Reduction of Fresh Gas Flow During Administration of Volatile Anesthetic Agents via Monthly Individualized E-Mail Feedback

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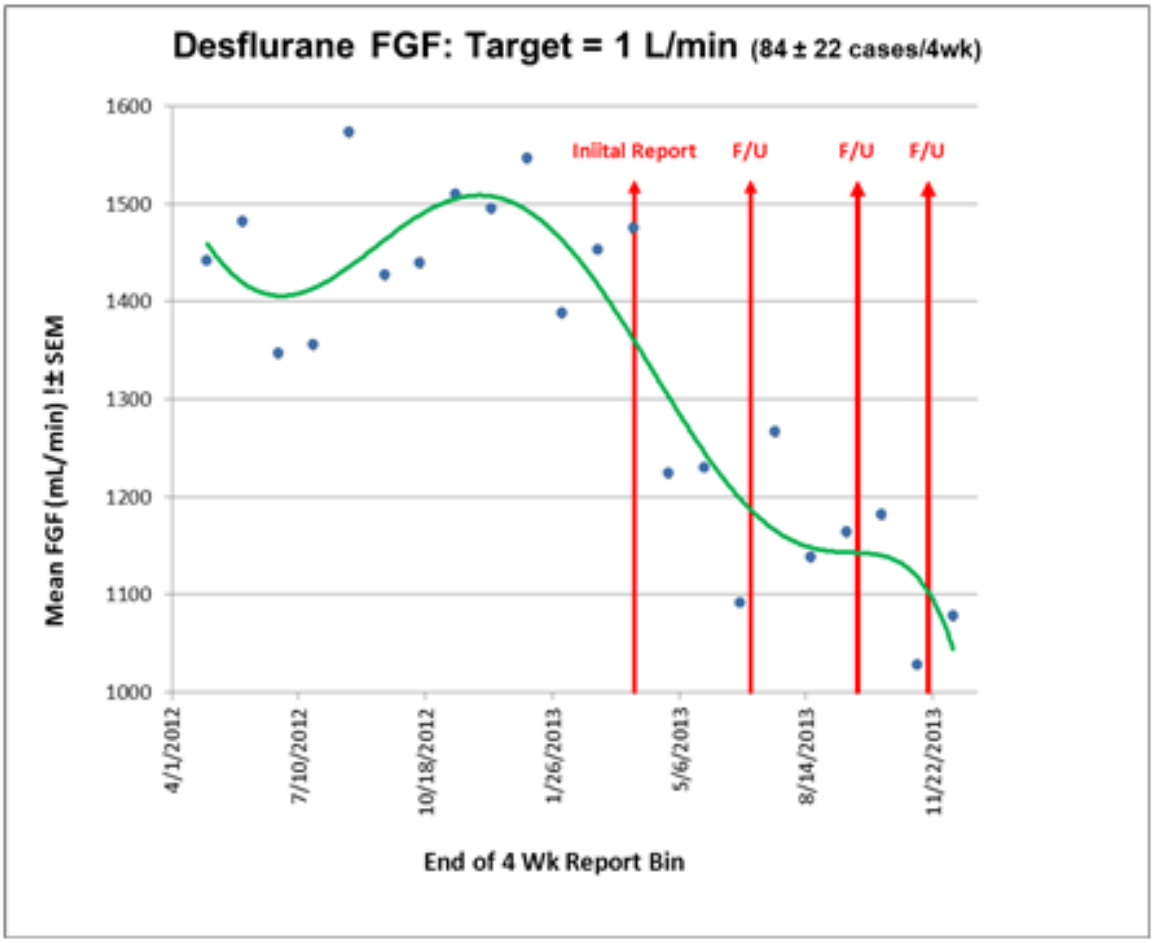
Introduction: Reducing excessive fresh gas flow (FGF) during general anesthesia is a simple strategy to lower the cost of administering inhalational agents. Atmospheric venting of such ozone-depleting gases and subsequent greenhouse gas effects are also of concern. Nair et al. recently showed that real-time feedback from their Smart Anesthesia Messenger™ system reduced FGF during surgery.i For sevoflurane (SEV) and isoflurane (ISO), but not for desflurane (DES), FGF rates increased when decision support system (DSS) messages were suppressed, and decreased when the DSS was reactivated. Although we have a similar DSS connected to our anesthesia information management system (AIMS), our approach to changing behavior is first to attempt personalized e-Mail feedback before adding real-time messages, since such messages are potentially disruptive, challenging to maintain over generations of AIMS, and may be subject to future FDA regulation. Implementing a DSS is a non-trivial task, and access to real-time monitoring data is difficult within many commercial, enterprise-wide AIMS. Not only is database reporting by e-Mail easier to implement, it provides a scalable solution. We hypothesized that a personalized feedback system, with reports delivered intermittently via e-Mail, would result in a reduction in FGF.

