ROBERT G. MERIN, M.D.
Professor of Anesthesiology
University of Rochester Medical Center
Rochester, New York 14642

REFERENCES


(Accepted for publication April 25, 1980.)

Formulas for Calculating Fluid Maintenance Requirements

To the Editor: — In 1957, Holliday and Segar described the maintenance requirements for water of hospital patients, based on caloric expenditure. Without changing the concept described by the above-mentioned authors, I have modified their formulas to those proposed in table 1 for calculation of a patient’s hourly maintenance fluid volume, and compared the proposed formulas with equations currently available (table 1). It has been simpler for the medical students and residents in anesthesia service to calculate the hourly maintenance requirement for water of patients by using these proposed formulas, in which certain restrictions, such as “for each kg over 10 kg” and “for each kg over 20 kg,” have been eliminated.

TAE H. OH, M.D.
Associate Professor of Anesthesiology and Child Health and Development
George Washington University School of Medicine at Children’s Hospital National Medical Center
Washington, D. C. 20010

Table 1. Formulas for Fluid Maintenance: Amount (ml) and Rate

<table>
<thead>
<tr>
<th>Body Weight</th>
<th>Original* (per Day)</th>
<th>Currently Available (per Hour)</th>
<th>Proposed (per Hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–10 kg</td>
<td>100 cal/kg</td>
<td>4 ml/kg</td>
<td>4 x kg</td>
</tr>
<tr>
<td>10–20 kg</td>
<td>1,000 cal</td>
<td>40 ml</td>
<td>20 + (2 x kg)</td>
</tr>
<tr>
<td></td>
<td>+ 50 cal/kg*</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1,500 cal†</td>
<td>60 ml</td>
<td>40 + kg</td>
</tr>
<tr>
<td></td>
<td>+ 20 cal/kg†</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* For each kg over 10 kg.
† For each kg over 20 kg.

REFERENCE

(Accepted for publication April 25, 1980.)

Bioassay, Potency, and Intravenous Anesthetics

To the Editor: — In their interesting paper, Sarnquist and associates compared clinical effects of thiopental and midazolam. The calculation of drug potencies in this study was based on the duration of sleep. I would like to make some comments in this regard, since I believe that the use of the duration of drug effect in comparing drug potencies is unjustified. In the textbook of pharmacology by Goodman and Gilman, a dose–response curve is described with the dose represented on the horizontal axis, and the intensity of effect on the vertical axis; the location of the dose–effect curve along the dose axis is given as an expression of the potency of a drug. For anesthetics, potency can be defined as the relative amounts of drugs that will produce the same depth of anesthesia. Depth of anesthesia is analogous to intensity of effect. Intensity of effect cannot be substituted for by duration of effect; since potency is dependent on the number of receptors involved in the drug–receptor interaction and not on the duration of their involvement. Sarnquist and co-authors stated that dose–response curves for midazolam and thiopental have similar
slopes, and performed a parallel-line analysis. Parallelism of log dose–response curves has both theoretical and practical significance. In theory, it is evidence of the same mechanism of action (including the same intrinsic activity). Intravenous anesthetics that are chemical congeners may have parallel dose–response curves. For example, such parallelism has been shown for thiopental and methohexitol. Inhalational anesthetics, from various chemical classes, seem to have similar slopes of their dose–response curves. This is in accordance with their common physicochemical type of action. Intravenous anesthetics that are not chemical congeners may have very different slopes of their dose–response curves, reflecting the differences in their mechanisms of action (if drug–receptor interaction with the same type of receptors is involved, it may be better to say differences in their intrinsic activities). For example, Stella and associates have shown recently that thiopental, diazepam, and alphaxalone have very significant differences in angular coefficients of their dose–response curves.

The practical aspect of dose–response curve parallelism is in the assessment of the relative potencies of anesthetics, and their dose-related side effects. This aspect is illustrated in figure 1. In the left of the figure, agents A and B have parallel dose–response curves, i.e., their relative potencies are proportionately the same at different levels of anesthesia. This means that if at one level of anesthesia, agent B has higher incidence of a dose-related side effect than agent A, the same is likely to be true at different levels of anesthesia. In the second graph, agents X and Y have different slopes of their dose–response curves, i.e., their relative potencies are different at each level of anesthesia. Therefore, for the proper assessment of the incidence of side effects, equipotent doses of agents at several levels of anesthesia must be studied.

Thus, it has been shown above that for intravenous anesthetics from different chemical classes, it is uncommon to have parallel dose–response curves, and it has been demonstrated by Stella and associates that thiopental and diazepam have nonparallel dose–response curves. Therefore, the parallelism of the dose–response curves of thiopental and midazolam (which is chemically closely related to diazepam) in the Sarnaquist study is probably due to the use of the duration of anesthesia as a basis for potency determination, which, in my opinion, is inappropriate methodology for this purpose.

The final comment concerns the use of term “bioassay.” This term describes the estimation of the relative potencies of partially purified preparations by comparison of their biological effects with that of highly purified preparation of the same substance. Under these circumstances, dose–response curves must be parallel. For the determination of relative potencies of compounds from different chemical classes where the chance for dose–response curve parallelism is remote, it is better to avoid this terminology.

Igor Kissin, M.D., Ph.D.
Visiting Associate Professor
University of Alabama
Birmingham, Alabama 35294

REFERENCES

Anesthesiology 52:149–153, 1980

(Accepted for publication April 29, 1980.)

A Departmental Logo for Anesthesiologists

To the Editor:—Recently our Anesthesiology Section had the opportunity to develop a new departmental logo for use on white coats and jackets. Rejecting any abstract depiction of the lungs or the traditional draped Greek maiden, ever watchful while holding the torch of knowledge, the department adopted a logo that was more in keeping with the “soft technology” of the new decade (fig. 1).

Seeing this emblem on a white coat leaves little question as to the specialty of the wearer, and it serves to soften or humanize the image of our hospital-based, technology-dependent specialty; this is especially so with children, who associate “counting sheep” with tranquil sleep. The design is available to members of the anesthesia community; anyone wishing to copy or utilize this design for noncommercial purposes may freely do so. Color photographs and additional information are available upon written request.

THOMAS E. MACNAMARA, M.B., CH.B.
DAVID ERIC LEES, M.D.
Anesthesiology Section
3 D 42 Clinical Center
National Institutes of Health
Baltimore, Maryland 20205

(Accepted for publication April 29, 1980.)

Unilateral Analgesia Following Epidural and Subarachnoid Block

To the Editor:—Bozeman and Chandra report unilateral analgesia in a parturient for cesarean section following both epidural and subarachnoid injection of local anesthetic. Unilateral analgesia extending from the L2 to T8 dermatomes on the nondependent side was present 40 minutes after an epidural injection of 19 ml of 0.75 percent bupivacaine administered at L2–3 with the patient in the lateral position. Following a subarachnoid injection of 10 mg of tetracaine with the patient in the sitting position, the unilateral sensory loss extended from T6 to the entire lower limb.

There are three phenomena to be explained in this case report. First, an unusually large amount of local anesthetic for injection at the L2–3 interspace gave sensory loss to T8 only. Although the height and...