Investigating the Effects of picture book on Reducing Anxiety Caused by Intravenous Catheterization among School-aged Children

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Abstract

Background: Injection procedures like peripheral intravenous catheterization provoke a significant anxiety among hospitalized children, which negatively affects both the child and his/her parents.

Objective: The present study aimed to investigate the effects of children's orientation on the intravenous catheterization and serum infusion by picture books on their anxiety.

Methods: In this randomized control trial study, seventy 6-12 year-old children were randomly assigned to either intervention or control group. The subjects' anxiety was evaluated before, during, and after the procedure by using Observation Scale of Behavior Distress instrument. During intervention, they were simply informed about peripheral intravenous catheters and serum treatment by the picture book and oral account of the nurse. The control group received the oral explanation routinely. Chi-square, Mann-Whitney and Wilcoxon tests were used for data analysis.

Results: Mean anxiety scores for both groups before the intervention phase were not significantly different although the mean anxiety scores of the intervention group was significantly less than those of control group after intervention. In addition, a significant difference was observed before and after the intervention in terms of anxiety levels in both groups.

Conclusions: Based on the results, the school-aged children's orientation on the intravenous catheterization and serum infusion play a significant role in controlling and reducing their anxiety during and after the intervention.

Clinical implications: Picture book may be an easily accessed and effective technique to control or reduce anxiety in school-aged children undergoing IV insertion.

Keywords: Anxiety; Pediatric; Catheterization; Intravenous infusions; Education; Picture book

Introduction

Injections are the main factors provoking pain, fear, and anxiety among hospitalized children [1]. Intravenous, muscular, and subcutaneous injections, access to central venous, urinary and vascular catheter placement are among the procedures performed routinely in emergency wards [2]. Intravenous catheters are considered as one of the most common invasive medical procedures [3]. In addition to causing pain, this procedure provokes anxiety in children, their parents, and even nurses [4]. Taddio et al. (2012) reported that 24 % of mothers and 63 % of children are afraid of needles [5]. Most children consider intravenous (IV) placement, either for planned medical examination or for an unexpected admittance, as the most horrible aspect of hospitalization [6]. In Iran, Borhani et al. (2012) reported that children experience mild or severe pain and anxiety during intravenous placement procedure. In addition, they reported that a significant relationship between post-injection pain and pre-injection anxiety [7].

Children's unanswered medical questions, as well as the lack of certainty and awareness of what happens in hospitals are often regarded as the main reasons for provoking distress [8]. In another study conducted on the children undergoing the intravenous placement procedure, the results indicated that the children's lack of briefing by their parents and lack of a close relationship between the children and nurses are among the factors provoking fear-related behavioral reactions in children [9]. Due to genetic and behavioral differences, anxiety is not often expressed orally and is manifested through behavioral and physiological changes [10]. Over-anxiety leads to the children's unwillingness during the medical treatment results in creating negative feelings towards the personnel and preventing effective medical treatment [11]. Thus, clinical researchers are required to develop, implement, and evaluate methods to reduce the children's anxiety and their ability to overcome hospitalization and invasive procedures stresses [12]. Considering children's age and previous experiences, nurses should make the children ready for the procedure [13]. Various pharmaceutical and non-pharmaceutical approaches have been adopted to reduce children's pain and anxiety during medical procedures [14]. Most of the interventions during intravenous placement in children include pharmaceutical interventions, behavioral distractions, tactile interventions, sweet solutions for infants, and cold analgesia leading to different results [15].

Today, non-pharmaceutical approaches for reducing pain and anxiety has attracted the attention of the nursing system and patients have voiced their willingness to the application of these approaches. Orientation is one of the non-pharmaceutical approaches for reducing anxiety among children [16]. In addition, providing the patients with knowledge of medical procedures can reduce their anxiety [17]. A review study indicated that training the 4-6-aged children undergoing elective surgical procedures can reduce their anxiety although it may negatively affect the younger children's anxiety [18]. It is worth noting that the ideal method of delivering this piece of information before the procedure is unknown [17]. In this regard, there are different protocols such as instructions on future procedures, visiting hospital and...
operation room, studying picture books on similar experiences and introducing videos [19]. Printed materials are very instrumental for giving information to the patients, but not all of the patients can read and understand them [17]. Pictures and creative materials inside picture books for children can help them to identify the content and rebuild their own version of the story. Picture books contain interactive texts and pictures which create a conscious and artistic elegance. Children’s illustrated books are unique sources for attractive instructions since these books aim to provide the reader with brief, fun, colorful, and readable material (20). Some studies reported that medical picture books are very instrumental to reduce anxiety among pre-school children during and after intravenous placement procedure. Thus, it is recommended to use these books routinely for reducing the distress caused by intravenous injection [20]. Another study reported the children orientation on voiding cystourethrogram through storybook is very instrumental to increase the children’s tolerance undergoing this diagnostic test [21]. Further, this method was proven to be effective in making the children ready for surgical operation through books and reducing their anxiety before surgery [8,22].

