to accomplish the union of the two groups, but Ruth's efforts were not at fault.

Rosenberg and Axelrod are to be complimented on reminding us of the boldness of our pioneer colleagues and that, through their hard work and sheer force of will, they created the infrastructure that anesthesiology now enjoys. We owe an unrepayable debt to Ruth and his colleagues for their efforts on our behalf.

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Anesthesia Studies Should Include Costs

To the Editor:—In their editorial, White and Watcha advised that new drugs "not only require evidence that they are safe and effective, but that they improve outcome and are cost-effective. . . ."[1] This is the third editorial in 2 yr emphasizing the importance of cost-effectiveness and the economic consequences of anesthetic drugs and techniques.[2,3] Obviously, these directives require collecting and publishing cost and other economic data. Despite this, neither the three articles discussed by White and Watcha nor those in the remainder of the January issue include specific cost information. This omission of costs is especially regrettable for the lead articles because drug company employees were coauthors and favorable results were presented for very expensive drugs.

Wong *et al.*[4] concluded that ketorolac, when used in an intravenous and then oral sequence, "is a safe and effective analgesic in the ambulatory surgical setting." They failed to mention that the wholesale cost of ketorolac for the 73 patients in their K30 group is $1,552, whereas the cost of fentanyl and codeine for the 76 patients in their F50 group is $74.* When these drug costs are increased by hospitals to cover inventory, personnel, and record-keeping expenses (usually a multiple of 3), the differences can become very large. These additional costs may be more than anesthesiologists and patients want to bear and are certainly worth considering before reaching a conclusion. Similarly, in the study by Scuderi *et al.*[5] the wholesale cost of ondansetron for the 119 patients receiving 4-mg doses is $2,058, whereas the cost of alternative antiemetic therapy, such as droperidol or promethazine, is approximately $40. This cost of $2,058 for ondansetron assumes use of the 20-ml multidose vial and no waste; if a new vial is opened for each patient, the cost would be $20,577! McKenzie *et al.*[6] found "the 4-mg ondansetron dose was 30% more effective than placebo in preventing emesis." They concluded that, "because of a marginal improvement in the efficacy of ondansetron compared with droperidol, a trial that directly compares these two compounds is needed." Anesthesiologists making this comparison should know that ondansetron costs nearly 5,000% more than droperidol.

We have no argument with the recommendation or administration of expensive drugs if these costs are recognized and considered. However, the drug costs are missing from these articles, and they are not widely known to either anesthesiologists or patients. Recently, an anesthesiologist in a nearby hospital unknowingly cost his pharmacy more than $100,000 when he gave every recovery-room patient an injection of ondansetron during a trial period.

Our cost comments also apply to non-drug studies. Also in the January issue, Hickey *et al.* found that intraoperative somatosensory evoked potential monitoring "may be of benefit in all types of surgery . . . ."[7] The cost of 5 h of this monitoring at our hospital is $1,974, which is far more than the cost of the anesthetic and certainly worth considering. Similarly, Mamourian *et al.*[8] recommended magnetic resonance imaging (MRI) as a primary imaging technique to diagnose epidural abscess in patients with back pain after epidural injections.

* United Hospital Consortium prices. Assumes new fentanyl ampule opened for each dose.

A lumbar MRI costs our patients $998, which is expensive for a screening test. MRI should be reserved as a definitive test in selected patients. If the cost is not known, the test may be ordered inappropriately.

Because health-care costs are important, studies of new drugs and techniques must include and reveal costs. An increase (or decrease) in costs may be as significant as an improvement in effectiveness as resources become scarce. The practice of anesthesiology requires allocating these limited resources among competing needs. Especially in an era of fixed revenue, buying expensive drugs or services may preclude other desirable therapies or programs. Intelligent choices require knowing the costs of each alternative. We would prefer to know total differential costs, but knowing just the costs of each drug studied helps place findings in perspective. Authors should add an appendix listing pertinent costs when the information is not contained within their study. The economic realities of health care and anesthesia require the inclusion of costs when considering any benefits found in a scientific study.

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In Reply:—The Letter to the editor by Johnstone and Martinec is timely and appropriate although not rationally applicable to the studies with ondansetron.[1,2] However, any speculation on the cost of ondansetron for postoperative nausea and vomiting, at this time, is premature and unreliable.

The cost of developing new medications is related to numerous factors, many of which are not yet available to the authors. One important factor is the size of the estimated market, which is directly related to the condition treated. For ondansetron, the available pool of patients has been those undergoing chemotherapy or radiation therapy—a relatively small pool. The standard treatment regimen consumes most of the 40-mg vial. Development costs had to include potential sales estimates. In contrast, the pool for either the prevention or treatment of postoperative nausea and vomiting is much larger because, in the United States alone, more than 20 million anesthesias are given annually. The most effective dose of ondansetron seems to be 4 mg intravenously or, in Europe, 8 mg orally three times a day.[3] At current prices, as quoted by Johnstone and Martinec, the 4-mg intravenous dose would cost $17.29. However, packaging and pricing of ondansetron for the prevention and treatment of postoperative nausea and vomiting, to my knowledge, is not available.

There are factors other than cost to consider. A significant finding in our paper was the 95% incidence of nausea in history of postoperative nausea and vomiting. Ondansetron reduced this incidence to 54%.[2] Droperidol may or may not do the same.

Ondansetron in a single dose, when compared with placebo, provides a 24-h protection from emesis for ambulatory patients who did not vomit in the recovery room.[2] Droperidol may or may not last as long.

The side effect profile of ondansetron to date has been benign, whereas extrapyramidal symptoms, including restlessness, akathisia, and torticollis, have been reported even with low-dose droperidol.[4,5]

Only one publication to date has compared metoclopramide, droperidol, and ondansetron.[6] The percentage of patients vomiting were 54%, 45%, and 13%, respectively.

The cost-effectiveness of this promising new antiemetic will be decided soon, when ondansetron takes its place in competition with other antiemetic agents.

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