Chapter XXIX
Anesthesia Information Management Systems (AIMS)

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ABSTRACT

This chapter discusses the critical role of anesthesia information management systems (AIMS) in clinical tracking and operating room information management. It begins by reviewing the history and implementation of such systems and examines their current abilities and utilities. The current known benefits of AIMS, as documented by peer-reviewed literature, are examined. Possible additional benefits, both future and current, and the potential role of AIMS in future healthcare information management are discussed. Though AIMS vary greatly between individual systems and will continue to evolve over time, this chapter aims to highlight fundamental system features. The goal of this chapter is to broaden understanding of AIMS and their clinical utility, as they have an essential part of modern operative care.

INTRODUCTION

The operating suite remains one of the highest technology and highest clinical acuity locations within the hospital. As such, tracking data and appropriately using information real-time represents a critical challenge to the operative team. The most highly developed form of operating room information system is known as the Anesthesia Information Management System (AIMS), a system of tracking clinical patient data throughout an operation for uses in patient care and medical administration.

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The conventional function of AIMS is to digitally record data related to anesthesia care. Consistent collection and analysis of perioperative data represents a critical improvement over a paper record, improving patient care, quality assurance (QA) programs, clinical research, and managerial tasks. Sophisticated systems implement electronic checklists reducing the likelihood for human error, e.g. medication errors in the operating room (OR). AIMS have been recognized as a tool for supervision and training of young anesthesiologists and have been successfully used to capture costs and track charges. Newer trends focus on developing interactive AIMS to help implement and monitor practice guidelines and to support clinical decision-making. Modern AIMS are increasingly linked with, and part of, integrated clinical information systems (CIS) and thus, allow read and write access to patient data in the perioperative setting. From humble beginnings as recorders of intraoperative physiologic data, AIMS have developed into sophisticated IT systems with customized user interfaces and functionality.

HISTORICAL BACKGROUND OF AIMS

The first ten years of experience with AIMS (1975 – 1985) were characterized by early proprietary systems. (Chase et al., 1983; Rosen & Rosenzweig, 1985; Zollinger et al., 1977) No framework existed for the interfacing of clinical devices or interchange of clinical information. Most early computer user interfaces (UI) were text-based and non-intuitive. (Ash & Ulrich, 1986)

In the mid-1970's, a prototype electronic anesthesia record was developed at the Departments of Surgery und Anesthesiology, University Hospitals, Case Western Reserve University, in Cleveland, OH. (Zollinger et al., 1977) It was one of the first systems to successfully obtain, display, and store real-time data from patient monitors during surgery. In addition, it allowed entering time stamps for intra-operative events (intubation, incision, etc). This simplistic system initiated the era of AIMS and the electronic anesthesia record.

Another early system, called the Computer-Assisted Patient Evaluation (CAPE) system, was designed in the early 1980s at the University of Vermont College of Medicine. It provided a method to record patient indicators, based on the preoperative assessment, to track medical devices (monitors, ventilators, etc), and to document the administration of fluids and medications. (Chase et al., 1983) Unlike the earlier Case Western prototype, it did not have the capability of recording real-time vital signs, i.e. data from patient monitors. The benefits described by the developers included convenience of record keeping and time-savings for internal audits. The CAPE system was noted to enable physicians to research identification of high-risk surgical patients and translate those results into a preoperative screening method.

Early recognition that AIMS would be important did not mean that enabling technology yet existed to support rapid development. In the early 1980's, there were difficulties absorbing data from multiple proprietary and independent anesthesia devices, in interfacing with the system in a rapid and intuitive fashion, and in transferring data to other clinical environments.

To address the difficulty of absorbing or entering patient data, many early research projects focused on the development of new UIs, often with limited success. Early AIMS showed no time savings compared to manual record keeping, estimated to account for 10-15% of total anesthesia time. (Allard et al., 1995) This finding was especially true for short cases (those lasting up to 1-2 hours), which require tracking of all data related to intubation and extubation to record without lengthy intervening periods of clinical stability. In at least one institution, providers

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