Although intravenous catheterization and serum infusion does not usually last for some minutes, it can provoke the children’s anxiety. However, providing an anxious child with medical care and attention is very difficult in medical procedures [23,24]. Nurses play an important role in controlling the patients’ anxiety, especially children [25]. Those nurses who take the patients’ anxiety seriously and try to alleviate the created anxiety can establish a better relationship and increase the children and their parents’ satisfaction levels [26]. Various studies have been conducted in Iran and other countries regarding the children’s anxiety and its reduction in different procedures. However, no study, to the best of our knowledge, has been reported regarding children orientation to catheterization and intravenous infusion through picture books and their effects on school-aged children’s anxiety in Iran. Therefore, the present study aimed to evaluate the effects of intravenous catheterization and infusion orientation through picture books on school-aged children’s anxiety at pediatric emergency ward of Shohadaye Khalij Fars Hospital in Bushehr, Iran.

**Methods**

This randomized clinical trial study was conducted at Shohadaye Khalij Fars Hospital in Bushehr during the summer and autumn, 2017. The effect of orientation on peripheral intravenous catheterization and serum infusion through picture books among 6-12-aged children referring to emergency ward was examined in the present study.

**Subjects**

The subjects included the children, aged 6-12, who underwent peripheral intravenous catheterization and intravenous serum infusion at Shohadaye Khalij Fars Hospital in Bushehr. The 6-12 aged children who had not been hospitalized previously and had not undergone any peripheral intravenous catheterization were selected. Other criteria included full consciousness, the parent’s informed consent, oral agreement of the children to participate, and one of the parents’ attendances during the study. Those participants taking pain and anxiety relief drugs (at least 6 hours before the procedure), having physical problems such as verbal, mental, eyesight, and hearing, and suffering from known psychological diseases requiring emergency serum therapy were excluded from the study. In addition, after entrance to the procedure, those individuals who confronted with an unsuccessful catheterization at the first attempt were eliminated from the list.

Based on the previous study, the subjects in the intervention group had 1.57 and 2.22 for the mean and standard deviation of anxiety, respectively, while those in the control group had 3.42 and 3.65, respectively [27]. In order to evaluate the effectiveness of type 1 error, \( \alpha = 0.05 \) and statistical power of 0.80 are necessary for the sample size based on the comparative mean formula of the population. Finally, 70 children were selected and equally divided into an intervention and a control group.

**Ethical considerations**

The present research was approved by the Ethical Committee of Bushehr University of Medical Sciences and was registered at Iranian Registry of Clinical Trials (IRCT) (code: IRCT2017041712830N22). After obtaining permission from Research Deputy of Bushehr University of Medical Sciences, presenting the introductory letter to the Research Center, introducing the authors of this paper to the Research Units and explaining the advantages of reading and safe nature of the intervention to the parents, they were given the option to participate in this study. The study was executed in pediatric emergency ward of Shohadaye Khalij Fars Hospital in Bushehr. The parents’ informed consent was taken in written form and the children gave an oral agreement. The participants were assured about the confidentiality of the collected data.

**Materials**

In the present study, the independent variable was a picture book, which was compiled by an illustration postgraduate through consultation with some professors at Nursing and Midwifery Faculty at Bushehr University of Medical Sciences. This book contained six childish drawings in which peripheral intravenous cannulation and serum therapy demonstrated step-by-step from the beginning to the end of the procedure.

Anxiety was considered as the dependent variable, which was measured by Observation Scale of Behavior Distress, Revised (OSBD_R), which is a standard scale to measure anxiety and has been used in various studies [20,28]. The reliability and validity of this scale was satisfactorily confirmed by Elliott et al. (1987) [29]. Regarding Iran, Ghazavi et al. confirmed the reliability of this scale (\( r=0.70 \)) [30]. The scale consists of eight behaviors indicating children distress resulting from therapeutic procedure. The behaviors and their weights include crying (1.5), screaming (4.0), restraining (4.0), and verbal resistance (2.5), and information-seeking (1.5), solicitation of emotional support (2.0), verbal pain expression (2.5) and flail (4.0). A total score of 22 is considered as the highest level of distress [1]. Further, demographic information such as age, gender, birth order, parents’ education level, and residential area was collected.

