# ■ CORRESPONDENCE

## Forget the Costs: Use What Is Best

*To the Editor:*—Anesthesiology is reaching a new low when we worry about and calculate cost per minute of anesthesia time; particularly because the difference is pennies per minute. The cost analysis by Macario *et al.*[1] compares the cost of different methods of airway management—mask, laryngeal mask, and endotracheal tube—and drug costs with each. The assumption is such that, with a mask, gas flows of 6 l/min must be used. The authors seem unaware of the fact that it is possible (and was standard practice) to use even a closed system with a mask. Flow rates of 300–400 ml/min were customary. I am sure that low flows would have a major impact on the calculations and would make the mask method best by far. It should come as no surprise to anyone that reused items are less costly than disposables.

What troubles me is that what is best for the patient is not even considered. Is inconvenience for the anesthesiologist more important?

I have yet to see surgeons calculating the cost per stitch for suture materials, swedged-on needles, disposable *versus* reusable sponges, drapes, and other items. Expensive high-technology surgery is acceptable and sought. It is demeaning for the anesthesiologist and a disservice to patients that we should consider pennies per minute to be important.

When I have my operation, I want what is best for me, not what is cheapest and most convenient for the anesthesiologist.

Primum non nocere.

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### Reference

1. Macario A, Chang P, Stempel D, Brock-Utne J: A cost analysis of the laryngeal mask airway for adult elective outpatient surgery. ANESTHESIOLOGY 1995; 83:250–7

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*In Reply:*—Our economic analysis of the laryngeal mask airway for outpatient elective surgery provides a model to identify the variables that have the greatest effect on cost-efficiency when determining airway management choice.[1] Jacoby raises several important points. The first is that intraoperative anesthesia costs (*i.e.,* cost per minute of anesthesia) are a small portion (5.6%) of the overall costs related to perioperative care of a surgical patient.[2] Although the cost per case of anesthesia drugs and supplies is small, given the large number of anesthetics administered, small savings per case can represent substantial savings when aggregated. By taking a leadership role in analyses of operating room economics, we will be better able to work with our surgical and nursing colleagues to improve the fiscal profile of surgical care.

In a capitated reimbursement environment, where a healthcare system is paid a fixed amount of money per month to care for a predefined number of covered lives, anesthesiologists need to continually determine how to achieve the best outcomes at the lowest reasonable cost, even if the marginal cost difference between anesthetics is low. Quantitatively defining what is best for the patient can be difficult. In our cost analysis, we placed value on what is best for the patient by factoring in the cost of various complications (*i.e.,* risk of dental injury). We also state that delivering high-quality anesthesia care requires that specific patient preferences regarding airway choice be incorporated into the airway management decision.

We assumed the fresh gas flow used for a face-mask anesthetic (6 l/min in our baseline case) to be greater than the fresh gas flow used for the laryngeal mask airway or the tracheal tube. Certainly, if the flow rates used for the face masks are decreased to 400 ml/min, the

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face mask becomes an even more economically attractive airway choice for elective outpatient surgery.

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### References

1. Macario A, Chang P, Stempel D, Brock-Utne J: A cost analysis of the laryngeal mask airway for adult elective outpatient surgery. ANESTHESIOLOGY 1995; 83:250–7

2. Macario A, Vitez T, Dunn B, McDonald T: What does perioperative care really cost?: Analysis of hospital costs and charges for inpatient surgical care. ANESTHESIOLOGY 1995; 83:1138–144

# Preoperative Pregnancy Testing in Ambulatory Surgery: I

*To the Editor:*—Manley *et al.* [1] found the true incidence of previously unrecognized pregnancy in menstruating women presenting for elective ambulatory surgery to be 7 of 2,056 (0.3%), as determined by urinary or serum human chorionic gonadotrophin immunoassay. Although this information is valuable, alone it is insufficient for the clinician to evaluate the significance of a positive or negative pregnancy test result in a single patient.

The probability of pregnancy in a patient with a positive test result (positive predictive value) equals the number of true positives divided by the total number of positives (true positives + false positives); the probability of nonpregnancy in a patient with a negative test result (negative predictive value) equals the number of true negatives divided by the total number of negatives (true negatives + false negatives). The clinical significance of the pregnancy test is therefore given by the positive predictive and the negative predictive values. These values can be calculated from intrinsic properties of the test (sensitivity and specificity) and the estimated prevalence of pregnancy in the population in question. [2,3]

Manley *et al.* [1] quote one false-positive pregnancy test among 179 adolescent women (0.6%) during preoperative testing from data by Malviya *et al.* [4] The specificity of the pregnancy test is therefore 178 of 179, 99.4%. Manley *et al.* [1] also state that the possibility of a false-negative result (pregnancy despite a negative test result) is "extremely remote." Let us assume, therefore, that the sensitivity of the test is 100% (a sensitivity of 99% would give virtually the same result in the following discussion).

Consider a sample of 100,000 menstruating women presenting for elective ambulatory surgery. Given the original findings by Manley *et al.* [1] of a 0.3% pregnancy rate, there would be 300 pregnant and 99,700 nonpregnant women in the sample. Pregnancy testing of the 300 pregnant women would result in 300 true positives and no false negatives (100% sensitivity); pregnancy testing of the 99,700 nonpregnant women would result in 99,102 true negatives and 598 false positives (99.4% specificity). The positive predictive value is 300/300 + 598 = 33%, and the negative predictive value is 99,102/99,102 + 0 = 100%.

Given that the aforementioned assumptions are valid, the clinician can be virtually 100% confident that a negative preoperative pregnancy test means that the patient is not pregnant. On the other hand, only 33% of women who test positive will be pregnant; the remaining 67% will have their surgery delayed but will not be pregnant. The latter statement is based on the specificity derived from data by Malviya *et al.* [4] Even if this assumption is not valid, when a population has a low overall prevalence of pregnancy (0.3% in this example), it is essential for the pregnancy test to be highly specific (few false positives) if a low positive predictive value is to be avoided. Improving the specificity to 99.95% (a false-positive rate of 1 in 2,000) would only result in an 86% positive predictive value given the same prevalence of pregnancy (0.3%).

Although Manley *et al.* [1] and Malviya *et al.* [4] found what appear to be minor differences in specificity for preoperative pregnancy testing, the low prevalence of pregnancy in the population to be tested will