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An Application of Health Services Research to Anesthesiology

THE specialty of anesthesiology has contributed much in methodology that is useful in the area of health services research. The National Halothane Study[1] was an important effort that dealt with large numbers of surgical patients to resolve a question of comparison among low rates of surgical complications following administration of halothane and other agents. Much useful experience was gained concerning the difficulties of carrying out such studies and the statistical procedures appropriate to design and evaluation of the results. On another line, the work of Beecher,[2] Houde *et al.*[3,4], and many others has shown the way to obtain reliable and valid experimental data that yield quantitative comparisons of analgesic agents in practice when the outcome is a subjective report of pain relief from the patient.

The article by Forrest, Rehder *et al.*[5] in this issue of the Journal, together with two preceding articles[6,7] related to the same study, are a nice illustration of a movement that will become more and more important in this decade and beyond. Choices among alternative medical treatments for categories of the patient and for the individual case become matters of finer trade-offs, hinging on multiple patient characteristics, multiple therapeutic objectives, differing toxicity profiles and frequencies, differences in the quality of life of the patient, and economic considerations of the patient and society. Resolution of these dilemmas that leads to clear policy requires quantitative and reliable data. Questions in the area of surgical and anesthetic procedures are especially challenging because of the multiplicity of causes and the paucity of untoward events and the variability of patient responses. Larger numbers of patients must be studied if clear answers and useful policy guidelines are to be produced.

Forrest, Rehder *et al.*[5] bring the randomized experimental method to bear on the comparison of anesthetic agents in practice, a blending of the approach used in the National Halothane Study[1] and the randomized experimental approach of Houde and co-workers.[3,4] The Forrest, Rehder *et al.*[5] study employed modern clinical trial techniques, multisite collaboration, thousands of patients, and current statistical techniques for comparing the relative risks of death and serious complications following surgery. The two previous articles[6,7] presented the methods and the comparison of the agents with regard to risk of death and serious complications. The article in this issue of the Journal[5] provides us with an illustration of the way data in these studies can be exploited to yield ancillary results of use to the policy maker and to the practitioner in decision-making. Patient characteristics that might be used to predict serious sequelae following various surgical procedures are described, and the data are quantitative. One can therefore easily compute the risk of various complications following surgery based on the patient's characteristics. For example, one can compute the risk of serious respiratory complication for a patient with a smoking history, ASA physical status 2, age 50 yr, and so forth. The calculations are simple, and the data underlying them could easily be installed in a personal calculator or small computer. Of course, the caveats for the user are obvious. Probabilities, even if valid, are not certainties. Furthermore, the data base for trial may not resemble the patients whom the user is managing in his or her own hospital and practice.

Statistically, one notes that Forrest, Rehder *et al.*[5] have used care in choosing the predictors for the several serious outcomes and have used state-of-the-art statistical methods for deriving the coefficients for the prediction equations. However, and importantly, Forrest, Rehder *et al.*[5] have not themselves checked or validated their results. A natural follow-up would be to use resampling methods or, better, another set of data to validate predictions based on their results.

The reader should also bear in mind that a variable

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that does *not* appear in a particular prediction equation might yet be an important predictor. Omission might merely mean that other variables in the equation are surrogates for the omitted variable.

This work of Forrest, Rehder *et al.*[5] is important as an illustration of the work that must be done in the future to resolve finer, yet important, questions related to health policy and practice—questions that must be answered as we become more sensitive to patient characteristics, secondary outcomes, patient preferences, and the costs of health care. These studies are necessarily expensive. They can be worth the costs, but they must be directed at important questions and done according to the best of experimental canons. Furthermore, the data obtained must be used for secondary purposes as well as for the primary purpose of the study. The article in this issue of the Journal is a good example of what needs to be done.

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