**Procedure**

First, the patients selected by using the convenience method. Then, they were randomly assigned into intervention or control groups by drawing from a collection of 70 cards labeled from 1 to 70 after the parents and their children declared their informed consent. The cards with even and odd numbers were assigned to control and intervention groups, respectively. Demographic information was provided by one of the parents. After visiting by the doctor and serum prescription, the child entered the treatment room with one of the parent. During the
first phase, the child entered the room and visited the nurse preparing peripheral intravenous cannulation and serum infusion equipment for 3 minutes. Then, the nurse gave him/her enough information on intravenous catheterization and serum infusion procedure by using the picture book and oral account. Regarding the control group, the subjects received the same oral account as done for the intervention group and the same nurse performed intravenous placement and insert serum. The intravenous placement was performed by an experienced nurse. The presence or absence of eight operationally-defined behaviors indicating anxiety was recorded by trained observers at 15-second intervals during the procedure and evaluated according to the severity of distress. The weighted scores were summed during each 15-second interval and divided by the number of intervals to obtain a mean score for each phase.

These phases include the following features in the intervention and control groups:

- **Phase 1:** In the treatment room for three minutes
- **Phase 2:** Finding the injection spot and preparing the skin
- **Phase 3:** Performing catheterization procedure, attaching and serum infusion
- **Phase 4:** From the end of phase 3 to 3 minutes after intravenous placement

Data analysis methods

The data were analyzed by SPSS software (version 22). In addition to descriptive statistics, Chi-square, Mann-Whitney, and Wilcoxon tests were used for comparing the distribution of qualitative demographic variables between the two groups before intervention, comparing the mean anxiety scores of different phases between the two groups, and comparing the mean anxiety score before and after intervention in two groups, respectively. The significance level was set at p<0.05 in all tests.

**Results**

After meeting the inclusion criteria and declaring informed consent to take part in the study, 74 children were selected for the study. Due to unsuccessful peripheral intravenous annulations in the first intravenous placement attempt, three children from the control group and one from the intervention group were excluded. Finally, the mean anxiety of 70 school-aged children was considered for evaluation. Based on the results, no significant difference was observed between the intervention and control groups in terms of demographic variables such as gender, birth order, parents' education level, the parent accompanying the child, and residential area. In other words, two groups were homogenous regarding demographic features. In addition, the mean age of the two groups was not significantly different. The mean age of intervention and control groups was 8.26 ± 2.147 and 8 ± 2.072, respectively.

<table>
<thead>
<tr>
<th>Demographic Features</th>
<th>Number (%)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intervention group</td>
<td>Control Group</td>
</tr>
<tr>
<td>Gender</td>
<td>Girl</td>
<td>20 (57.1%)</td>
</tr>
<tr>
<td></td>
<td>Boy</td>
<td>15 (42.9%)</td>
</tr>
<tr>
<td>Birth order</td>
<td>1</td>
<td>16 (45.7%)</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>15 (42.9%)</td>
</tr>
<tr>
<td></td>
<td>3 and Above</td>
<td>4 (11.4%)</td>
</tr>
<tr>
<td>Father’s Education</td>
<td>Under Diploma</td>
<td>10 (28.6%)</td>
</tr>
<tr>
<td></td>
<td>Diploma</td>
<td>13 (37.1%)</td>
</tr>
<tr>
<td></td>
<td>Academic</td>
<td>12 (34.3%)</td>
</tr>
<tr>
<td>Mother’s education</td>
<td>Under Diploma</td>
<td>13 (37.1%)</td>
</tr>
<tr>
<td></td>
<td>Diploma</td>
<td>13 (37.1%)</td>
</tr>
<tr>
<td></td>
<td>Academic</td>
<td>9 (25.7%)</td>
</tr>
<tr>
<td>Accompanying parent</td>
<td>Father</td>
<td>11 (31.4)</td>
</tr>
<tr>
<td></td>
<td>Mother</td>
<td>24 (68.6%)</td>
</tr>
<tr>
<td>Residential area</td>
<td>City</td>
<td>33 (94.3%)</td>
</tr>
<tr>
<td></td>
<td>Village</td>
<td>2 (5.7%)</td>
</tr>
</tbody>
</table>

**Table 1:** Frequency of demographic variables among the participants.

Further, the results indicated that the anxiety of both groups in the first phase (before intervention) was not significantly different. However, after intervention, the intervention group had considerably less anxiety in the second, third, and fourth phases, compared to the
Discussion

Opportunity for the nurses to help the school-aged children in facing phases in the intervention and control groups.

After children under study in both groups were the aged children through participant observations was documented.

