

Exploring sevoflurane effect site levels at awakening after anaesthesia.

Ross Kennedy MB ChB PhD FANZCA

Christchurch Hospital & University of Otago, Christchurch, NEW ZEALAND

Background

We have been exploring effect-site sevoflurane levels (C_{e-sevo}) at awakening using locally developed tools¹.

Navigator & SmartPilot View use interaction models to calculate probability of given responses.

These systems calculate C_e of the various drugs.

Johnson² found subjects woke within +/- 1min of reaching 50% probability of awakening.

Our aims are to

1. characterise C_{e-sevo} at awakening after surgery
2. explore the effect of drugs not included in models
3. compare patterns of C_{e-sevo} across studies

Method

Ethics committee approval, patient consent as required

Two data sets:

- A: 91 patients where Navigator used
- B: 60 patients from a study of effect of surgery on wakening

C_{e-sevo} downloaded from Navigator for Study A and derived using local techniques³ for Study B.

Time of first response to command (OAAS = 4/5) and time of reaching 50% in Gp A noted, C_{e-sevo} at that time extracted.

Results

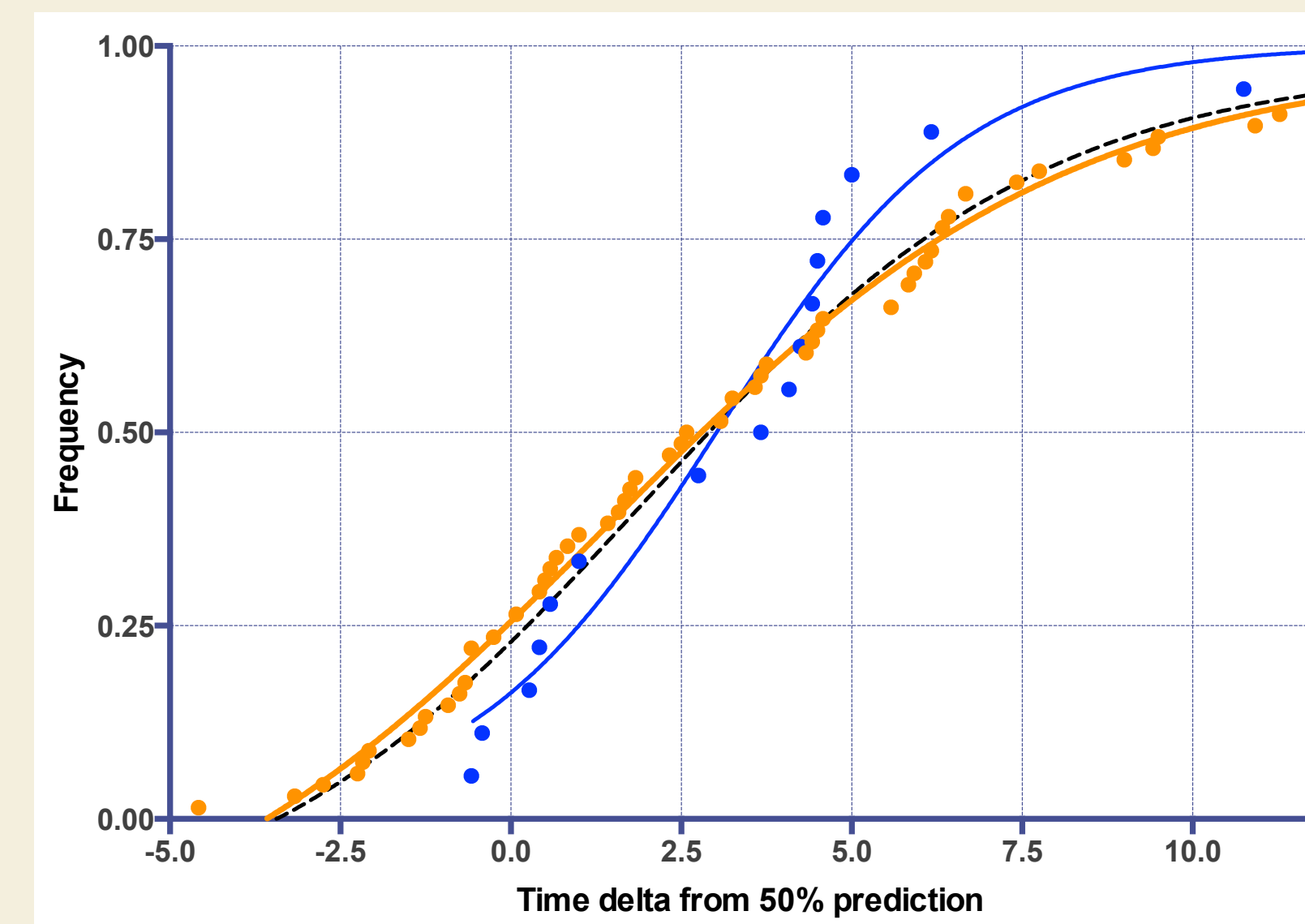


Figure 2: Difference between time of 50% "awake" probability and observed first response. (Sevo, Des)

