



Observational study of prolonged times to tracheal extubation

Franklin Dexter, PhD · Richard H. Epstein, MD

Received: 14 August 2015/Revised: 17 August 2015/Accepted: 15 September 2015/Published online: 22 September 2015
© Canadian Anesthesiologists' Society 2015

To the Editor,

Tabing *et al.* studied changes in costs and workflow at Vanderbilt University Medical Center when desflurane vaporizers were removed from anesthesia machines in the operating rooms (ORs).¹ They studied cases that took ≥ 15 min from the *end of the case until the OR exit*. In contrast, observational and randomized studies of prolonged times to tracheal extubation have used ≥ 15 min from the time of finishing applying the surgical *dressing on the patient* (or its functional equivalent) *to tracheal extubation*.^{2–4} There is excellent reliability for the *dressing on until extubation* period (Krippendorff's $\alpha = 0.989$).³ Furthermore, prolonged (≥ 15 min) times for that period are associated with longer times to OR exit.^{2–6} From Table 4 of reference⁶, among cases with prolonged times to tracheal extubation, the mean time from end of surgery to OR exit was 28 min. Therefore, among the authors' cases with tracheal intubation and extubation in the OR, what percentage of cases in the before and after periods had times ≥ 28 min from the end of surgery to OR exit (i.e., as previously studied) or, alternatively, ≥ 30 min (i.e., what an organization might monitor), and what was the corresponding relative risk and confidence interval?

For sevoflurane, using an approximate Canadian acquisition price (\$200/250 mL), fresh gas flow ($2 \text{ L}\cdot\text{min}^{-1}$), average vaporizer concentration (2%), and OR temperature (20°C) and pressure (760 mmHg), administration costs are approximately \$11.05 per hour during anesthesia maintenance. Even though, in the US, sevoflurane acquisition costs are about half of that in Canada, the authors report in their Table 5 that the cost of sevoflurane was \$0.63 per case. This apparent discrepancy would require explanation and redo of the cost analysis, as necessary. In comparison, the authors' values in Table 5 for isoflurane and desflurane seem reasonable based on typical fresh gas flows (i.e., without feedback to providers).^{7,8}

Acknowledgement Ms. Jennifer Espy, BFA, assisted in the preparation of this Letter to the Editor.

Conflicts of interest None declared.

Disclosure The Division of Management Consulting of the Department of Anesthesia, University of Iowa has previously received funding from Abbott Laboratories, Baxter Healthcare, and Merck. Dr. Dexter receives no funds personally other than his salary and allowable expense reimbursements from the University of Iowa and has tenure with no incentive program. He and his family have no financial holdings in any company related to his work other than indirectly through mutual funds for retirement. Income from the Division's consulting work is used to fund Division research.

Funding Departmental.

References

1. Tabing AK, Ehrenfeld JM, Wanderer JP. Limiting the accessibility of cost-prohibitive drugs reduces overall anesthetic drug costs: a retrospective before and after analysis. *Can J Anesth* 2015; DOI:10.1007/s12630-015-0442-8.

This letter is accompanied by a reply. Please see *Can J Anesth* 2016; 63: this issue.

F. Dexter, PhD (✉)
Division of Management Consulting, Department of Anesthesia,
University of Iowa, Iowa City, IA, USA
e-mail: franklin-dexter@uiowa.edu

R. H. Epstein, MD
Sidney Kimmel Medical College at Thomas Jefferson
University, Philadelphia, PA, USA

2. *Dexter F, Bayman EO, Epstein RH.* Statistical modeling of average and variability of time to extubation for meta-analysis comparing desflurane to sevoflurane. *Anesth Analg* 2010; 110: 570-80.
3. *Masursky D, Dexter F, Kwakye MO, Smallman B.* Measure to quantify the influence of time from end of surgery to tracheal extubation on operating room workflow. *Anesth Analg* 2012; 115: 402-6.
4. *Agoliati A, Dexter F, Lok J, et al.* Meta-analysis of average and variability of time to extubation comparing isoflurane with desflurane or sevoflurane with sevoflurane. *Anesth Analg* 2010; 110: 1433-9.
5. *Epstein RH, Dexter F, Brull SJ.* Cohort study of cases with prolonged tracheal extubation times to examine the relationship with duration of workday. *Can J Anesth* 2013; 60: 1070-6.
6. *Dexter F, Epstein RH.* Increased mean time from end of surgery to operating room exit in a historical cohort of cases with prolonged time to extubation. *Anesth Analg* 2013; 117: 1453-9.
7. *Nair BG, Peterson GN, Neradilek MB, Newman SF, Huang EY, Schwid HA.* Reducing wastage of inhalation anesthetics using real-time decision support to notify of excessive fresh gas flow. *Anesthesiology* 2013; 118: 874-84.
8. *Epstein R, Dexter F, Patel N.* Influencing anesthesia provider behavior using anesthesia information management system data for near real-time alerts and post hoc reports. *Anesth Analg* 2015; DOI:[10.1213/ANE.0000000000000677](https://doi.org/10.1213/ANE.0000000000000677).