



**Children's Hospital Association of Texas**  
***Safety and Quality Collaborative***  
**Asthma Management Pathway (ED and IP)**

**Adjunctive Therapies**

**Terbutaline**

**Recommendation:** Weak recommendation with low-quality evidence to use IV terbutaline in a monitored care setting for the treatment of children with severe asthma exacerbations.

**Dosage:**

- **Bolus**
  - 10 mcg/kg (Range 2-10 mcg/kg)
  
- **Infusion**
  - Starting dose 0.5 mcg/kg/min
  - (Range 0.5 mcg/kg-3 mcg/kg/min)
  - Titrate up in 0.5 mg/kg/min increments to MAX 3 mcg/kg/min

**Non-Invasive Positive Pressure Ventilation**

**Recommendation:** Strong recommendation with low quality evidence for the use of non-invasive positive pressure ventilation prior to intubation in children with severe asthma exacerbations.

**Heliox**

**Not Recommended:** Low quality evidence to use Heliox in the treatment of children with asthma exacerbations.

**SQ Terbutaline or Epinephrine**

**Not Recommended:** Low-quality evidence to use subcutaneous terbutaline or epinephrine with severe asthma exacerbations.



**Children's Hospital Association of Texas**  
***Safety and Quality Collaborative***  
**Asthma Management Pathway (ED and IP)**

**Adjunctive Therapies**

**References:**

**Terbutaline**

1. Bogie, A.L.; Towne, D.; Luckett, P.M.; Abramo, T.J.; Wiebe, R.A. (2007). Comparison of intravenous terbutaline versus normal saline in pediatric patients on continuous high-dose nebulized albuterol for status asthmaticus. *Pediatric Emergency Care*, 23(6):355-361 <http://www.ncbi.nlm.nih.gov/pubmed/17572517>
2. Carroll, C.L. and Schramm, C.M. (2006). Protocol-based titration of intravenous terbutaline decreases length of stay in pediatric status asthmaticus. *Pediatric Pulmonology*, 41(4):350-6 <http://www.ncbi.nlm.nih.gov/pubmed/16502398>
3. Jones, G.H. and Scott, S.J. (2011). Continuous infusions of terbutaline in asthma - a review. *Journal of Asthma* 48(8):753-6 <http://www.ncbi.nlm.nih.gov/pubmed/21942352>
4. Lin, Y. Z., Hsieh, K. H., Chang, L. F., & Chu, C. Y. (1996). Terbutaline nebulization and epinephrine injection in treating acute asthmatic children. *Pediatric Allergy and Immunology*, 7(2), 95-99.  
<http://www.ncbi.nlm.nih.gov/pubmed/8902860>
5. Payne, D. N.; Balfour-Lynn, I. M.; Biggart, E. A.; Bush, A.; and Rosenthal, M. (2002). Subcutaneous terbutaline in children with chronic severe asthma. *Pediatric Pulmonology*, 33(5), 356-361  
<http://onlinelibrary.wiley.com/doi/10.1002/ppul.10081/abstract>
6. Simons, F. E., & Gillies, J. D. (1981). Dose response of subcutaneous terbutaline and epinephrine in children with acute asthma. *American Journal of Diseases of Children*, 135(3), 214-217.  
<http://www.ncbi.nlm.nih.gov/pubmed/?term=Dose+response+of+subcutaneous+terbutaline+and+epinephrine+in+children+with+acute+asthma.+American+Journal+of+Diseases+of+Children>
7. Spiteri, M. A., Millar, A. B., Pavia, D., & Clarke, S. W. (1988). Subcutaneous adrenaline versus terbutaline in the treatment of acute severe asthma. *Thorax*, 43(1), 19-23.  
<http://www.ncbi.nlm.nih.gov/pubmed/?term=Subcutaneous+adrenaline+versus+terbutaline+in+the+treatment+of+acute+severe+asthma>
8. Uden, D. L., Goetz, D. R., Kohen, D. P., & Fifield, G. C. (1985). Comparison of nebulized terbutaline and subcutaneous epinephrine in the treatment of acute asthma. *Annals of Emergency Medicine*, 14(3), 229-232.  
<http://www.ncbi.nlm.nih.gov/pubmed/3883857>