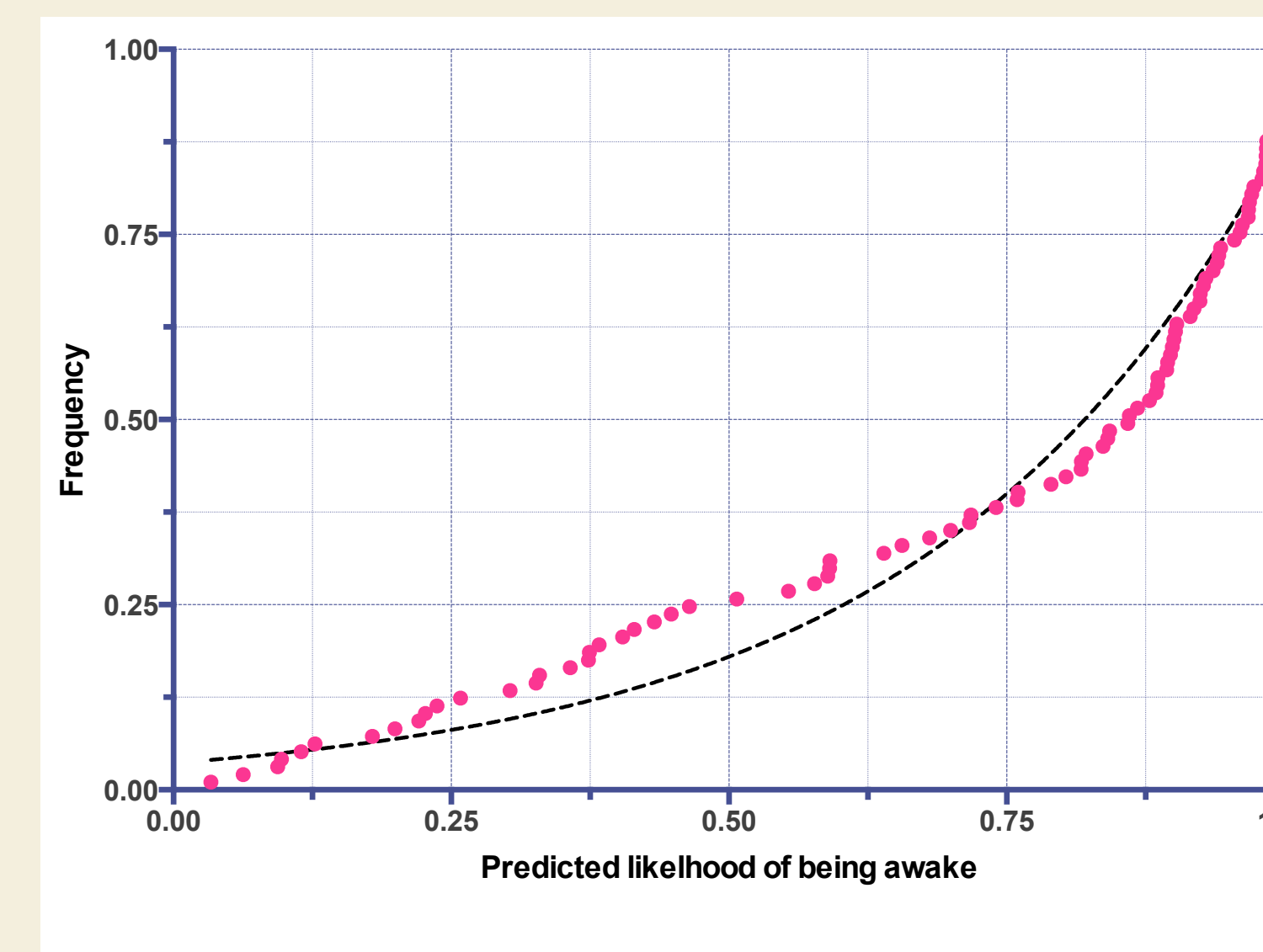


Figure 3: Predicted probability of "consciousness" at time of first response.

