RCoA Research, Education & Travel Grants 2012
Award: The Ernest Leach Fund

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Project Title: Comparison of measured versus predicted blood propofol concentration in children undergoing spinal surgery

Project Description

Background

Major spinal surgery in children requires intra-operative neuro-physiological monitoring to detect spinal cord ischemia. Inhalational anaesthetic agents cause interference by suppressing the evoked potentials. Hence total intra-venous anaesthesia (TIVA) is used. TIVA, using propofol, is administered as a target controlled infusion (TCI). TCI pumps use an algorithm, derived from previously measured blood propofol levels in children. The algorithm is the "best fit" relationship between blood level versus the infusion rate (and the patient's age and weight). Inter-patient pharmacokinetic variability is high in children and therefore there could be important differences between the predicted and the measured drug concentration. Propofol TCI models have not been tested in paediatric spinal surgical patients. Also, spinal surgery in children on average lasts up to 5 hours and is associated with significant blood loss which can affect the propofol levels. We are therefore uncertain about the difference between predicted and actual blood propofol levels.

The clinical effects of propofol are determined mainly by its blood concentration. A high concentration can cause cardiovascular depression and delayed recovery, and a low concentration permits intra-operative awareness, both are serious complications. A bed side measurement of propofol concentration could help the clinician to know the true blood levels of propofol and thereby adjust the infusion accordingly, to avoid over or under administration of the drug. The Pelorus 1000 propofol analyser can measure the blood concentration of propofol in less than 5 minutes and has been shown to be precise and accurate at clinically relevant concentrations.

Main aim/objective: To determine if there is an important difference between the predicted and measured blood levels of propofol in children during major surgery.

Secondary aim: to determine the potential value of a bed-side blood propofol measurement. A large difference between measured and predicted propofol blood concentrations may have implications for drug costs and patient safety.

Methods

Study Design:
This is an observational study in 20 patients. The protocol is being submitted to IRAS. Written informed consent is required for this study.

Blood samples (up to 10 per patient) will be taken every 20 minutes during TIVA. Actual blood propofol concentrations will be compared with predicted blood levels.

The anaesthetists managing the patient will remain unaware of the measured propofol concentration. The clinical management is unaffected by this study. The only change to routine care is increased blood sampling.

Endpoints

Primary endpoint:

- The difference between the predicted and measured blood levels of propofol during the maintenance and recovery stages of anaesthesia.

Secondary endpoints:

- Measures of performance of TCI pharmacokinetic models including: Median performance error , Median absolute performance error, Wobble, Drift
- Effects of propofol blood levels on EEG and invasive blood pressure recordings throughout surgery
- Identification of factors associated with major differences between predicted and actual propofol blood concentrations

Timescale

We will be ready to begin data collection in October 2012. On average there are 3 spinal operations per week at GOSH; we estimate we can recruit at least one patient per week. The study should be complete in 6 months.