

endothelial microvascular injury syndrome" (GEMIS). I am opposed to this terminology, although I agree that a fairly broad spread but irregularly distributed capillary injury and capillary leak syndrome occurs. This part of the problem certainly complicates the initial resuscitation and subsequent maintenance of oxygen transport in ways that some authors who report on resuscitation do not understand.

Nonetheless, the capillary injury that occurs is not a cause of multiple systems organ failure, but a manifestation of multiple systems organ failure. Using the acronym GEMIS does not place our attention on a portion of the pathophysiology that is a key to therapy. Therefore, I fail to see value in this descriptive term. It is much more important that we focus initially on criteria for adequate oxygen transport and then add to that therapies for reducing undue leukocyte systems activation. Such therapies would initially focus on the release of oxygen free radicals by the reperfusion syndrome and especially so in the gut. I have discussed this problem in the editorial in significant part.

We have a major problem in medicine with the use of words each of us thinks we understand, but which we apply in widely different ways under the stress of clinical care. As an illustration, many of the words related to infection come to mind. It is much better if we use the words for clinical conditions that describe only what is observed at a gross, repeatable level by every one until we have the pathophysiologic evidence and understanding that clearly makes a major difference in clinical care. The key question is not is there a fairly generalized capillary injury, but what mechanism produces the capillary injury and how is that mechanism related to other manifestations and how is it effectively prevented or treated. I do not believe GEMIS makes a contribution to this basic problem.

JOHN R. BORDER, M.D.  
Buffalo, New York

March 27, 1991

Dear Editor:

We were very interested to read the paper by Fuchs et al.<sup>1</sup> dealing with the computerized identification of duodenogastric reflux using 24-hour gastric pH monitoring.

Thirty healthy, normal subjects and 11 patients fulfilling Ritchie's clinical criteria for the diagnosis of pathologic duodenogastric reflux were enrolled in study 3. Seventy-one variables were calculated from each individual pH recording and were subjected to discriminant analysis.

Despite this original and sophisticated approach to the detection of duodenogastric reflux, there are several points that should be clarified

1. Discriminant analysis cannot be made using a number of variables higher than the number of subjects, in that an equation system with more variables than equations is undetermined. It is good statistical practice to study a number of cases which is several times the number of the variables simultaneously considered.
2. In order to select the variables most suitable in discriminating different groups, it is necessary to test the coefficients against their own errors, which must be calculated

via inversa matrix. It is virtually impossible to obtain a well-conditioned matrix using more inputs than subjects. Moreover, testing the coefficients implies that the variables follow the Gaussian distribution and that the covariance matrix is the same in both populations. The data of authors do not seem to fit in with these hypotheses.

3. Discriminant analysis requires that the subjects are attributed to each group on the basis of a gold standard. Ritchie's criteria are not a gold standard, since a certain diagnosis can only be achieved by demonstrating the presence of a component of duodenal juice inside the stomach.

## Reference

1. Fuchs KH, DeMeester T, Hinder RA, et al. Computerized identification of pathological duodenogastric reflux using 24-hour gastric pH monitoring. *Ann Surg* 1991;213:13-20.

GIUSEPPE SANDRO MELA, M.D.  
VINCENZO SAVARINO, M.D.  
Genova, Italy

Dear Editor:

We are aware of the fact that the application of discriminant analysis in the detection of pathologic duodenogastric reflux as described does not represent an optimal approach from the statistical-mathematical point of view.<sup>1</sup> But facing the problem of analyzing 24-hour, pH-monitoring data, analysis of the 24-hour pH record requires a selection of clinically valuable parameters among the vast amount of data.

A function that can separate two populations with different characteristics and that at the same time identifies characteristic variables according to their discriminating power, is the discriminant analysis. This was the basis for us to apply this function for our problems.

Ad 1:

One cannot expect discriminant analysis to work properly and select discriminating variables able to separate two populations if the number of variables used is higher than the number of subjects. We agree that it is good statistical practice to study a number of cases amounting to several times the number of variables simultaneously considered. However, the clinical problem we were trying to solve unfortunately did not provide an optimal data pool for statistical analysis. The prevalence of patients with excessive duodenogastric reflux fulfilling Ritchie's clinical criteria is not high.

When applying discriminant analysis on this limited data base, selection of variables with discriminating power might not be possible. However, if variables are selected with an ability to separate two populations (healthy volunteers and patients with path, DGR) with no overlap, as was the case in our study, this finding gives strong evidence. In order to verify this, our statistical consultant required an additional clinical validation of the selected discriminating variables, what we did. Even in the validation population of patients, a separation was possible.