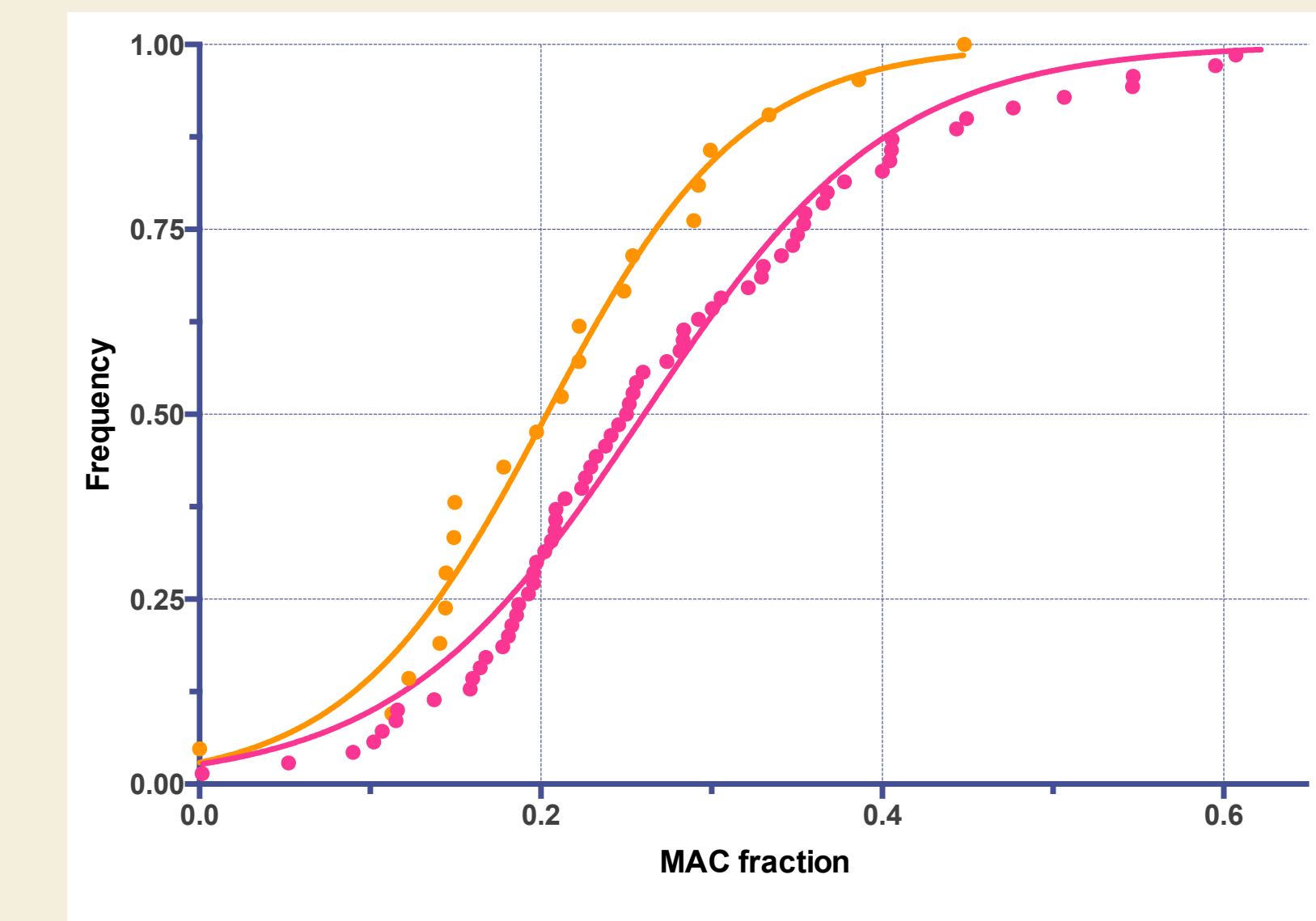


Figure 4: Effect of use of clonidine or morphine on MAC fraction at first response. (Adjunct, No adjunct)

