

Title: A MORE ACCURATE ANESTHESIA RECORD: THE ELECTRONIC CLIPBOARD

Authors: D.A. Paulus, M.D., J. van der Aa, Jr., G. McLaughlin, R.N.,  
M.K. Culberson, R.N., E. Radson, R.N., and J.S. Gravenstein, M.D.

Affiliations: Department of Anesthesiology, University of Florida College of Medicine,  
Gainesville, Florida 32610

**Introduction.** Several computer driven anesthesia record systems have been developed, which rely on automated sampling of physiologic signals and entering data by keyboard or barcode device. These systems are difficult to use because they are bulky and hence not mobile and they do not invite easy data entry by hand. We have tested a system that circumvents these problems: the electronic clipboard (ECB). The ECB automatically prints the physiologic data. When one of two buttons is pressed, it numbers and records the time of drug and event entries with space by each entry, where the anesthesiologist can write the nature of the event or can identify the drug.

**Methods.** In order to test the hypothesis that the ECB would facilitate the generation of an accurate anesthesia record we prospectively studied 40 routine anesthetic procedures. In 20, the anesthesiologist kept the record as usual, while the ECB was attended by a trained nurse. In half of these procedures, invasive monitoring was used. In another 20 cases (again one-half invasive) the anesthesiologist used the ECB while a nurse kept the standard, handwritten record. Each case was studied from preinduction to the end of the surgical procedure or for 2 h. After the study, all data from the ECB and the handwritten record were tabulated such that, for every minute, physiologic as well as drug and event data could be compared. Multiple *t*-test comparisons were performed.

**Results.** Whether handwritten data for events were listed at the correct time was tested by plotting all entries (figure). The graph shows the wide range of errors typical of handwritten anesthesia records. Note the improved timing of events when the anesthesiologist used the ECB. Whether handwritten physiologic data corresponded to the values recorded automatically was analyzed statistically. For each case in which the standard handwritten record was kept by the anesthesiologist and the ECB by the nurse, systolic and diastolic blood pressures and heart rate were analyzed over 2 h. In 11 of 20 cases, the handwritten and ECB records differed

statistically significantly in at least 1 parameter ( $P < 0.05$ ). The errors in systolic and diastolic pressures were significant in 4 and in heart rate in 6 of the 20 handwritten records.

**Conclusion.** The anesthesia record is an important document, the accuracy of which is of great concern. An electronic clipboard has been shown to reduce the magnitude of error for three physiologic parameters and to improve accuracy of recording the time and nature of events and drug administration. Further, the ECB allows ample space for handwritten comments and thereby enhances the record.

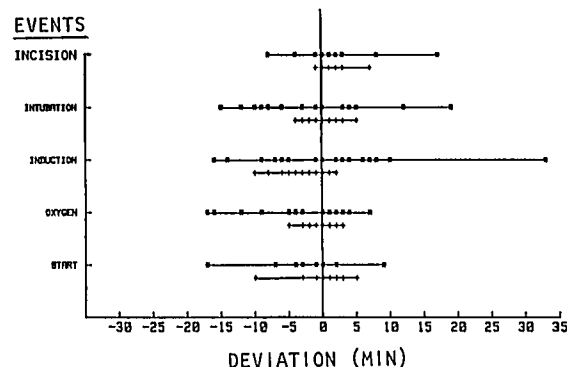


FIGURE. The recording by anesthesiologists of the time of events with the electronic clipboard (ECB) (+) vs. by handwriting (\*). The actual time of events was recorded by a trained observer and provided the control against which both groups of recordings were compared; corresponding entries by the anesthesiologist were plotted as deviations (early as  $< 0$  min and late as  $> 0$  min). Handwritten or ECB entries that did not differ by more than 1 min from control are not shown.