**Children's Hospital Association of Texas**  
***Safety and Quality Collaborative***  
**Asthma Management Pathway (ED and IP)**

**Adjunctive Therapies**

**Non-Invasive Positive Pressure Ventilation (NPPV)**

1. Abramo, T.J. and Wiebe, R.A. (2007). Comparison of intravenous terbutaline versus normal saline in pediatric patients on continuous high-dose nebulized albuterol for status asthmaticus. *Pediatric Emergency Care*, 23(6):355-361  
<http://www.ncbi.nlm.nih.gov/pubmed/17572517>
2. Bogie, A.L.; Towne, D.; Lockett, P.M.; Abramo, T.J.; Wiebe, R.A. (2007). Comparison of intravenous terbutaline versus normal saline in pediatric patients on continuous high-dose nebulized albuterol for status asthmaticus. *Pediatric Emergency Care*, 23(6):355-361 <http://www.ncbi.nlm.nih.gov/pubmed/17572517>
3. Lafond, C.; Series, F.; and Lemiere, C. (2007). Impact of CPAP on asthmatic patients with obstructive sleep apnea. *European Respiratory Journal*, 29(2):307-311  
<http://www.ncbi.nlm.nih.gov/pubmed/17050561>
4. Loh, L.E.; Chan, Y.H.; and Chan, I. (2007). Noninvasive ventilation in children: a review. *Journal of Pediatrics*, 83(2 Suppl): S91 -S99  
<http://www.ncbi.nlm.nih.gov/pubmed/17486195>
5. Ram, F.S.F., Wellington, S.R., Rowe, B., and Wedzicha, J.A. (2005). Non-invasive positive pressure ventilation for treatment of respiratory failure due to severe acute exacerbations of asthma. *Cochrane Database of Systematic Reviews*, Issues 3. Art. No.: CD004360. DOI: 10.1002/14651858.CD004360.pub3.  
<http://www.ncbi.nlm.nih.gov/pubmed/16034928>
6. Soma, T., Hino, M., Kida, K., Kudoh, S. (2008). A prospective and randomized study for improvement of acute asthma by non-invasive positive pressure ventilation (NPPV). *Internal Medicine*, 47( ):493-501 <http://www.ncbi.nlm.nih.gov/pubmed/18344635>
7. Yim, S., Fredberg, J.J., and Malhotra, A. (2007). Continuous positive airway pressure for asthma: not a big stretch? *European Respiratory Journal*, 29(2):226-228  
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3496923/>

**Heliox**

1. SIGN: British Guideline on the Management of Asthma: Scottish Intercollegiate Guidelines Network. (2012). *Thorax*. 63 Suppl<sup>4</sup>: iv1-121.  
<http://www.sign.ac.uk/pdf/qrg101.pdf>



**Children's Hospital Association of Texas**  
***Safety and Quality Collaborative***  
**Asthma Management Pathway (ED and IP)**

**Adjunctive Therapies**

2. Bigham, M. T.; Jacobs, B. R.; Monaco, M. A.; Brill, R. J.; Wells, D., et al. (2010). Helium/oxygen driven albuterol nebulization in the management of children with status asthmaticus: a randomized, placebo-controlled trial. *Pediatric Critical Care, 11*(3), 356-361 <http://www.ncbi.nlm.nih.gov/pubmed/20464778>
3. Rivera, M. L.; Kim, T. Y.; Stewart, G. M.; Minasyan, L.; and Brown, L. (2006). Albuterol nebulized in heliox in the initial ED treatment of pediatric asthma: a blinded, randomized controlled trial. *American Journal of Emergency Medicine, 24*(1): 38-42 <http://www.ncbi.nlm.nih.gov/pubmed/16338507>
4. Rodrigo, G.; Pollack, C.; Rodrigo, C.; and Rowe, B. H. (2006). Heliox for nonintubated acute asthma patients. *Cochrane Database of Systematic Reviews*, Issue 4. Art. No: CD002884 <http://www.ncbi.nlm.nih.gov/pubmed/14583955>