

# Comparing End-Tidal and Calculated Effect-Site Sevoflurane Concentrations at Awakening from Anesthesia

**Presenting Author:** Ross Kennedy<sup>1,2</sup>

**Co-Authors:** Margie McKellow<sup>1</sup>, Jonathan Williman<sup>3</sup>

<sup>1</sup> Department of Anaesthesia, Christchurch Hospital, Christchurch NEW ZEALAND

<sup>2</sup> Department of Anaesthesia, University of Otago - Christchurch, Christchurch NEW ZEALAND

<sup>3</sup> Department of Population Health, University of Otago - Christchurch, Christchurch, NEW ZEALAND

**Background/Introduction:** The relationship between drug dosing and effect is complex. This is especially so of many drugs used in anesthesia where the effect may need to be changed well before equilibrium is reached. It has been suggested that using calculated effect-site concentrations (Ce) can improve titration of intravenous anesthetic drugs. We are interested in the proposition that effect-site concentrations of volatile anesthetic agents can provide useful information for the provider especially during periods of rapid change when the delay between measured end-tidal and effect-site concentration will be greatest.

We have previously demonstrated that subjects wake, on average, at Ce-sevoflurane close to MAC-awake. This observation supports the concept of Ce for volatiles, since MAC values are assumed to represent equilibrium.

The aim of this study is to compare calculated Ce and measured end-tidal (ET) sevoflurane concentrations at awakening in a wide range of patients and procedures.

**Methods:** With National Ethics Board approval, data was collected from ASA 1 -3 patients undergoing procedures where the anesthetic plan was based on sevoflurane and fentanyl. This is an opportunistic sample, dependant on the availability of the research assistant and GE\_Navigator. The only change to normal practice was to keep patients attached to the anesthesia machine and monitors until awakening with a minute ventilation  $\geq 3\text{l/min} \geq 5$  breaths/min to ensure monitored end-tidal concentrations represented alveolar, rather than breathing circuit, gas. Awakening time was when the patient first responded to spoken command (OAA/S =4/5, similar to MAC-awake studies). Effect-site concentrations were taken from the Navigator data files. ET and Ce concentrations were adjusted for age.

**Results:** We have paired data from 74 subjects. Age range 18-86, median 52; BMI median 27, [IQR 24-32] kg/m<sup>2</sup>. Duration of anaesthesia median 94 [75-149] min. Median age adjusted Ce-sevo was 0.51 [0.40-0.66] vol% while age-adjusted ET sevo concentration was 0.29 [0.24-0.35] vol%. The median difference between Ce and ET was 0.25 [0.15 to 0.35] vol%. Median fentanyl Ce at response was 2.2 [1.8-2.9]ng/ml

There was a weak correlation ( $p=0.0017$ ) between age-adjusted Ce and ET values; (95%CI of slope 0.05 to 0.26). There was no correlation between age or duration of surgery with either Ce or ET values.

**Conclusions:** We have confirmed our previous observation that pooled, age-adjusted Ce-sevoflurane concentrations at wake-up are similar to MAC-awake and demonstrated that end-tidal values at this time are much lower. While this result would be expected by those familiar with effect-site concepts, it is often considered that end-tidal values are “close enough”. Our data suggests that this may not be the case during rapid changes and may be useful in discussions about the role of Ce.