



# Nursing Intervention to Reduce Pediatric Pain in Needle Procedures in Emergency Department: A Systematic Review of Randomized Controlled Trial

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**Abstract:** Introduction: Needle procedures are common actions that are often encountered in emergencies. Emergency Department (ED) with high workloads sometimes needle procedures are performed by force, thus causing uncontrolled pain, long-term negative psychological disorder, impairing physical evaluation and clinical outcome. The purpose of this review is to identify nursing intervention to reduce pediatric pain in needle procedures in ED. Methods: The literature search used the PubMed database with the keywords: nursing intervention, pain, needle procedures or injection and emergency department. Article criteria: 1) full text, 2) published in the 2016-2020 period, 3) employing Randomized Controlled Trial (RCT) research design, and 4) respondents aged 3-13 years old. Analysis of the quality of articles using the Critical Appraisal Skills Programme (CASP) and Preferred Reporting Items for Systematic Review and Meta-analyses (PRISMA). Result: 171 articles identified. Based on criteria and quality assessment of articles as many as 6 articles reviewed with focus intervention: virtual reality, parental presence, buzzy application, ditto application, humanoid robot and listening music. Conclusion: Nurses can use these interventions in the nursing care to reduce pediatric pain during needle procedures in ED.

**Keywords** Emergency Department, Needle Procedures, Nursing Intervention, Pediatric Pain

## 1. INTRODUCTION

The main crisis that children face when they are sick is hospitalization. During treatment, children experience physical and psychological stress, one of which is the result of invasive procedures such as infusion installation, blood retrieval procedures and intravenous administration of drugs. This not only causes pain but triggers anxiety in children in the long term (L. J. Chang, L. Y., & Tsai 2017). The child's response to pain stimulus varies greatly. Some of the children's responses are that they think that pain can magically disappear, consider pain as punishment, tend to assume someone intentionally performed the act, cried, shouted, hit the head, arms and legs, encouraged stimulus and was uncooperative. Most children experience pain and fear while receiving treatment, the condition affects each other (M. Piskorz, J., & Czub 2018).

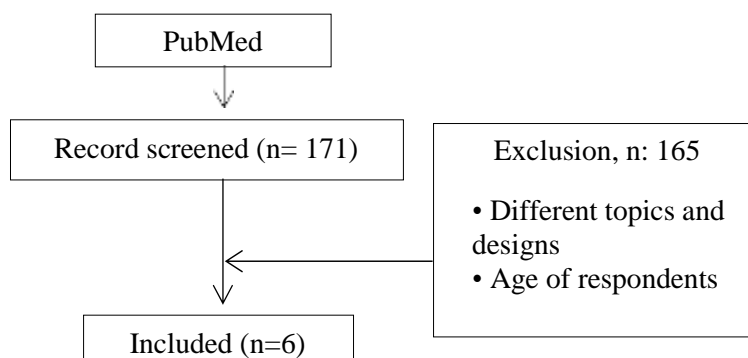
In the Emergency Department (ED), it is known as a room with a dense capacity, so that during the procedure of action, it is often carried out quickly, in addition in some cases, successful actions, usually the babysitter or member of the medical personnel must spend additional time entertaining, restraining and forcing the child. Forcing and restraining children can cause discomfort, violence and trauma. In other cases allowing children

without coercion usually increases the procedural duration and this becomes an additional burden on nurses, so it is not uncommon for pain relief to be often overlooked by health workers (K. J. Ball, Bindler, & Cowen 2010), (Yang & Chang 2014).

Needle-related actions inevitably cause pain, but what is needed is to manage and minimize the impact. Interventions to reduce inadequate pain can negatively affect children, the elderly and hospitals (Jibb & Cafazzo 2017). Failure to manage pain can increase workload and prolong action time, consequently reducing satisfaction (Wong, Lui & Choi 2019). Nurses are responsible for the pain that children experience during action in ED. Various nursing interventions are needed to address the problem. The interventions carried out are of course non-pharmacological nursing interventions. Nonpharmacological nursing interventions have a significant impact in pain management and can be controlled by children (Aydin, Sahiner & Ciftci 2016). Based on the above problems, a systematic review is needed to identify the various nursing intervention to reduce pediatric pain in needle procedures in ED.

