Reducing Needlestick Pain

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My Home for the Summer Project consisted mostly of researching literature on pharmacological and non-pharmacological methods of reducing needlestick pain. At first I planned to incorporate survey results from applying some of these methods and a survey of patients’ experiences. However, I did not utilize many of these methods or products and have mostly literature information to present.

Why address this issue?

Patients encounter many interventions that rely on needlestick procedures. These interventions can be preventative, part of medical investigations, or a component of treatment. Regardless of the indication, they are frequently uncomfortable, even painful. It is prudent to minimize the amount of discomfort a patient experiences. Both pharmacologic and non-pharmacologic methods exist to do so. In the past I have approached health care with the view that children or infants may need some extra compassion during minor procedures and vaccinations requiring needlesticks, but I’ve learned in my experiences that even among adults there is a large variation in pain perception. I’ve seen large athletic men weep and whine at the approach of a needle that a 4 year old girl accepted as long as she could choose a pony sticker. Some patients will say, “It’s just sort of very itchy, doesn’t really hurt.” While others will scream. Needless to say, “Individual patient experience will vary.”

Some common pharmacologic methods used to reduce needlestick pain include topical anesthetics, needle-free injection and iontophoresis. The usefulness of transcutaneous electrical nerve stimulation will also be discussed. Oral sucrose, given to infants, is also considered a pharmacologic method of reducing pain. Non-pharmacologic methods include distractors and patient positioning, vigorous rub, rapid method, and using positive reinforcement. The non-pharmacologic methods are discussed first.

Non-Pharmacological Methods

1. Distractors and patient positioning. These can alleviate patient anxiety by providing entertainment or other stimuli so that the trauma experienced during a needlestick procedure is lessened. For example, I played a game with a 3 year old girl on my smartphone while the surgeon removed a small growth from her chest. She cried very little and was more interested in the game than the needles and suturing. The parents were very appreciative of the effort made and minimal discomfort their child experienced. In
another case however, with a 7 year-old boy requiring a simple frenotomy, distractors were not useful and I, the father and a nurse just held the child while the surgeon injected anesthesia into the base of the frenulum and snipped it. The nature of the procedure made simple distractors inadequate.

2. I have found that a vigorous rub prior to administering the needlestick can decrease the sensation of pain. This method minimizes the experience skin puncture, making it just another step in series of small steps of the procedure. Patients frequently respond with surprise and, “That’s it? I barely felt it.” However, certain injections are more uncomfortable than others, considering the nature of the substance being injected.

3. Using a rapid method. With many simple procedures and vaccinations especially in areas where vascularity is less prone to intravenous injection, it is better practice to rapidly administer the injection rather than prolonging the procedure by attempting to aspirate blood, a suggested technique to avoid intravenous injection. However, the health care professional must always consider this possibility when administering anything.

4. Positive reinforcement. For the young child, allowing them a reward, such as choosing a sticker, can act both as a distractor (poke them while they choose), and positive reinforcement. Some facilities arrange for children receiving a series of shots to receive a teddy bear or similar comfort object. Some practitioners still use small candies or suckers as treats, but due to increasing awareness of allergies and childhood weight issues it is a good idea to know to parent’s attitude regarding such treats. A word of encouragement can also help a patient of any age to feel better during an uncomfortable procedure.

Pharmacological Methods

1. Among the pharmacological methods available to reduce needlestick pain, topical anesthetics are popular. Lidocaine and tetracaine provide sensory blockade via reversible inhibition of axonal sodium channels, blocking action potentials, resulting in numbness and weakness. Lidocaine is metabolized by the liver and tetracaine by pseudocholinesterase. LET (combined lidocaine, epinephrine and tetracaine) is an excellent anesthesia for suturing simple face or scalp lacerations, but contraindicated for digits, ears, or the nose when containing epinephrine. One study showed that 46% of patients received adequate anesthesia with LET alone (1). Supplemental lidocaine was used for additional anesthesia for the remaining patients. I think it is important to point out that, if necessary, it is possible to reach a desired state of anesthesia using topical products alone.
2. EMLA (eutectic mixture of local anesthetics) is also considered useful for simple procedures on intact normal skin. It contains a 5% emulsion of lidocaine (2.5%) and prilocaine (2.5%). One study showed anesthesia of 3mm penetration at 1 hour and 5 mm at 2 hours (2). EMLA typically has a duration of about 1-2 hours, sometimes longer.

