

Procedural Sedation

EVIDENCE REPOSITORIES

Evidence repositories are collections of best available resources and evidence (clinical guidelines, peer reviewed literature, systematic reviews, etc.), collated by our knowledge synthesis team and content advisors. This evidence repository is not intended to be an exhaustive list of resources for a topic, but rather a curated list of current, evidence-based resources, based on expert consensus of relevance and usability for a general emergency department setting. We search databases (Cochrane Library, PubMed, TRIP Database) and web search engines (Google, Google Scholar) to locate evidence. Additionally, hospital websites are browsed for guidance documents, such as clinical practice guidelines (CPG) for healthcare professionals

Every effort is made to identify resources that are open access (i.e. publicly available, free of charge, not requiring a subscription).

More information about the creation of our evidence repositories can be found at <https://pubmed.ncbi.nlm.nih.gov/28537762/>

CONTENT TEAM

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Key Resources

TREKK developed resources for healthcare providers and parents & families can be found [here](#).

Clinical Guidelines

1. Green SM, Leroy PL, Roback MG, et al. An international multidisciplinary consensus statement on fasting before procedural sedation in adults and children [published correction appears in *Anaesthesia*. 2020 Jun;75(6):818]. *Anaesthesia*. 2020;75(3):374-385.
2. Coté CJ, Wilson S, American Academy of Pediatrics, American Academy of Pediatric Dentistry. Guidelines for Monitoring and Management of Pediatric Patients Before, During, and After Sedation for Diagnostic and Therapeutic Procedures. *Pediatrics*. 2019;143(6):e20191000.
3. Green SM, Roback MG, Krauss BS, et al. Unscheduled Procedural Sedation: A Multidisciplinary Consensus Practice Guideline. *Ann Emerg Med*. 2019;73(5):e51-e65.
4. Miller KA, Andolfatto G, Miner JR, et al. Clinical Practice Guideline for Emergency Department Procedural Sedation with Propofol: 2018 Update. *Ann Emerg Med*. 2019;73(5):470-480.
5. Coté CJ, Wilson S; AMERICAN ACADEMY OF PEDIATRICS; AMERICAN ACADEMY OF PEDIATRIC DENTISTRY. Guidelines for Monitoring and Management of Pediatric Patients Before, During, and After Sedation for Diagnostic and Therapeutic Procedures: Update 2016. *Pediatrics*. 2016;138(1):e20161212.
6. Godwin SA, Burton JH, Gerardo CJ, et al. Clinical policy: procedural sedation and analgesia in the emergency department [published correction appears in *Ann Emerg Med*. 2017 Nov;70(5):758]. *Ann Emerg Med*. 2014;63(2):247-58.e18.
7. Green SM, Roback MG, Kennedy RM, Krauss B. Clinical practice guideline for emergency department ketamine dissociative sedation: 2011 update. *Ann Emerg Med*. 2011;57(5):449-461.

Summaries of Systematic Reviews

1. Hartling L, Milne A, Foisy M, et al. What Works and What's Safe in Pediatric Emergency Procedural Sedation: An Overview of Reviews. *Acad Emerg Med*. 2016;23(5):519-530.
2. Coté CJ, Wilson S, American Academy of Pediatrics, American Academy of Pediatric Dentistry. Guidelines for Monitoring and Management of Pediatric Patients Before, During, and After Sedation for Diagnostic and Therapeutic Procedures: Update 2016. *Pediatrics*. 2016;138(1):e20161212.
3. Godwin SA, Burton JH, Gerardo CJ, et al. Clinical policy: procedural sedation and analgesia in the emergency department [published correction appears in *Ann Emerg Med*. 2017 Nov;70(5):758]. *Ann Emerg Med*. 2014;63(2):247-58.e18.

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- Green SM, Roback MG, Kennedy RM, Krauss B. Clinical practice guideline for emergency department ketamine dissociative sedation: 2011 update. *Ann Emerg Med*. 2011;57(5):449-461.