## 2. METHODS

Systematic review is carried out by searching for research articles through the electronic databases of PubMed with keywords: nursing intervention, pain, needle procedures or injection and emergency department with the following inclusion criteria: 1) full text, 2) published in the 2016-2020 period, 3) research design Randomized Controlled Trial (RCT) , 4) respondents aged 3-13 years old. The quality analysis of research articles was selected by applying the Preferred Reporting Items for Systematic Reviews and Meta-analyzes (PRISMA) and the Critical Appraisal Skills Program (CASP).



**Figure 1.** Flowchart of the selection procedure for articles

### 3. RESULTS AND DISCUSSION

171 articles reviewed and 6 articles were obtained based on the selection of inclusion criteria. There are several interventions to reduce pediatric pain in needle procedures in ED, namely:

#### **Virtual Reality**

Yen-Ju Chen et al (2019) conduct research by providing Virtual Reality intervention (VR), which aims to reduce pain and fear in school-age children receiving intravenous injection in a regional IDG in Taiwan. Research with a total sample of 136 people (experiment and control each 68 people), using a scale Wong—Baker Faces Pain Rating Scale (WBFPS) and Children's Fear Scale (CFS) in the process of measuring the level of pain and fear. This RCT research which was conducted for 6 months, conducted its intervention in which the experimental group used VR and iPhone. There are 4 virtual environments on offer, namely roller coaster, space, wildlife and tourist destinations, After the participants select the virtual environment they want then they put on a screen that is placed on their head whose VR usage time starts when the injection location is determined, while the control group only received verbal entertainment. A post test was performed after the intervention for 5-8 minutes with the overall result that pain and fear scores were significantly lower in the virtualreality group [8].

This is in line with research S. H. Ryu et al, that this Virtual Reality intervention can effectively reduce the pain and fear of pediatric patients aged 4-10 years receiving general anesthesia and elective surgery [9], [10]. The same research was also conducted by S. J. Birnie KA et al, in pediatric patients with cancer aged 8-18 years who underwent needle insertion implantable venous access device (IVAD), in reducing the side effects of nausea and dizziness [11]. VR environment which is a virtual three-dimensional can stimulate hearing, visual and touch so that it can divert the action [12]. Interacting with VR can distract attention, which causes the incoming pain signal to respond more slowly [13].

#### **Parental Presence**

In his research Dilek et al (2018) wrote down the influence of parental presence on levels of pain and anxiety during invasive procedures. Research conducted in Turkey divided into 3 groups, namely the parent involvement group and the presence of parents, each of which was 40 samples and the parent absent group was 31 respondents. The inclusion criteria in this study were children aged 9-12 years, using instruments Visual Analogue Scale & State-Trait Anxiety Inventory for Children, It was found that the level of pain of children

in the parent absence group was significantly higher than the parent involvement group and the parent attendance group. [14].

Other studies in qualitative studies are also in line, where the results of the analysis of the theme show that the role of the presence of parents is very influential on anxiety and reducing pain after surgery [15], [16]. This is also in line with research H. Al-Abbass et al, in children aged 7-12 years during blood withdrawal and invasive, where parental support can reduce pain, stress and bad behavior, in addition to reducing pain during the blood draw process in children aged 6- 10 [17]. Maternal participation in hospital care has a positive effect on psychological, physical and social, thereby reducing physiological symptoms in children, children feel comfortable when loved ones are nearby [18].

### **Buzzy Application**

Birsen et al (2019), in his research applying Buzzy® and ShotBlocker® devices to reduce pain during IM Penicillin injections in children. The study, which was conducted in Turkey, took 150 samples from 7-12 years old, which were divided into 3 groups (the control group, Buzzy®, and ShotBlocker®, each with 50 respondents). Buzzy® is a local device that stimulates the skin with a cool and vibrational effect while the ShotBlocker® is a non-invasive device made of small plastic, in the shape of a horseshoe, temporarily blocks pain by pressing pressure on the skin through its points. By using State-Trait Anxiety Inventory for Children, Visual Analog Scale & Faces Pain Scale-Revised, It was found that the children in the control group had significantly higher pain scores during penicillin injection than the children in the ShotBlocker® and Buzzy® groups. Anak-anak dalam kelompok Buzzy® memiliki rasa sakit yang jauh lebih sedikit daripada anak-anak di kelompok ShotBlocker® dan kontrol (  $p < .001$ ). Buzzy® is more effective than ShotBlocker® in this study [19].