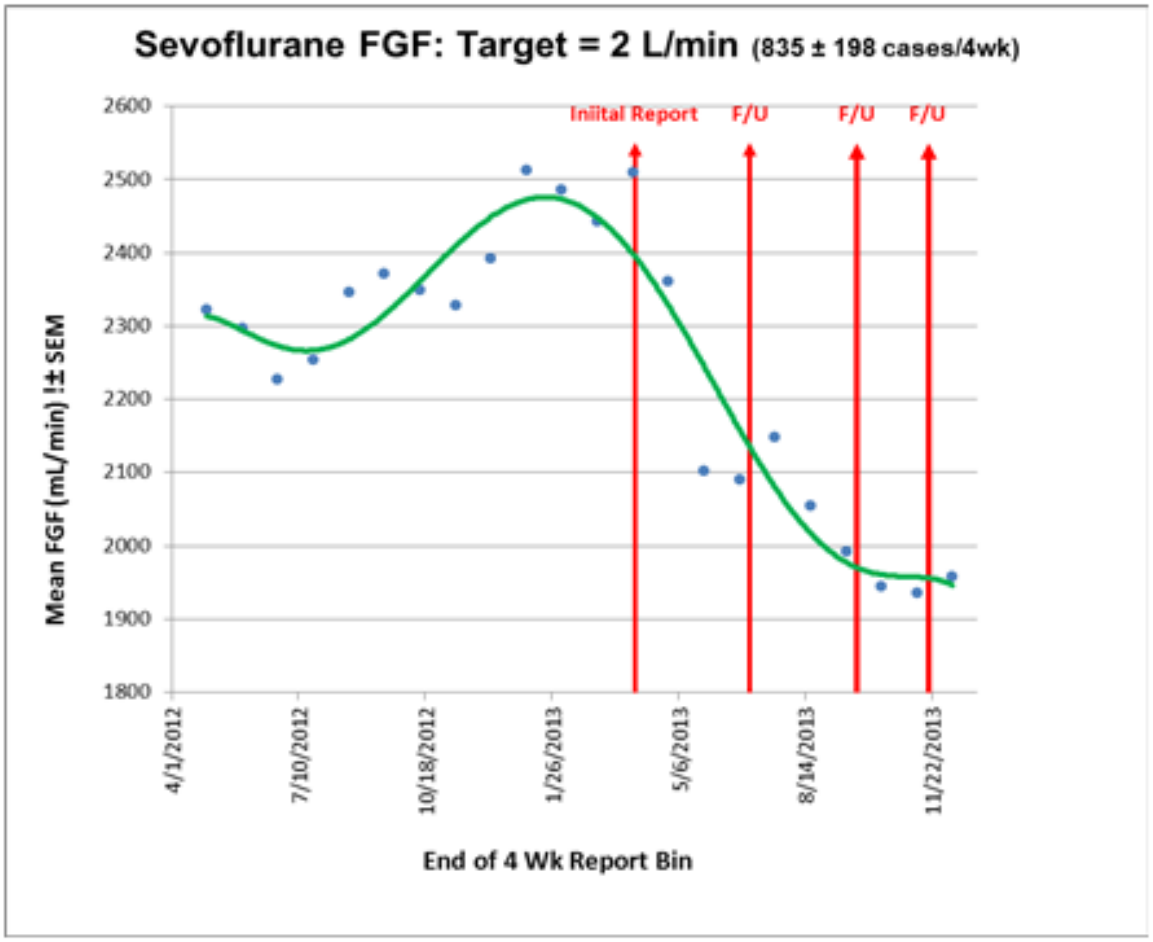
Methods: This quality improvement project was considered exempt from IRB review. Cases were included if done with a laryngeal mask airway or tracheal tube and an inhalational agent. Cardiopulmonary bypass cases were excluded, as were cases where multiple volatile agents were given. The timestamps of measurements, volatile agent, and FGF were retrieved from our AIMS from surgery begin to end for cases where this interval was ³15 min. We presented the program as an environmental initiative, with cost savings as a secondary benefit. In April 2013, each anesthesia provider was e-Mailed a report describing his or her FGF for each agent over the prior 12 months, along with an explanation of the goal to reduce mean FGF for ISO and DES to 1.0 l/min and SEV to 2.0 l/min. Providers' reports included cases where they were the sole provider. Anesthesiologists' reports included cases where they were the sole supervisor. Individualized reports for each agent (with n ³ 10 cases) over the previous 12 weeks were e-Mailed on Jul 1, Sep 4, Sep 23, and Oct 21, 2013. Data are presented as the mean FGF ± standard error (SEM), calculated using the method of batched means and 4-week bins. Comparisons to baseline used the two sided unpaired Student t-test. Results for ISO are not reported, as mean use is less than 1 case per day.

Results: During the baseline period, the FGF was 1.46 ± 0.02 l/min for DES (N = 64.8 ± 4.5 cases per bin) and 2.37 ± 0.03 l/min for SEV (N = 881.5 ± 23.1 cases per bin). The FGF

decreased compared to baseline over the last 5 4-week intervals to 1.12 ± 0.03 l/min for DES (P < 10-6) and 1.98 ± 0.02 l/min for SEV (P < 10-6). SEV and DES FGF rates were correlated, with R = 0.89 (P < 10-6), suggesting that the reductions were related to the e-Mail intervention, and were not simply random events.

Discussion: Personalized e-Mail notifications reduced the SEV FGF to below our target of 2.0 l/min, but the DES FGF remains slightly above our target of 1.0 l/min. Additional reporting periods will be required to determine if the SEV FGF benefit is sustained, with data collection and personalized e-Mails ongoing. i Nair BG et al. Anesthesiology. 2013; 18:874-84




Sevoflurane FGF: Target = 2 L/min (835 ± 198 cases/4wk)
Initial Report
F/U
F/U
F/U
Mean FGF (mL/min) !± SEM
2600
2500
2400
2300
2200
2100
2000
1900
1800
4/1/2012
7/10/2012
10/18/2012
1/26/2013
5/6/2013
8/14/2013
11/22/2013
End of 4 Wk Report Bin