Systematic Reviews

- Giordano V, Edobor J, Deindl P, et al. Pain and Sedation Scales for Neonatal and Pediatric Patients in a Preverbal Stage of Development: A Systematic Review. *JAMA Pediatr*. 2019;173(12):1186-1197.
- Poonai N, Canton K, Ali S, et al. Intranasal ketamine for procedural sedation and analgesia in children: A systematic review. *PLoS One*. 2017;12(3):e0173253. Published 2017 Mar 20.
- Bellolio MF, Puls HA, Anderson JL, et al. Incidence of adverse events in paediatric procedural sedation in the emergency department: a systematic review and meta-analysis. *BMJ Open*. 2016;6(6):e011384. Published 2016 Jun 15.
- Roback MG, Carlson DW, Babl FE, Kennedy RM. Update on pharmacological management of procedural sedation for children. *Curr Opin Anaesthesiol*. 2016;29 Suppl 1:S21-S35.
- Pedersen RS, Bayat A, Steen NP, Jacobsson ML. Nitrous oxide provides safe and effective analgesia for minor paediatric procedures--a systematic review. *Dan Med J*. 2013;60(6):A4627.
- Ramaiah R, Bhananker S. Pediatric procedural sedation and analgesia outside the operating room: anticipating, avoiding and managing complications. *Expert Rev Neurother*. 2011;11(5):755-763.
- Deasy C, Babl FE. Intravenous vs intramuscular ketamine for pediatric procedural sedation by emergency medicine specialists: a review. *Paediatr Anaesth*. 2010;20(9):787-796.
- Leroy PL, Schipper DM, Knappe HJ. Professional skills and competence for safe and effective procedural sedation in children: recommendations based on a systematic review of the literature. *Int J Pediatr*. 2010;2010:934298.
- Green SM, Roback MG, Krauss B, et al. Predictors of emesis and recovery agitation with emergency department ketamine sedation: an individual-patient data meta-analysis of 8,282 children. *Ann Emerg Med*. 2009;54(2):171-80.e804.
- Mace SE, Barata IA, Cravero JP, et al. Clinical policy: evidence-based approach to pharmacologic agents used in pediatric sedation and analgesia in the emergency department. *Ann Emerg Med*. 2004;44(4):342-377.

Key Studies

- Cosgrove P, Krauss BS, Cravero JP, Fleegler EW. Predictors of Laryngospasm During 276,832 Episodes of Pediatric Procedural Sedation. *Ann Emerg Med*. 2022;80(6):485-496.

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2. Bhatt M, Cheng W, Roback MG, Johnson DW, Taljaard M; Sedation Safety Study Group of Pediatric Emergency Research Canada (PERC). Impact of Timing of Preprocedural Opioids on Adverse Events in Procedural Sedation. *Acad Emerg Med.* 2020;27(3):217-227.
3. Kamat PP, McCracken CE, Simon HK, et al. Trends in Outpatient Procedural Sedation: 2007-2018. *Pediatrics.* 2020;145(5):e20193559.
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5. Bhatt M, Johnson DW, Chan J, et al. Risk Factors for Adverse Events in Emergency Department Procedural Sedation for Children. *JAMA Pediatr.* 2017;171(10):957–964.
6. Beach ML, Cohen DM, Gallagher SM, Cravero JP. Major Adverse Events and Relationship to Nil per Os Status in Pediatric Sedation/Anesthesia Outside the Operating Room: A Report of the Pediatric Sedation Research Consortium [published correction appears in *Anesthesiology.* 2016 May;124(5):1202]. *Anesthesiology.* 2016;124(1):80-88.
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11. Cravero JP, Beach ML, Blike GT, Gallagher SM, Hertzog JH, Pediatric Sedation Research Consortium. The incidence and nature of adverse events during pediatric sedation/anesthesia with propofol for procedures outside the operating room: a report from the Pediatric Sedation Research Consortium. *Anesth Analg.* 2009;108(3):795-804.
12. Di Liddo L, D'Angelo A, Nguyen B, Bailey B, Amre D, Stanciu C. Etomidate versus midazolam for procedural sedation in pediatric outpatients: a randomized controlled trial. *Ann Emerg Med.* 2006;48(4):433-440.e1.
13. Roback MG, Wathen JE, MacKenzie T, Bajaj L. A randomized, controlled trial of i.v. versus i.m. ketamine for sedation of pediatric patients receiving emergency department orthopedic procedures. *Ann Emerg Med.* 2006;48(5):605-612.

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14. McGlone RG, Howes MC, Joshi M. The Lancaster experience of 2.0 to 2.5 mg/kg intramuscular ketamine for paediatric sedation: 501 cases and analysis. *Emerg Med J.* 2004;21(3):290-295.
15. Barbi E, Marchetti F, Gerarduzzi T, et al. Pretreatment with intravenous ketamine reduces propofol injection pain. *Paediatr Anaesth.* 2003;13(9):764-768.
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17. Wathen JE, Roback MG, Mackenzie T, Bothner JP. Does midazolam alter the clinical effects of intravenous ketamine sedation in children? A double-blind, randomized, controlled, emergency department trial. *Ann Emerg Med.* 2000;36(6):579-588.

Other Resources

1. Cravero JP, Askins N, Sriswasdi P, Tsz DS, Zurakowski D, Sinnott S. Validation of the Pediatric Sedation State Scale. *Pediatrics.* 2017;139(5):e20162897.
2. Krauss BS, Krauss BA, Green SM. Videos in clinical medicine. Procedural sedation and analgesia in children. *N Engl J Med.* 2014;370(15):e23.