was no significant difference on this measure between the two groups (p = .995). However, parents in the experimental group reported greater satisfaction with the procedure, and the difference was significant on the item concerning their satisfaction with the child's position for the IV insertion (Table 3).

The number of IV attempts needed was slightly greater in the experimental group (M = 1.41) than in the control group (M = 1.32), but the difference was not statistically significant (p = .546). However, there was a significant difference in the satisfaction scores of nurses between the two groups, with more nurses reporting greater satisfaction in the control group (Table 4).

With 18 of the subjects from the experimental group, nurses made comments concerning difficulty with the position. The statements included the following: difficulty properly restraining the child; (the nurse) feeling awkward with the position; and greater mobility of the child. No comments were made from nurses in the control group.

Despite the fact that skin anesthesia for IV insertion is a standard of care in the study emergency department, 76 of 118 subjects did not receive any anesthesia. The use of anesthesia did not differ significantly between the two groups. In the control group, 37 children received no anesthetic, 13 received lidocaine, 7 received ELA-Max, and 2 received oxycodone. In the experimental group, 39 children received no anesthetic, 13 received lidocaine, and 7 received ELA-Max.

DISCUSSION

Parental holding and upright positioning appear to be successful in reducing the distress of having an IV started in young children. The two prior studies with upright positioning and IV/venipuncture procedures (Cavender et al., 2004; Kaher, 2003) both found lower distress scores with upright positioning, although in neither study was the difference statistically significant. However, both studies had small sample sizes. In this study, children in the experimental group had significantly lower distress scores for the overall measure of distress, as well as for all periods of the procedure. Distress scores were lowest in the experimental group during the preprocedural and postprocedural periods. This is reasonable in that, during these periods, the child is not experiencing anything painful, and being held by the parent gives the child a greater sense of security. Thus, anticipatory distress is lessened, and recovery after the procedure is faster. This corresponds to the statement by van Aken et al. (1989), who reasoned that children who are able to observe what is happening to them experience less distress compared to children who are unable to see what is going on. The effect size of the difference in scores was quite large, indicating the clinical significance of this intervention. Distress scores in children needing a second IV attempt were also lower in the group held upright by parents. However, probably due to the small size of this group, the difference was not statistically significant.

The number of IV attempts needed was slightly greater in the upright positioning group, but the difference was not statistically significant. Therefore, upright positioning and parental holding did not significantly impact the nurse's ability to start an IV in these children. This reflects the advantages of the position cited by Stephens et al. (1999) concerning the stability of the extremity for IV placement. However, several nurses in this study who indicated less satisfaction with the upright position stated that their discomfort came from the concern for patient stability. It may be that there was fear of less stability although it was not the case in reality.

Parents in both groups reported comfort and satisfaction with their participation in the procedure, and satisfaction with the staff's ability to provide pain management and emotional support to their children. In general, parents in the experimental group reported greater satisfaction with all measures. Additionally, parents holding their children upright reported greater satisfaction with the child's position for IV insertion than did parents in the supine group (p = .034).

The groups did not vary significantly on any other factor measured that may have accounted for differences in distress scores. Children in both groups had at least one parent in the room with

them during the procedure, and many parents in the control group (supine) were actively involved in the procedure, helping to distract the child and providing comfort. No restrictions concerning parental activity were imposed on either group; the only condition was that parents in the experimental group needed to be willing to hold their child during the procedure. No parent refused to do this; in fact, one parent withdrew from the study the moment she found that her child was in the supine group. This mother was a nurse and wanted to hold her child for the procedure, which she was able to do, but her child was not included in the study.

The nurses in the study emergency department varied as to their comfort in starting IVs with a child held upright by a parent. Some nurses preferred this position, and others preferred supine positioning. None of the nurses refused to participate in the study, and even those who were less comfortable with the position were professional in their approach to the families, never indicating that anything other than the position used was their "standard" position for starting IVs. The nurses did not know in advance which position would be used; therefore, the nurses were also randomized to the experimental and control groups.

The nurses reported greater satisfaction with supine positioning: 86% of nurses reported satisfaction with the supine position, and 54% of the nurses reported satisfaction with the upright position. The nurses were also asked if they needed to change their IV technique to accommodate the child's position. Nurses using upright positioning indicated needing to change their technique in 25% of the cases; however, nurses using supine positioning indicated needing to change their technique in 10% of the cases. Therefore, changes in technique were needed in both groups (reason for changes not stated), and the difference approached significance. This is similar to the findings by Kaher (2003), where no additional personnel was required to start IVs in young children held upright despite fears stated by nurses that more personnel would be needed.

A surprising finding was how many children did not receive any anesthetic for the IV start when doing so is a standard of care in this emergency department. Sixty-four percent of the total sample received no anesthesia (the difference was evenly distributed between the two groups). The reason for this finding is unclear. However, changes in practice, particularly changes in skills, are difficult to make.

Brown (2002) studied the use of lidocaine by nurses for IV insertions after the use of skin anesthetic was adopted by a hospital and after in-service education was completed. Almost half of the nurses surveyed (46.7%) stated that they never used any anesthetic. The reasons given included the following: not wanting to have to "stick" a patient twice; believing that IVs did not cause enough pain to use an anesthetic; and believing that lidocaine makes the vein difficult to see. Brown concluded that the nurses' "barrier for changing their practice was the perception that this procedure [using lidocaine] would be detrimental to their patients" (p. 75).

Although the reason for not using anesthesia in this study is not known, Brown's (2002) conclusion may be true here as well. Additionally, the perception that upright positioning makes starting an IV more difficult may account for the nurses' lack of satisfaction. Further research is needed to identify the barriers to changes in IV technique and to determine what will be needed to support and encourage nurses to make these changes. Research demonstrates improved patient outcomes with actions such as skin anesthesia and patient positioning, but more needs to be performed to help nurses incorporate these interventions into their care.

This study is limited to children with ages between 9 months and 4 years and undergoing IV insertion only. Further research is needed to see if parental holding and upright positioning could help decrease the distress of other procedures, such as suturing of lacerations.

The clinical implications are clear: Parental holding and upright positioning decrease IV distress in young children, increase parental satisfaction, and do not significantly impact IV success. This is a safe, simple, cost-effective measure that may help children and families cope with the frequent experience of having an IV inserted. Furthermore, it can be used in any setting and is not limited to emergency departments. It remains then for nurses to be willing to try new methods that have been found to be beneficial. Doing so involves risk and requires stepping out of a "comfort zone," but if it is for the benefit of the patient, then it is worth the risk. Methods to help nurses make these changes in practice need to be identified and provided. By doing so, nurses will be able to provide more family-centered care during this technical procedure.

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