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Effect of Co2 Absorbent on the Cost of Low Flow Anesthesia: Lower Flows Are Not Always Cheaper

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Introduction: The cost of inhalational anesthesia is proportional to the fresh gas flow. Low fresh gas flows have been encouraged as a mechanism to decrease the cost of inhalational agents. However, historically low flow anesthesia has been limited with sevoflurane due to concerns of chemical reactions with the CO2 absorbent, which may have clinical implications. In response to these issues new C02 absorbents have been introduced which decrease the possibility of accumulation of toxic products. However, the cost of these new absorbents is higher than first generation agents and as such, may impact the cost saving of low flow anesthesia. This study quantitates the cost of a current C02 absorbent and provides a context for determining the costs of low flow inhalation anesthesia and its potential savings.**Methods:** Costs of inhalational anesthesia were calculated utilizing the universal gas law (Loke 1993) using the current prices of the agents at our institution [desflurane $0.63/ml, sevoflurane $0.34/ml, isoflurane $0.10/ml]. The cost of the C02 absorbent, Absorb Plus (Armstrong Medical, Coleraine, UK) was based on $17.68 per 1.2 liter canister and was determined from calculation of the manufacturer's specifications which was in agreement with published studies (Kobayshi 2004). The cost of Absorb Plus was calculated to be $1.62/ hour at 0.5 lpm flow, assuming an 80 kg person at 1 metabolic equivalent (3.5 ml 02/kg/min). **Results:** The cost of inhalation agent alone per MAC hour at 0.5 lpm fresh gas flow is desflurane $5.16, sevoflurane $1.07, and isoflurane $0.16 . Thus, cost of anesthetic plus C02 absorbent under these conditions would be: $6.78, $2.69 and $1.78 respectively (figure 1). At a fresh gas flow of 1 lpm, (assuming a doubling of anesthetic cost and a halving of absorbent usage) the combined costs would be: $11.13, $2.95 and $1.13 respectively. This analysis would change with patients of different weight or metabolic rate and would need to confirmed empirically as the absorption of C02 may not be linear with fresh gas flow. **Discussion:** These data allow comparison of costs at various gas flows and for desflurane and sevoflurane support the conventional view that low fresh gas flows result in lower costs. Paradoxically, isoflurane costs are higher at lower fresh gas flows as the cost per hour of the Absorb Plus is greater than the agent cost. Under these conditions, the least expensive flow rate for isoflurane is approximately 2 lpm. These results support the notion that a full understanding of costs is important for rational practice choices. **References:** Kobayashi, S., Bito, H., Morita, K., Katoh, T., & Sato, S. (2004). Amsorb Plus and Drägersorb Free, two new-generation carbon dioxide absorbents that produce a low compound A concentration while providing sufficient CO 2 absorption capacity in simulated sevoflurane anesthesia. Journal of anesthesia, 18(4), 277-281. Loke, J., & Shearer, W. A. (1993). Cost of anaesthesia. Canadian Journal of Anesthesia/Journal canadien d'anesthésie, 40(5), 472-474.

	Desflurane	Sevoflurane	Isoflurane
0.5L/Min			
Inhalational agent cost	5.16	1.07	0.16
CO2 absorbent cost	1.62	1.62	1.62
Total cost	6.78	2.69	1.78
1L/min			
Inhalational agent cost	10.32	2.14	0.32
CO2 absorbent cost	0.81	0.81	0.81
Total cost	11.13	2.95	1.13
2L/min			
Inhalational agent cost	20.64	4.28	0.64
CO2 absorbent cost	0.41	0.41	0.41
Total cost	21.05	4.69	1.05
4L/min			
Inhalational agent cost	41.28	8.56	1.28
CO2 absorbent cost	0.20	0.20	0.20
Total cost	41.48	8.76	1.48

Figure 1