8 Critical Incidents: A Postscript

8.1 Introduction

In this book the concept of critical incidents has been emphasized a number of times. The concept as such is rather new and was only recently introduced by Cooper et al. (1978), in the form of a study in which the "critical-incident technique" (Flanagan 1954) was applied to anesthesia management. Until that time, terms such as "mishaps" and "adverse occurrences" etc. had been used in studies which exclusively discussed anesthesia procedures with a fatal outcome.

Below I will label the different studies as either "critical-incident" or "mortality", but when both indications apply I will use the term "mishap". The reason why studies with respect to critical incidents are so important has been formulated as follows by Newbower et al. (1981 b): "The present level of risk in anesthesia, while small, is not irreducible... Quite possibly, a more systematic approach to the analysis of errors and failures and to the design of corrective action could help to produce a better anesthesia result", and: "Preventing the problems related to human factors and equipment failures which lead to near-miss incidents is believed to reduce the probability of ultimate disaster."

In Chapter 4 critical incidents were mentioned both in relation to performance criteria and (re)design criteria for automated monitoring systems. The use of critical incidents as a criterion to measure the performance of a system was not considered to be feasible.

However, a systematic analysis of circumstances and patient signals in the operating room was performed in this book in order to select those aspects where the use of automation may ultimately lead to a decrease in critical incidents. In the scope of redesign a number of suggestions for improvement of information presentation in the OR by means of automation were given in Chapter 2. Some of these improvements may prevent smaller adverse occurrences which may lead to a critical incident. In Chapter 5 it was shown that specific signal behavior precedes certain clinically significant events, and an investigation into the use of signal correlations to warn for some critical incidents was recommended.

Based on the suggestions from Chapter 2, Chapter 6 discussed the (re)design of an integrated workstation. It represents our view on the direction in which the layout of operating rooms should go in order to minimize errors associated with both scattered information presentation and instrument control.

With the objective of reaching a reduction in peroperative mortality and morbidity, a direct study of critical incidents might well lead to useful recommendations with respect to automation in the operating room and could perhaps yield clues regarding the requirements for alarm algorithms.
For example, a disconnection of the tracheal tube is a frequently occurring incident; it can be prevented by a special mechanical construction (Pogulanik 1980), but also by providing an alarm triggered by the signal behavior resulting from the disconnection (McEwen and Jenkins 1983).

In this chapter I will mention some of the most important publications on the subject of mishaps. Furthermore, I will list the results from 6 recent survey studies in order to obtain an indication of the mishap incidence and thereby of those aspects which most urgently require the application of automation (Meijler et al. 1982). A few illustrative suggestions will be given, although I will do this with some reservations: publications on the subject of mishaps are innumerable and the diversity of the performed investigations is such that comparing and using their results is a precarious enterprise. An adequate description of this literature and its use for automation in anesthesia merits a book of its own, and I will restrict myself to a tentative reconnaissance.

8.2 Critical Incidents as a Means

Several authors give outstanding reviews of the literature regarding mishaps in anesthesia (Phillips and Capizzi 1974, Keats 1979, Davies and Strunin 1984, Pierce 1984). In the history of anesthesia the first reported mishap occurred in 1848, well over a year after the first administration of an anesthetic. Apart from a remarkable mortality study by Snow published in 1858, all subsequent studies were primarily "case reports, compilations of case reports, or collections of compilations" (Phillips and Capizzi 1974). The first systematic survey was published by Beecher and Todd in 1954: they investigated 599,500 surgical procedures and divided the 384 cases of anesthesia-associated mortality into different categories according to their cause. An enormous wave of publications followed. In the period between 1980 and 1985 alone, more than 50 articles were published. Roughly, they can be divided in three groups: those describing specific equipment problems such as Cooper and Newbower (1975) and Rendell-Baker (1982) on anesthesia machines, case studies (Gordh and Mostert 1978), and survey studies of mishaps. It is generally considered useful to compare results of the surveys to obtain improvements in anesthesia. However, one main problem is caused by the differences in the study methodology followed. This discussion about the uniformity of the collected data was initiated by Collins (1960): "The lack of uniformity in compilation of operating room statistics makes it difficult to appraise complications and death occurring in patients who undergo anesthetic and surgical procedures."

In the Netherlands, Smalhout (1972) listed the results from seven mortality studies and concluded: "Although there are large differences between the outcomes, there are some causes of mortality which reoccur in every study". According to him many mishaps could have been prevented by better organization, more knowledge about the situation, improved technical equipment and more careful management.

Phillips and Capizzi (1974) mention some of the differences in data collection, such as the period over which the data were collected, the patient populations, and the applied classifications. The major problem in obtaining comparable re-