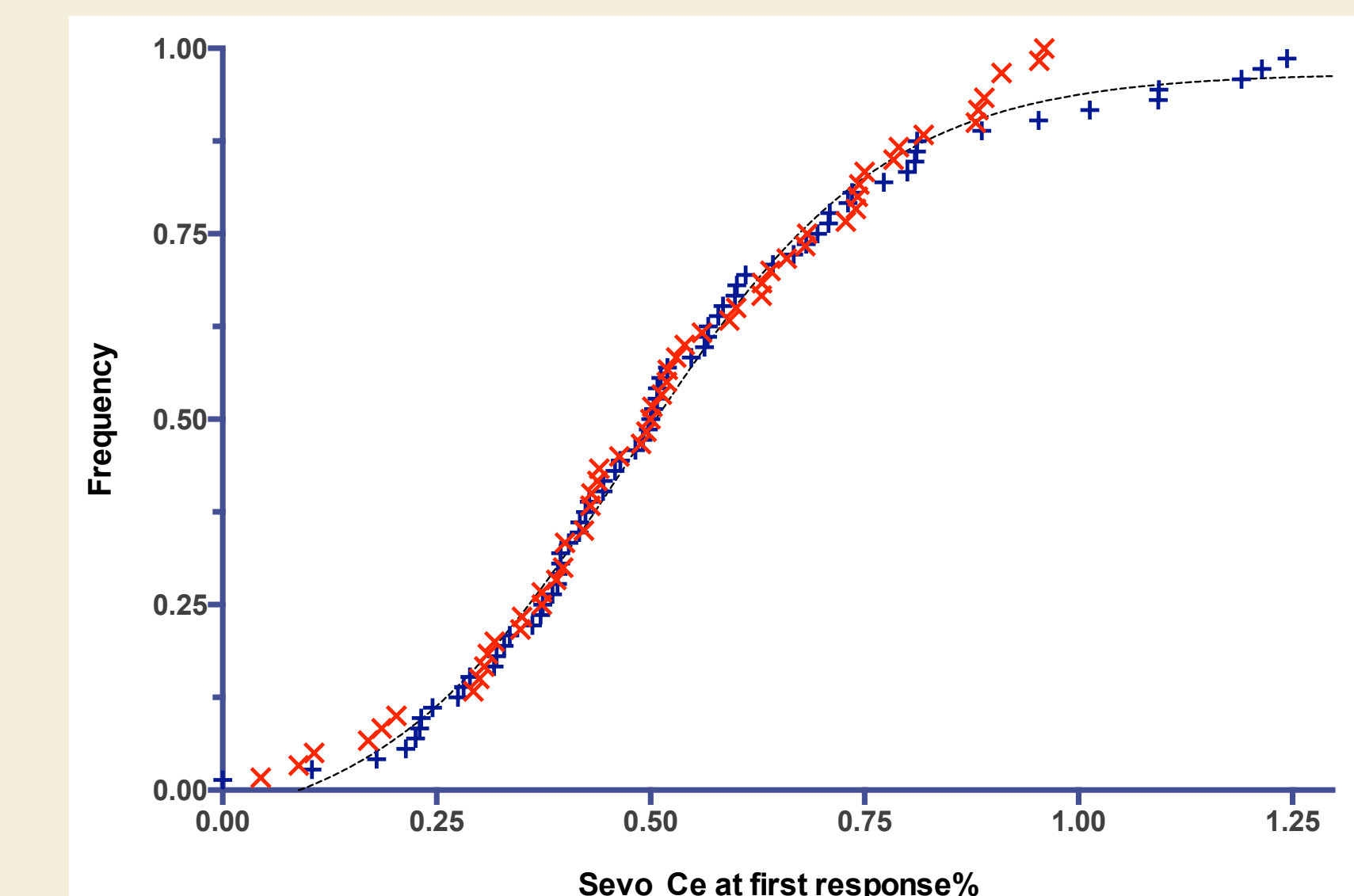
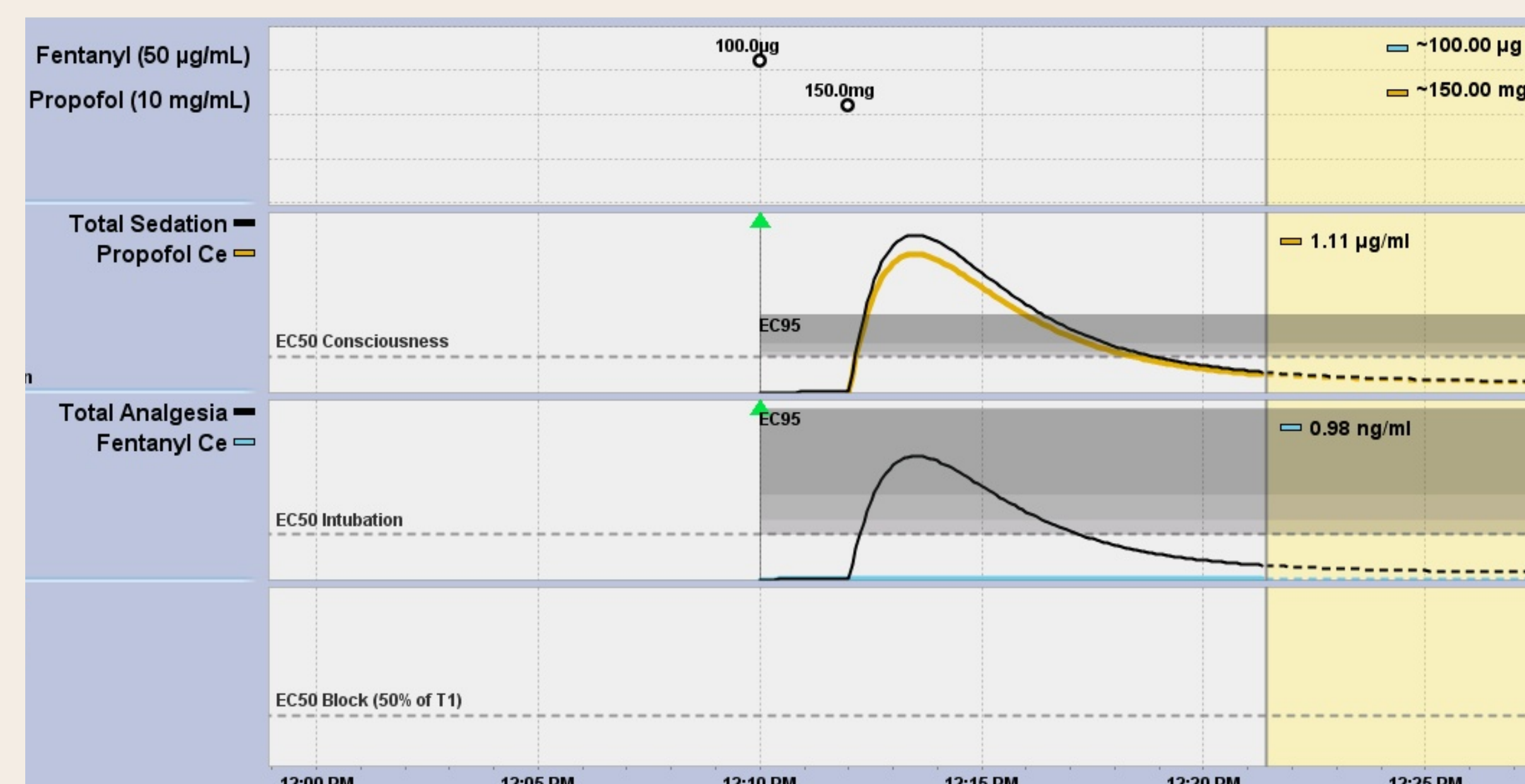


