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Short Communication

Are New Technology Effective in Reducing Pain and Anxiety in Children Undergoing Surgery? A Narrative Review

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Abstract

This review examines the effectiveness of therapeutic play interventions in reducing anxiety, pain, and improving the overall well-being of pediatric patients undergoing surgery. Preoperative anxiety in children is linked to negative postoperative outcomes, including increased pain and a higher need for analgesics. The review analyzes studies published between 2020 and 2024 that focus on game-based interventions and new technologies such as virtual reality and AI. Findings suggest that these interventions can alleviate anxiety, enhance preoperative preparation, and improve patient satisfaction, particularly in younger children. While pain reduction was not significantly observed, digital distractions have shown promise in decreasing distress during painful procedures. The review highlights the potential benefits of gamification in both preoperative and postoperative care, though further research is needed to explore long-term effects and optimize these interventions in clinical settings.

Keywords: children, pain, nursing, surgery

Intense anxiety can impact both the physical and mental well-being of children, leading to negative postoperative results. As many as 20% of children undergoing surgery may show signs of stress and psychological strain (such as delirium and behavioral changes), with some effects lasting for months after the procedure. Moreover, preoperative anxiety is linked to increased postoperative pain and can even result in a threefold increase in the use of analgesics. In this context, alleviating anxiety and pain is a key objective for promoting the overall well-being of children undergoing surgery within nursing care.

The aim of this review is to critically evaluate and summarize the available empirical evidence on the effectiveness of therapeutic play interventions in reducing anxiety, pain, and enhancing the overall well-being of pediatric patients undergoing surgery.

The inclusion criteria were studies published between 2020 and 2024, including original articles in English with free full text access, as well as systematic reviews, reviews, clinical trials, and meta-analyses. The databases consulted were SCOPUS, MEDLINE/PubMed, and WoS.

A total of 50 articles were identified. Forty-one papers were excluded due to irrelevance to the topic, and two were excluded because they were not in English. Seven records were initially selected, and after a thorough review, six articles were ultimately included. The child samples were eterogeneous, encompassing different settings (ambulatory and elective) and types of surgery (dental, ENT, genital, urological, ophthalmological, orthopedic, abdominal, and general). All the studies examined the impact of game-based interventions and new technologies on anxiety and pain levels. Each of the six studies provided strong evidence supporting the role of therapeutic play in reducing anxiety and pain, as well as improving the overall well-being of pediatric patients.

To the best of our knowledge, no prior narrative reviews or meta-analyses have assessed the impact of game-based interventions and new technologies on pain and anxiety levels in children undergoing surgery. Our analysis indicates that new technologies (such as gaming, virtual reality, and AI) enhance preoperative preparation for children, particularly by alleviating anxiety. While no significant differences in pain levels were observed, this may be attributed to the limited number of studies addressing this aspect. However, digital distraction methods have been shown to decrease distress and pain in children undergoing painful procedures.

Distraction techniques and non-pharmacological medical approaches offer simple, easily implementable interventions that help reduce anxiety and disruptive behavior in children. Virtual reality devices, when used during routine blood draws, have been shown to decrease acute pain and anxiety, while also resulting in high levels of patient satisfaction. In a related study, patients stated that the intervention helped them feel more at ease and less fearful during their hospital stay. Gamification is another enjoyable educational tool that can be beneficial both in preparing children for surgery and in postoperative care. Research has shown that children who participate in multimedia educational interventions experience less anxiety about surgery and other hospital procedures. Additionally, this approach can help reduce anxiety in parents as well. However, a recent meta-analysis suggested that virtual reality interventions might be more effective for younger children than for adolescents. Game-based interventions not only reduce preoperative anxiety but also offer an opportunity to educate children about the hospital environment, either during their stay or even at home before their treatment.

Gamification has been shown to enhance the physical, mental, and emotional well-being of children. However, despite the apparent significant benefits of this intervention, there is limited knowledge about the long-term effects (post-surgery, during hospitalization, or after discharge). Additionally, the children in the studies included in our analysis varied in age, type of surgery, and hospital setting, so our findings should be interpreted with caution.

The narrative review presented in this paper demonstrates that game-based interventions can effectively reduce preoperative anxiety. These interventions are safe and serve to both engage and educate children about medical procedures.

By alleviating anxiety, these interventions support quicker hospital discharge, faster recovery and rehabilitation, a decreased need for medication during anesthesia, and improved pain tolerance, all of which contribute to lower hospital costs. This innovative and enjoyable intervention can be valuable in caring for pediatric surgical patients, helping to reduce pain and anxiety during preoperative care. This task is often difficult for nursing professionals, but game-based strategies can assist them in offering positive support, benefiting children's emotional well-being and recovery after surgery. However, these distraction-based interventions require further development to optimize surgical care pathways in both preoperative and postoperative settings for pediatric patients [1-7].

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