3. Liposomal encapsulation employs a phospholipid liposome to protect the anesthetic from degradation before reaching the target. Eg. LMX5 = 5% lidocaine. One study involving venipuncture in children showed the level of anesthetic achieved after 30 minutes of LMX4 was equal to 60 minutes of EMLA (3).

4. Tetracaine gels like Ametop require 30 to 45 minutes after application and occlusive dressing for full effect. Skin erythema is commonly reported and is due to the vasodilatory effect of tetracaine on capillary vessels.

5. Needle-free jet injection systems use compressed gas to deliver liquid or powder lidocaine 5 to 8 mm beneath the skin. The sudden release of gas makes an audible popping sound. The anesthetic takes effect 1-3 minutes after injection, making it faster than topical anethetics, but is equal in cost. It is used on intact normal skin for any procedure requiring rapid anesthesia. One study reported it to be more effective in reducing pain in air blood gas sampling in children in emergency departments when compared to topical lidocaine (procedure performed only 2 min after application in both groups, so not surprising) (4). It is also reported to have no impact on first attempt success rate of IV placement (5). Side effects include mild erythema and petechiae. Typically patients report the noisy injection as surprising, but not painful (6).

6. Vapocoolant spray works by cooling the surface of the skin before a puncture procedure. It desensitizes the skin, apparently by inhibiting pain by cold stimulation. It is applied 15 seconds before a procedure with a 3 to 7 second spray or until skin blanches, but is not frozen. It is considered equal to EMLA or tetracaine gel, but less effective than applying an ice cube to skin surface for intradermal procedures (which are not very painful to begin with) (7).

7. Iontophoresis is considered a transdermal anesthetic where electric current induces transdermal migration of ionized lidocaine into the dermis where it blocks nerve endings. This method is reported to be uncomfortable and takes time to take effect. Also there are local skin reactions due to application of electric current.

8. Transcutaneous electrical nerve stimulation may reduce pain in some people with certain conditions but not shown to reduce pain associated with needlesticks (8).
Oral sucrose is considered a pharmacological method of pain relief appropriate for neonates. It is used in a 0.5 ml preparation of 24% sucrose solution. It has been shown to decrease pain during arterial puncture and venipuncture in infants of 30 to 36 weeks gestation. The endpoints were significantly less crying during and after the procedure in the group receiving 24% sucrose than non-sucrose group according to Neonatal Infant Pain subscale (9).

My Own Experiences

My own experiences with topical anesthetics were very limited during my Home for the Summer experience and I would have liked to see more, especially in those situations where they were indicated. Procedures on children that may have benefited from topical anesthetics were usually carried on without them. Explanations included time constraints and the common practice of administering most needlestick procedures without a topical anesthetic. I did get some experience with administering lidocaine and marcaine via injection.

A non-pharmacological method that I have learned to employ is performing a vigorous rub of the skin area about to be punctured, which usually appears to be successful in decreasing pain perception. This may work due to the pressure and touch sensation that acts to inhibit the pain fibres, or the relatively minor contact of the puncture that is made immediately after a firm rub of the area. Using this as part of my method, I am frequently told by patients that they perceived less discomfort than is typical for them. This is especially true for procedures that they get periodically and have experience with, such as vaccinations or vitamin B12 injections, for example.

I mentioned previously the experience of using a distractor in the case of the 3 year old girl and my smart phone which was quite successful. Also, I think it can be appropriate to give a small treat for children who need needle puncture procedures. My own children view vaccinations a positive experience because of the lollipop and sticker they’ve received. Last fall my daughter who was 3 wanted to join her older sister for her pre-kindergarten round of shots because she remembered the treat they received during flu vaccines previously.

In conclusion, Home for the Summer has provided an excellent summer exposure and I thank Wayne Heide and the Office of Rural and Northern Health for this opportunity, as well as Jim Neufeld from C W Wiebe Medical Clinic who acted as my coordinator and all of the physicians, nurses and staff that made my summer experience a memorable one.
References