Subjects in the intervention and control groups, respectively. According to the results, the highest percentage of children in both groups was accompanied by their mothers. Regarding birth order, most of the children under study in both groups were the first child of the family.

Regarding the father's education level, most of them in both groups hold a diploma. As far as mother's education level was concerned, 37.1% of mothers in the intervention group hold a diploma or they were under diploma while 45.7% of mothers in the control group hold a diploma.

In terms of residential area, most of the participants in both groups are living in the city. Exposure to city environment and culture may lead to a better relationship between the parents and the researcher.

Children's training on various medical procedures in which they are involved constitutes an important nursing intervention which is affected by their expectations and needs. Generally, training aims to enhance patients' autonomy and independence, and improve health outcomes [18].

The findings indicated that the mean anxiety level in the intervention and control groups is not significantly different. However, the mean anxiety level of the intervention group was significantly less than the control group after orientation intervention in the second and third phases. In addition, the anxiety level decreased in both groups in the fourth phase while it was more significant in the control group, compared to the intervention group. In other words, orientation intervention can control the children's anxiety during and after the procedure. In this regard, a study applied in 2015 in which concluded that insulin injection anxiety level among the children in the interactive game group involved with orientation toward the disease and insulin therapy was lower during and after the game, compared to the control group [1].

Based on the findings of the present study, the variations of mean anxiety scores before and after intervention were significantly different in both groups (Table 2).

<table>
<thead>
<tr>
<th>Groups Phases</th>
<th>Intervention</th>
<th>Control</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean ± SD</td>
<td>Mean ± SD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0.844 ± 0.901</td>
<td>0.724 ± 1.015</td>
<td>0.417</td>
</tr>
<tr>
<td>2</td>
<td>0.675 ± 0.979</td>
<td>2.197 ± 1.906</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>3</td>
<td>0.667 ± 0.610</td>
<td>3.218 ± 1.799</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>4</td>
<td>0.032 ± 0.875</td>
<td>0.303 ± 0.819</td>
<td>0.017</td>
</tr>
</tbody>
</table>

Table 2: A comparison of children's mean anxiety score during four phases in the intervention and control groups.

As shown in Table 3, a significant difference was observed between the groups in terms of anxiety level before and after intervention during the procedure to 3 minutes onwards. The difference decreased the anxiety level in the intervention group while it increased the anxiety level in the control group.

<table>
<thead>
<tr>
<th>Groups Phases</th>
<th>Before intervention</th>
<th>After intervention</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean ± SD</td>
<td>Mean ± SD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention</td>
<td>0.844 ± 0.901</td>
<td>0.458 ± 0.467</td>
<td>0.018</td>
</tr>
<tr>
<td>Control</td>
<td>0.724 ± 1.015</td>
<td>1.906 ± 1.157</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

Table 3: A comparison of anxiety score mean variations before and after intervention.

Discussion

In the present study, a picture book on IV catheterization and infusion was created and the behavioral distress of hospitalized school-aged children through participant observations was documented. Based on the results, this kind of intervention could provide an opportunity for the nurses to help the school-aged children in facing IV catheterization. In addition, this method can improve the children's preparation and reduce their anxiety.

Further, the mean anxiety level was examined by using OSBD_R in four phases. The first phase was performed in the treatment room before any intervention while three other phases were conducted after intervention. The results indicated that the mean anxiety during the phases after intervention in the control group was significantly higher than that of the intervention group. Furthermore, the variations of mean anxiety scores in four phases were significantly different in both intervention and control groups. These variations in the intervention group represented the reduction of anxiety level in the first to fourth phases. However, these variations in control group could represent a gradual increase of anxiety level from the first to third phases and finally a reduction during the last phase.

Among the participants girls included 57.1% and 48.6% of the subjects in the intervention and control groups, respectively. According to the findings, the highest percentage of children in both groups was accompanied by their mothers. Regarding birth order, most of the children under study in both groups were the first child of the family. Regarding the father's education level, most of them in both groups hold a diploma. As far as mother's education level was concerned, 37.1% of mothers in the intervention group hold a diploma or they were under diploma while 45.7% of mothers in the control group hold a diploma. In terms of residential area, most of the participants in both groups are living in the city. Exposure to city environment and culture may lead to a better relationship between the parents and the researcher.

Children's training on various medical procedures in which they are involved constitutes an important nursing intervention which is affected by their expectations and needs. Generally, training aims to enhance patients' autonomy and independence, and improve health outcomes [18].

