Intranasal Ketamine and "Ketadex"

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- Intranasal procedural sedation options are great for pediatric procedures.
- Procedures where this is ideal include suturing, fracture reduction, foreign body removal, and facilitation of imaging.
- Dose of intranasal ketamine is 2mg/kg-4mg/kg.
- The issue is the volume that can be delivered intranasally and the concentration of ketamine that is available.
- **The maximum dose that can be administered intranasally is about 0.5cc/mL via atomizer.**
- Most departments have the 50mg/mL concentration but the 100mg/mL is ideal.
- Duration of action is approximately 15-20 minutes.
- Patient should be watched for about 60 minutes after the procedure
- If you are setting up a new protocol, involve the nurses and pharmacists early in the process.
- Intranasal ketamine and dexmedetomidine is called "KetaDex".
    - This is being studied at some children's hospitals in Canada.
    - The combination is primarily motivated by the volume issue that ketamine brings to the table.
    - Dexmedetomidine is like "clonidine on steroids". It is an alpha-2 agonist with similar risks to other agents that have this mechanism which include bradycardia and hypotension.
    - **Dose for ketamine in this combo is 2-4 mg/kg and for Dexmedetomidine it is 2-4 mcg/kg.**
    - The combination brings the analgesia effects of ketamine and the sedative effects of Dexmedetomidine.
    - Administer via atomizer in 2 separate doses.

References:

Intranasal Dexmedetomidine for Procedural Distress in Children: A Systematic Review. Poonai N, Spohn J, Vandermeer B, Ali S, Bhatt M, Hendrikx S, Trottier ED, Sabhaney V, Shah A, Joubert G, Hartling L. Pediatrics. 2020 Jan;145(1):e20191623. doi: 10.1542/peds.2019-1623. PMID: 31862730

Intranasal ketamine for procedural sedation and analgesia in children: A systematic review. Poonai N, Canton K, Ali S, Hendrikx S, Shah A, Miller M, Joubert G, Rieder M, Hartling L. PLoS One. 2017 Mar 20;12(3):e0173253. doi:10.1371/journal.pone.0173253. eCollection 2017. PMID: 28319161

Analysis of 17 948 pediatric patients undergoing procedural sedation with a combination of intranasal dexmedetomidine and ketamine.
Yang F, Liu Y, Yu Q, Li S, Zhang J, Sun M, Liu L, Lei Y, Tian Q, Liu H, Tu S. Paediatr Anaesth. 2019 Jan;29(1):85-91. doi: 10.1111/pan.13526. Epub 2018 Nov 28. PMID: 30484930

Adaptive randomised controlled non-inferiority multicentre trial (the Ketodex Trial) on intranasal dexmedetomidine plus ketamine for procedural sedation in children: study protocol.
Poonai N, Coriolano K, Klassen T, Heath A, Yaskina M, Beer D, Sawyer S, Bhatt M, Kam A, Doan Q, Sabhaney V, Offringa M, Pechlivanoglou P, Hickes S, Ali S; KidsCAN PERC iPCT-SPOR (Innovative Paediatric Clinical Trials – Strategy for Patient Oriented Research) Ketodex Study Team. BMJ Open. 2020 Dec 10;10(12):e041319. doi: 10.1136/bmjopen-2020-041319. PMID: 33303457

Effect of Intranasal Ketamine vs Fentanyl on Pain Reduction for Extremity Injuries in Children: The PRIME Randomized Clinical Trial.
Frey TM, Florin TA, Caruso M, Zhang N, Zhang Y, Mittiga MR. JAMA Pediatr. 2019 Feb 1;173(2):140-146. doi: 10.1001/jamapediatrics.2018.4582. PMID: 30592476

Nitrous Oxide in the ED

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- Nitrous oxide (NO) is a colorless, tasteless gas inhaled in combination with oxygen.
  - It is administered either through a full face mask (commonly seen in the ED) or a nasal hood (more common in the outpatient setting).
  - It is rapidly absorbed in the lungs and rapidly cleared (about 30-60 seconds).
  - No allergies have been reported.
  - It has proven to be extremely safe in adults and kids.
  - **It provides anxiolysis, amnesia and analgesia.**
  - When given as a sole agent, it is not considered procedural sedation. Often, it is used in combination with other medications (such as midazolam or fentanyl). In this case, it is considered a full procedural sedation.
- Procedures amenable to the use of nitrous oxide.
  - Most common ED procedures such as laceration repair, abscess drainage, fracture reduction, lumbar puncture, cardioversion, central line placement, fecal disimpaction, and wound/burn care.
  - Can be safely used in 3rd trimester pregnancy.
- Advantages of nitrous oxide over traditional PSA agents.
  - Extensive monitoring (cardiac or $EtCO_2$) is not required.
  - No intravenous line is needed.
  - It does not cause apnea.