

## **Procedural pain in children**

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Procedural pain is frequently encountered in children either during an emergency or management of their disease. Invasive procedures are documented as the most painful and traumatic events experienced by children. Although procedure-related pain represents an acute, short-lived experience, it is accompanied by a great deal of fear and anxiety. For example, researchers have reported that bone marrow aspirations/biopsies and lumbar punctures are perceived as extremely painful by children with cancer. Previous studies have shown that children do not adapt to the discomfort associated with intrusive procedures, but experience greater levels of anxiety with repeated painful experiences. Children often experience symptoms such as depression, insomnia, and anorexia before the clinic or hospital visit which will include a procedure. Consensus among professionals caring for children with cancer supports a developmental approach to managing pain associated with procedures in children with cancer. The goal is to provide comfort and support during all procedures experienced by the child with cancer.

This overview will address the following questions:

- what will influence the choice of therapy
- which procedures are included
- are therapeutic interventions supported by efficacy and safety data
- is there any evidence for combining drugs and non pharmacological techniques
- how to reduce the risk of analgesia-related complications

What will influence the choice of therapy ?

Many factors influence therapeutic choice. Among them, the expected intensity and duration of pain, the age of the child previous unpleasant experience, emergency, environment, and human

resources. Even for similar procedures, therapeutic interventions may vary considerably in the same country. In a Swedish nationwide survey of pain treatment in pediatric oncology, lumbar punctures were performed under general anesthesia in half of the institutions and without general anesthesia in the remaining centers. Expected intensity and duration of pain depends on the procedure involved and on the patient. Even a simple venous puncture may be described as the worst pain for some children. There is evidence that young children experience more distress and warrant additional consideration than older children subjected to similar procedures. Safety considerations are essential when painful procedures are to be managed in remote locations. Education of nursing staff or nonanesthesiologist physicians is a key issue for improving safety of analgesia-sedation techniques.

Which procedures are included?

Procedural pain includes many different procedures and situations. The procedures involved ranged from simple phlebotomy to invasive procedures with serious risks should the patient move in response to the painful stimulus.

Are therapeutic interventions supported by efficacy and safety data?

Procedures may be divided into 3 categories in terms of pain and/or discomfort:

- minor (venipuncture, Port-a-cath puncture, intravenous cannulation)
- moderate (lumbar puncture, bone marrow aspiration)
- major (fracture reduction, endoscopy)

For minor and moderate procedures 50% nitrous oxide and local anesthetics used alone or in combination have clearly proved their effectiveness and safety.

Other oral intravenous/intramuscular agents of many chemical groups are currently in use.

However, although many practitioners have anecdotal practice patterns that they believe are highly successful, the literature does not clearly support one practice pattern from the other.

Is there any evidence for combining drugs and non pharmacological techniques?

A wide range of behavioral and cognitive technique has been found to be efficacious for helping children to cope with acute procedural pain. Many existing interventions and assessment tools are reasonably easy to use, allowing practitioners to have the tools to identify children most vulnerable to pain and to significantly reduce pain-related distress in these children. However, cognitive-behavioral management is of limited application to the child who is very young or previously traumatized to a severe degree. Availability of expert practitioners is also limited in many centers.

How to reduce the risk of analgesia-related complications?

Large surveys of adverse events encountered during procedural sedation have been reported in the past. Studies involving midazolam-fentanyl- and propofol-fentanyl-based regimens report respiratory adverse event rates from 5 to 10%. In contrast, the incidence of serious adverse events is around 1% with agents, such as low-dose i.v. ketamine or nitrous oxide.

Prevention of procedural pain should be a priority for all physicians. Premixed nitrous oxide, local anesthetics and low-dose i.v. ketamine share the same interesting safety profile and are useful for most minor and moderate procedures. The combination of hypnotics and opioids requires close monitoring and should be reserved for trained physicians. Cognitive behavioral therapies are a valuable adjunct to reduce procedure-related distress and should be used whenever possible.

Organization and education are essential to reduce the potential hazards associated with unintentional deep sedation. The published guidelines should be followed to minimize the incidence of severe adverse events.