

Building a Pediatric TIVA and EEG Practice in an Anesthesia Department

Jones Oguh, S MD, Yuan I MD, Subramanyam R MD, McClung H MD, Johnson G MD, Kurth CD MD.
The Children's Hospital of Philadelphia, University of Pennsylvania, Perelman School of Medicine, PA



Background

- Propofol-based Total Intravenous Venous Anesthesia (TIVA) is increasingly popular
- Potential for under- and over-dosing¹
- No "end tidal" to assess propofol brain effect site concentration
- Significant biologic variability
- Intraoperative electroencephalogram (EEG)
- monitors hypnotic depth
- Proprietary indices, e.g., bispectral index (BIS)
- not accurate in infants and children²
- Most pediatric anesthesiologists lack sufficient knowledge to utilize non-proprietary EEG parameters
- Current standard of care during propofol TIVA is without EEG monitoring

Global Aim

- Use EEG to target the optimal hypnotic depth for pediatric patients

SMART Aim

- Increase the use of EEG for TIVA cases in our hospital's operating room from 0% to 80% by Mar 31, 2022

Methods

- Plan-Do-Study-Act (PDSA) methodology
- Multidisciplinary team
- Key Driver Diagram (Figure 1)
- Key interventions:
 - **PDSA # 1:** Educational lectures
 - **PDSA #2:** "Board Runner" list
 - **PDSA #3:** EMR Modifications
- Statistical process control chart (Figure 2)

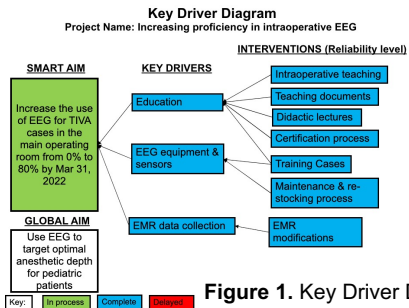


Figure 1. Key Driver Diagram

Results

- Control chart showed special cause variation with more than 6 above the centerline
- Balancing measures
 - *Procedure End to Out-of-OR* times showed no significant difference with EEG use (Figure 3)
 - "Anesthesia News" (overhead call for help)
 - No significant difference
 - *Emergence Agitation* (Watcha 3,4) $p = 0.34$
 - No significant difference

Conclusions

- Intraoperative EEG use during TIVA cases increased
- Special cause variation noted
- QI project will continue with additional PSDA cycles to achieve > 80% EEG usage during TIVA and to ensure sustainability

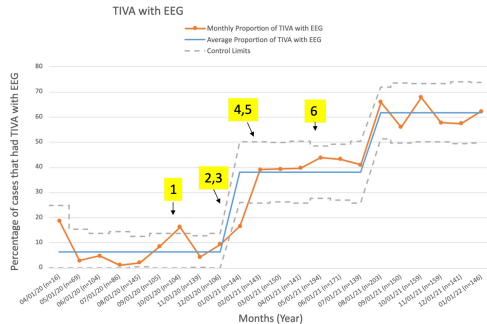


Figure 2. Control Chart

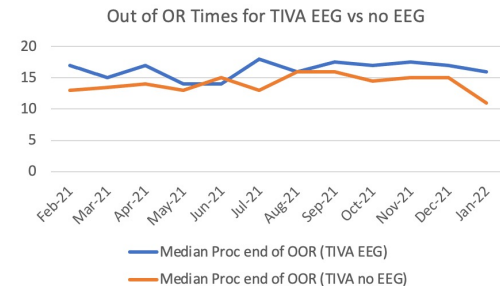


Figure 3. Run Chart

References

1. Xu T, Kurth CD, Yuan I, Vutskits L, Zhu T. An approach to using pharmacokinetics and electroencephalography for propofol anesthesia for surgery in infants. *Paediatr Anaesth.* 2020 Dec;30(12):1299-1307. doi: 10.1111/pan.14021. Epub 2020 Oct 28. PMID: 32965066.
2. Yuan I, Xu T, Kurth CD. Using Electroencephalography (EEG) to Guide Propofol and Sevoflurane Dosing in Pediatric Anesthesia. *Anesthesiol Clin.* 2020 Sep;38(3):709-725. doi: 10.1016/j.anclin.2020.06.007. PMID: 32792193.