

Are There Still Limitations For The Use Of Target-Controlled Infusion In Children?

Brian J Anderson

Department of Anaesthesiology, University of Auckland, New Zealand

Target controlled infusion (TCI) devices are gaining popularity among pediatric anesthesia practitioners because propofol and short acting opioids allow rapid onset and offset of action, reduce postoperative nausea and vomiting, reduce emergence delirium, lessen exposure to atmospheric pollutants and can be used in peripheral locations. Widespread use remains limited because TIVA is more demanding of the anesthetist and the vast majority of pediatric general anesthetics remain rooted with inhalational techniques. TCI devices are more cumbersome to use than a vaporizer, multiple pumps may be required for a single anesthetic, pumps vary in characteristics (programming, lag times, pressures generated), and intravenous lines may become obstructed. Current feedback controls are not rigorous and seldom used in pediatric TIVA. Open-loop rather than closed-loop TCI is the routine in pediatric anesthesia. There is no integrated PK-PD analysis that can supply parameter estimates to be programmed into pumps for either plasma or effect site concentration determination over the broad paediatric age range. Covariate influences such as severity of illness are unaccounted for. The impact of obesity is debated in the adult literature and unknown in children. The six pharmacokinetic parameter sets available for children out of infancy all differ. The link parameter ($T_{1/2keo}$) is not documented for any of these data sets and estimated $T_{1/2keo}$ is specific to the PK parameters used and cannot be indiscriminately applied to a different PK parameter set. Validation studies are few. Estimates in neonates and infants are dependent on maturation and size considerations that have not yet been elucidated. PK and PD interactions between drugs are poorly described. There remains a need for specific neonate-derived algorithms if EEG-derived anesthesia depth monitors are to be used for neonates or infants. End-tidal breath analysis of propofol offers a useful tool for central compartment monitoring.

Hardware limitations, a lack of integrated PK-PD studies and target monitoring issues restrict use. The European Society for Intravenous Anaesthesia (<http://www.eurosiva.org/>) has a downloadable TIVA- trainer that will simulate TIVA pharmacokinetics, which has proven useful for teaching. Intravenous induction remains a hurdle in children, but increasing familiarity with the technique guarantees continued use for maintenance anaesthesia.

Lerman J, Johr M. Paediatr Anaesth 2009;19(5):521-34.

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