The phenomenon of emergence agitation is a well-known, yet poorly understood adverse reaction to anesthesia. It most commonly affects the pediatric population. The cause of emergence agitation is unknown but is believed to be the result of an abrupt emergence from general anesthesia. Emergence agitation is characterized by an altered mental state, which often includes agitation, confusion, and hallucinations (Sikich & Lerman, 2004). The child experiencing emergence agitation is at risk for injuring themselves and those caring for them. Emergence agitation is well documented throughout the literature yet no consensus exists as to what the best strategies are to prevent it. To date no systematic review of emergence agitation exists in the literature.

The objective of this systematic review is to answer the following question: In children who are exposed to general anesthesia what are the current modalities for the prevention of emergence agitation reported in the literature?

This systematic review provides a number of evidence-based findings:

1. Emergence agitation occurs most frequently in children ages 2-5 years.
2. Assessment scales used to measure emergence agitation vary widely in their ability to do so, the PAED is validated and the most consistently cited.
3. Premedication does not prevent emergence agitation in children.
4. Melatonin has a dose-dependent effect on reducing the incidence of emergence agitation.
5. All inhalational anesthetics are associated with emergence agitation; sevoflurane is the most commonly implicated inhalational anesthetic due to its preferred use in children. Despite the abundance of literature, no consensus exists as to what the best preventative strategies for emergence agitation are. As a result, practice varies widely among anesthesia providers.

CONCLUSIONS
Emergence agitation is a well-known, poorly understood adverse reaction to general anesthesia. Despite a significant number of studies in the literature reporting on emergence agitation no clear, agreed upon recommendations for its preventative management exist. The evidence in the literature supporting the recommendations put forth in this systematic review were strong, particularly in regards to, identifying 2-5 year old children as being at highest risk for emergence agitation, the PAED being most reliable tool for measuring emergence agitation, intraoperative propofol or dexmedetomidine, and regional anesthesia in reducing the incidence of emergence agitation. Other recommendations that might be considered from this review include recognition that common premedication drugs including, midazolam and dexmedetomidine do not prevent the development of emergence agitation postoperatively but avoidance of inhalational anesthetic agents does. From the findings it was determined that a significantly enhanced reduction in the incidence of emergence agitation could be achieved if a combination of recommendations were used. Specifically, emergence agitation could be reduced significantly if anesthesia was provided by propofol or dexmedetomidine combine with a regional anesthetic technique and inhalational anesthetics were avoided completely.

REFERENCES

RESULTS
A search of The Cochrane Database of Systematic Reviews (1995-2012) revealed that no systematic review regarding the preventative management of emergence agitation in children has ever been published. In a search for relevant articles the PubMed database was queried. The following key words were used for the literature search: "emergence delirium," "emergence agitation," "postoperative agitation," and "post-anesthetic excitation." Other terms used in the literature search to capture articles related to the "emergence" theme included, "childhood" and "anesthesia." All papers were evaluated and classified according to the rating system endorsed by the Agency for Healthcare Research and Quality (AHRQ) and the US Preventive Services Task Force (Biddle, 2010). Thirty-eight articles were identified as meeting criteria for inclusion in the systematic review. Of those articles 37 were prospective randomized control trials and one was a metaanalysis of the literature.

METHODS
A number of common themes emerge from what researchers report in the literature regarding emergence agitation. Specifically, emergence agitation has a predilection for occurring in children, particularly those less than 5 years of age (Voepel-Lewis & Maliya, 2003). The incidence of emergence agitation ranges from 10% in children below the age of 12 years, to as high as 80% in children between 2-5 years (Aouad & Nair, 2005). Emergence agitation has been shown to occur after nearly every type of anesthetic technique even when potent inhalational anesthetics were avoided. Emergence agitation occurs more commonly after anesthetics involving sevoflurane or desflurane (Welborn, Hannallah, & Norden, 1996; Kuratani & Oi, 2008). Sevoflurane is the most commonly implicated inhalational anesthetic due to its preferred use in children. Despite the abundance of literature, no consensus exists as to what the best preventative strategies for emergence agitation are. As a result, practice varies widely among anesthesia providers.

BACKGROUND
The incidence of emergence agitation is reduced by the administration of dexmedetomidine either as an adjunct to a sevoflurane-based anesthetic or as TIVA.

Regional anesthesia reduces the incidence of emergence agitation.

REFERENCES

The pediatric agitation emergence delirium score devised by Sikich and Lerman [10]
1. The child makes eye contact with the caregiver
2. The child’s actions are purposeful
3. The child is aware of his or her surroundings
4. The child is restless
5. The child is incorrigible

Items 1, 2, and 3 are reversed scored as follows: 4 = not at all, 3 = just a little, 2 = quite a bit, 1 = very much, and 0 = extremely. Items 4 and 5 are scored as follows: 0 = not at all, 1 = just a little, 2 = quite a bit, 3 = very much, and 4 = extremely. The degree of emergence delirium increased directly with the total score.