In a single-blinded study, it was found that Buzzy® was effective at reducing pain by IM injection and improving post- injection satisfaction [20]. Sahiner and Bal also reported that among children aged 7 years who were vaccinated, the levels of pain and anxiety were lower than the control group using Buzzy® [21]. Another study that also supports the effectiveness of Buzzy® is the reduction of pain during blood sampling, intravenous and immunization shots [22]. Although IM injections are considered a simple technique, if administered inappropriately they can cause complications [23]. As long as IM procedures can cause pain and discomfort in children, future pain can be tolerated with proper and efficient pain management [24].

### **Ditto Application**

RCT research conducted by Kate Miller et al, have the purpose of wanting to assess the use of Ditto (Diversionary Therapy Technologies, Brisbane, Australia), a handheld electronic device that provides procedural preparation and distraction, as a means of managing pain and distress during IV cannulation performed in a child's ED. This research, which was conducted in Australia, took 98 samples using instruments Wong Baker Faces (FACES) Scale & Visual Analog in children aged 3-12 years. Respondents were divided into 5 groups and assessed through reports from respondents and observational reports by caregivers and nursing staff. Assessments are made before, during and after IV cannulation. As a result, children, caregivers and nursing staff reported significantly reduced pain and distress in children using the protocol Ditto Procedural Preparation dan Ditto Preparation and Distraction  $P \leq 0,01$ ). This intervention also saw the reduction in pain and distress reported by the child [25].

This concentration of attention is in accordance with the theory of pain control gates, where the message of pain that is felt can be modified by focusing attention so that it reduces a person experiencing pain [26]. Attention-based non- pharmacological approaches are increasingly being used to treat pain in children during medical procedures [27]. The use of technology in the form of electronic devices can be adapted as an alternative to conventional intervention approaches [28]. Supported by research Kipping et al, that use “Ditto” in children and adolescents who undergo burn treatment is more effective at reducing levels of pain and stress [29]

### **Humanoid Robot**

Samila Ali et al, in his research in Canada using a humanoid robot media named Medi Robot to reduce pain in the procedure Introduction Intravenous insertion (IVI). This study was aimed at children aged 6-11 years, which was conducted in 3 phases (pre, during and after) with a length of 15 minutes. This study uses a research assistant whose task is to collect research data. In the treatment group, the children would interact with the robot and be recorded by the assistant. The control group received standard care. The research with the number of respondents as many as 80 children showed that the use of a robot was able to reduce pain during intravenous procedures.

L. A. Jibb et al, in his research also using robots (MEDIPORT) as a diversion medium in reducing pain and distress in children aged 4-9 years with cancer during subcutaneous port access. The robot will dance and sing while the nurse performs the needle insertion with

the result that MEDIPOINT is very liked by the participants and the pressure during the procedure is less felt on the injection area [30]. Other studies that are also in line are by M. Yasemin et al, where in his research, he wanted to compare the effectiveness of the Huggable robot effect with virtual characters on the screen. It was found that children were more eager to be emotionally connected and physically activated by robots than virtual characters, which illustrates that social robots have the potential to provide socio-emotional support during inpatient child care. In addition, humanoid robots are effective in reducing anxiety and fear in children aged 4-10 years during their dental work [31].

### **Listening music**

Research conducted by van der heijen et al (2019) on the use of music and watching cartoons toward child pain in IGD, the results showed music is stronger in lowering pain during the procedure of action in ED[32]. This study is in accordance with previous research by Kant & Akpınar (2017), the results showed that music effectively reduces pain during intramuscular injection [33]. Music can reduce pain because music works by relaxing and physiologically calm music can stabilize vital signs and improving endorphins [34]. The use of music as therapy in health services has long been used. Music is very effective in reducing pain not only in adult patients but also in children. Music in question is music that is liked and familiar with patients [35].

### **4. Conclusion**

ED nurses can use interventions virtual reality, parental presence, buzzy application, ditto application, humanoid robot and listening music to help reduce pediatric pain during needle procedures.

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