Figure 5: Comparison of C_{e-sevo} at first response from two studies with different methodologies for C_{e-sevo} (Navigator, Chch)

Figure 1: Navigator display
Grey bands = 50-95% population probability of non-response.

This (typical) example shows a low probability of consciousness/recall and >5% chance of response to intubation (as a standard noxious stimulus)



Subjects

Study A: Navigator: sevoflurane=72, desflurane=19

Mean age 52(20) range 16-89, Weight 79(17) 44 - 122kg

Duration of surgery 107(98) 29-828 min

Clonidine n=13, mean 56mcg (23) range 15-105

Morphine n=10, mean 5.9mg (2.8) range 1.5-10

Study B: Two surgery types: no differences; data pooled

Mean age 46 (15) 18-77yr ; Weight 78 (19) 43-121 kg

Duration of surgery 116(78) 22 - 440 min

References

1. Kennedy RR, Sakowska MM. Anaesth Intens Care. 2006;34:116.
2. Johnson KB, Syroid ND et al. Anesth Analg. 2010;111:387.
3. Ting C-K, Johnson KB et al. Anesth Analg. 2014 118:546.
4. Kennedy R, McKelown M, et al. Anesth Analg. 2013;117:786.

Comments

Subjects wake at an average C_{eff} close to MAC_{awake}
The range is wide (Desflurane < Sevoflurane)

Definition of response matters!

Interaction studies use "shake& shout"⁴

We used "response to command" (=MAC_{awake})

Non-modelled adjuncts have an effect

(60mcg clonidine in 81yo 59kg pt -> wake at <0.01% sevo)

Our "older" methodology gives similar pattern to Navigator: adds confidence to results

Acknowledgments:

The data in these studies has been presented at several scientific meetings including ESA, ASA & ANZCA. Formal analysis of Study A is underway (as is further data collection). Study B is being prepared for publication.