

Postoperative Apnea Risk Following Sedation and Anesthesia for Infants

Evidence and Recommendations Regarding Mandatory Admission

Clinical Setting:

Children's Hospitals vary widely in their policies regarding the admission of infants following anesthesia. This variation belies the ambiguity in the literature regarding the risk of apnea following anesthetic exposure. Despite the lack of a nationally-accepted standard practice, each institution does establish guidelines, which are based upon their interpretation of the literature, and with the goal of attaining a consistent practice. Here at SFCH, no clearly-defined guideline exists; and with the addition of younger Pediatric Anesthesia Faculty from other Children's Hospitals, creates further confusion and inconsistency. The intent of this document is to initiate a multidisciplinary discussion, the goal of which will be the establishment of a uniformly-accepted guideline for the required in-hospital observation for infants following deep sedation and/or general anesthesia.

For the purpose of this document, we *define apnea* as a cessation of breathing for 15 seconds, with or without associated desaturation and/or bradycardia. And the "context" for this discussion is infants requiring anesthesia/deep sedation for either minor, elective surgery *or* non-invasive imaging studies, since such cases on older infants would be completed safely on an ambulatory basis. In addition, this discussion is *not* in the context of children with significant co-morbid conditions, or whose surgery itself would require admission.

Evidence:

The literature on the risk of post-anesthetic apnea among infants does not definitively identify such a standard. However, it does give us some insights regarding patient characteristics which will increase the likelihood of a serious apneic event following anesthetic exposure.

1. Risk Factors:

Prematurity (< 37 weeks EGA at birth)

Anemia (Hematocrit < 30)

Witnessed apneic events at home prior to anesthesia/surgery

Witnessed apnea in the PACU

2. Confounding features of the literature:

* Almost all studies are > 20 years old, and from an era of more potent volatile anesthetics.

- * These studies included small numbers of observations, and underestimated the frequency of apneic events due to reliance on visual observations, rather than continuous pulse oximetry.
- * Statisticians estimate that *each PCA week* would need to include 300 study infants, to allow for the determination of a 1% risk for each group.
- * We have little (or no) data on the incidence of severe events once the infant goes home.

3. What do we know?

- * Post-conceptual age is *inversely* related to risk of apnea (premies at higher risk).
- * Co-morbid pulmonary status and neurologic abnormalities increase the risk.
- * The risk for post-anesthetic apnea exists in the initial 22 hours following exposure.
- * The timing of normal “physiologic anemia” is a nadir 8-12 weeks after birth; with typical Hb values of 9-11 for term and 7-9 for premature infants. *That being said, the risk for apnea rises if the Hct is under 30; regardless of this normal nadir.*
- * In the presence of anemia, the risk for apnea is the same for both ex-premies and term infants.
- * Pediatric anesthesiologists uniformly consider *deep sedation as an equivalent risk* to general anesthesia; and the use of spinal anesthesia only reduces the risk of apnea within the initial 30 minutes of recovery. After that, the risk is the same as following a general anesthetic.
- * In the absence of anemia, the risk of a significant apneic event does not drop below 1% until 50 weeks postconceptual age (PCA).
- * The risk for post-anesthetic apnea in *ex-premies* does not decline to an “acceptable” risk (under 1%) until 60 weeks PCA
- * The risk for post-anesthetic apnea in *term* babies does not drop below 1% until PCA 48-54 weeks.

Discussion:

- * While appealing because of its simplicity, the application of a *single* PCA cutoff (let’s say 54 weeks for all infants, regardless if a term or premature at birth) would lead to the over-admission of term infants, and possibly an under-admission of ex-premies.
- * Paramount to this discussion is an agreement on how much “risk” we are willing to accept. I would suggest that any “risk” exceeding 1% would *not* be acceptable for elective procedures. But that is an admittedly arbitrary, personal perspective.

Recommendation:

1. Admit all former term infants if under 50 weeks PCA.
2. Admit all former premature infants if under 60 weeks PCA.
3. Inform all parents of the need to admit for overnight observation c/w these rules.
4. Advise all parents of infants under 60 weeks PCA that admission *might* be required, based upon the infants response to anesthesia, and the PACU course.
5. These rules will apply equally to *both* deep sedation *and* general anesthetic exposures.
6. An on-going documentation and periodic review of cases following implementation of this guideline would be a useful Quality & Safety project.
7. Consideration of routine Hct testing (upon placement of the PIV) may be of value in further identifying risk.