It was reported in a study performed in 2013 that the anxiety level of patients undergoing operation before blended education program in both groups was not significantly different. Further, the anxiety level of the intervention group was significantly lower than that of the control group after intervention. However, anxiety level in the second test (releasing time) was not significantly different in both groups [30,31], maybe due to the lengthy interval between the education and the second post-test. Furthermore, the method, age-range and the performed procedure on the patients were different from the present study.

Based on the results of the present study, the variations of mean anxiety scores before and after intervention were significant in both intervention and control groups. However, these variations represent a decrease in anxiety level in the intervention group and an increase in the control group. In other words, expectedly, the intervention could control and reduce the children's anxiety undergoing the procedure effectively. However, the anxiety of the control group increased due to the lack of intervention.
The results are consistent with those reported by a research that investigated the effects of Iranian famous puppet "Kolah Ghermez" (the red hat puppet) on the anxiety of hospitalized children before appendicitis surgery. They reported that the difference of anxiety level was significant before and after intervention in both groups. However, anxiety decreased in the intervention group and increased in the control group. The researchers in the present study believe that the puppets are instrumental for reducing children's anxiety before operation and their application is highly recommended [32]. In addition, a study published in 2013 concluded that children's storybooks containing operation related issues are effective for reducing the anxiety before the operation among 5 to 11 year-old children, especially 7-year-old girls [22].

It has been suggested that children orientation about the injection procedures through games can considerably reduce their anxiety during the procedure [13]. These results are consistent with the findings of the present study. In addition, in 2015 it was reported in study that anxiety decreased considerably among children who underwent interventions through training manual and role-playing the procedure on a teddy bear [33]. Further, mean anxiety variations were significant in the control group, which indicated an increase in the anxiety level in this study. According to a research published in 2013 giving information to patients undergoing coronary artery bypasses graft surgery about the surgery procedure and its following care and recovery can considerably reduce their anxiety, which this is in line with the results in the present study. Further, they reported that the mean anxiety level decreased in both groups, compared to pre-operation although the reduction was more significant in the intervention group [34]. However, it seems that the reduction of anxiety in the control group is related to the finished operation, which reduces patients' anxiety automatically.

Furthermore, some studies indicated the positive effects of picture books on decreasing the anxiety of children receiving medical procedure. For example, it was investigated the effects of pre-school children orientation on intravenous placement procedure through picture book and found that the anxiety level increased during intravenous placement procedure compared to the beginning of the procedure although this increment was only significant in the control group and no significant increase was observed among the children in the intervention group [20]. It is worth noting that they examined pre-school children while the present study considered the school-aged children. According to Langford, 6 to 12 year-old children acquire logical thinking and their anxiety could be reduced realistically through explanation and briefing before the procedure [35]. In addition, using distraction techniques can alleviate anxiety in children during IV placement. The reported distraction techniques include providing educational picture books about injections before its administration, as well as delivering visual and sensory information about the procedure [36].

However, some researchers conducted a study on 4 to 8 year-old children and reported that child's guardians' education about anesthesia through pamphlets did not affect the children's anxiety during anesthesia procedure and the anxiety level increased significantly in both groups after intervention [37]. On the contrary, it is believed by another study performed in 1994 that parents can smooth the experience for the children during induction with proper parental preparation, education and counseling, and anesthesia can be induced with no trauma, fear or anxiety [38].

The inconsistency in the results can be related to different training methods, age range, and procedure type. However, it has been reported that informing the children with the age range of 8-10 with operation and anesthesia through pamphlets could decrease their anxiety although the reduction was insignificant, which is inconsistent with the results of the present study. In addition, the anxiety of the control group increased in the previous studies [39], which is congruent with the results of the present study. The incongruent results of the previous studies could result from the absence of the children's parents or ineffectiveness of the intervention caused by this absence. Although school-aged children can tolerate parents' absence more, hospitalization may enhance their needs for security and parental presence [32].

Based on the results, an IV catheterization picture book is effective in decreasing school-aged children's anxiety during and after the intervention. Therefore, the nurses should explain the steps in procedure and their relations. Thus, nurses can play an important role within the framework of the holistic, patient-centered and individualized health care.

**Limitation of the study**

Ignoring the duration time of intervention, cultural and generation gap between parents and children are considered as the limitations of the present study, which may affect children's anxiety level.

**Clinical implications and conclusions**

Based on the results, orientation on intravenous catheterization and serum infusion procedure through picture books can control and reduce the anxiety among school-aged children during and after performing the treatment in the intervention group. Therefore, it is recommended that picture book should be routinely used for children during peripheral IV catheterization in order to decrease their anxiety. However, further studies with samples in different ages and cultural groups are warranted to provide conclusive evidence.

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