

in the operating room: A cause for concern' by Chaudhary *et al.*^[1] We congratulate the authors for raising an important concern of drug wastage related to our daily clinical practice.

We would like to add that the volatile anesthetics contribute to almost 20%^[2] of the cost incurred in anesthesia, and thus, need to be considered when we calculate the drug wastage in the operating room. This is more relevant in the present day when newer and more expensive agents like desflurane and sevoflurane are in clinical use in our country. Moreover, there is a definite potential of saving or rather not wasting these drugs, because the consumption of these agents largely depends on the type of circuit used and the rate of fresh gas flow used to conduct the anesthesia. A significant amount of gases are wasted when closed rebreathing systems are not in use. The fresh gas flow rate directly affects the amount of consumption of halogenated agents. The practice of low flow anesthesia has been proven to decrease the anesthesia delivery costs significantly. A flow rate of 1-2 liter/minute can be safely used for prolonged periods, and this use is increasingly becoming common.^[3]

The safety of the patient should not however, be compromised in order to reduce costs. It is mandatory that the anesthesia machines which are used to deliver low flows should have essential monitoring available, which include, continuous measurement of the inspired oxygen concentration, end-tidal/inspired carbon dioxide, end-tidal/inspired volatile agent concentration, airway pressure and minute volume with adjustable alarm limits.

Lockwood *et al.*^[4] studied the pharmaco-economics of isoflurane, sevoflurane and desflurane and concluded that at low flows with closed breathing system, there is a substantial cost saving with the use of the commonest inhalational agent, isoflurane. The amount of the more expensive agents like sevoflurane and desflurane used is much lesser, and their relative cost difference with isoflurane is significantly reduced with the use of a closed system. The cost of carbon dioxide absorber like soda lime increases; however, this is not significant in amount, compared to the expense of the gases including oxygen, nitrous oxide and inhalational anesthetics.

The efficiency coefficient of inhalational anesthetics is calculated by dividing the amount of agent taken up by the patient by that being delivered into the system, as follows:

$$Q_{\text{eff}} = V_u/V_{\text{del}}$$

The efficiency of desflurane for a 2 hour duration anesthesia with 4.4 l/min and 1.0 l/min fresh gas flows is 0.07 and 0.23, respectively. This means that only 7% of desflurane is taken up by the patient and the rest 93% is wasted at a 4.4 l/min flow.^[5] The efficiency can be increased several fold by just reducing this flow.

Inhaled anesthetics contributing to drug wastage

Sir,
We read with great interest the article 'Anesthetic drug wastage

It would thus be prudent to consider the cost of the gases used in anesthesia, and recommend measures to avoid their wastage. This saving is also likely to indirectly reduce the pollution in our working environment as well as in the world outside.^[6]

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