Introduction
Dyspnea is a common refractory complication in greater than 70% within the last 6 weeks of end-stage cancer.(1) We present 2 cases treated with a midazolam infusion.

Cases
Case 1
A 5 7/12 yo girl (18.5kg/BSA0.69) with stage IV metastatic rhabdomyosarcoma and leptomeningeal disease had bilateral pulmonary lower lobe atelectasis secondary to metastatic tumor obstruction, mild suprasternal and intercostal retractions, bilateral generalized rales. Medications included an albuterol inhaler QID, fluticasone inhaler BID, gabapentin 75 mg 3 TID, and lorazepam 2 mg IV prn anxiety Q 2 hours. We started on IV PCA morphine (0.5 mg/hour, bolus 0.5 mg, lockout 10 min). After 5 days she developed worsening dyspnea and began 2 L/min of NC O2. Her dyspnea was relieved only briefly with IV lorazepam and 25 mcg fentanyl nebulizer Q 2 hr. After consultation, the pediatric pain service started a midazolam drip at 0.5 mg/hr, and the dyspnea resolved. We continued fentanyl updrafts and IV lorazepam with the midazolam drip. The patient died peacefully of cardiopulmonary arrest 13 hr later surrounded by her family members.

Case 2
An 8 yo female (21kg/BSA0.91) with multifocal osteosarcoma presented with difficulty breathing, described by her mother as rapid, “heavy,” and with periodic gasping. She had a moderate right-sided pleural effusion. Her methadone was continued at 5mg PO BID but supplemented with a hydromorphone IV PCA (0.2 mg/hr, bolus 0.2 mg, lockout 8 min). Diazepam 2 mg IV Q 4 hr was added for anxiety. Over next 2 days, her dyspnea worsened, and 25 mcg fentanyl inhalation nebulizers Q 2 hr gave periodic relief for only 6 hr. After consultation, the pediatric pain service started an IV midazolam drip at 0.5 mg/hr. After 10 hr, the patient expired peacefully from cardiopulmonary arrest with her family at bedside.

Discussion
Once other therapeutic measures have failed, palliative sedation may be indicated for control of specific refractory symptoms, and when appropriately indicated and correctly applied, it does not seem to have a detrimental effect on survival of patients with terminal cancer.(2) Publications describing sedation for management of refractory symptoms at the end-of-life are anecdotal and refer to usage of opioids, neuroleptics, benzodiazepines, barbiturates, and propofol, and most commonly refer to treatment of delirium and dyspnea.(2) These relatively frequent symptoms are prognostic for death in a short time. For adults midazolam, a benzodiazepine with relatively short half-life, is most commonly used.(3) For children, we start 0.5 mg/hr or approximately 25 mcg/kg/hr, and titrate to effect. Frequent reassessment of the patient’s condition is essential as the dose-response can evolve, almost always requiring an increase of the infusion.

Refractory dyspnea may be alleviated with continuous IV midazolam in pediatric patients during end of life care. This treatment option should be made available to pediatric patients as part of a comprehensive plan to alleviate suffering during end of life care.

References
1. Ruben DB et. al. Chest 1986;89:234-6
3. Cherny N. Progress In Palliative Care 2008;16:51-62