Anesthesia Information Management Systems and Sharing Your Patient Data: A Resource for Potential Users

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I. INTRODUCTION

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Electronic medical records that simply create a printed record from the digital system are passé. If the only expectation is to capture vital-sign data from patient monitors and transform these data into a printed record, then the expense of an anesthesia information management system (AIMS) is not justified. However, nowhere else in healthcare do AIMSs make more sense than in the acute care arena, where patients are connected to myriad monitors and clinical information changes rapidly and dramatically. Computerized systems should be capable of collecting vital-sign data and collating patient information faster, better, and more comprehensively than any practitioner could hope to do using paper records, while simultaneously providing the patient with a high level of care. Along with the ability to generate real-time decision support, these systems should be able to improve patient care, which is essential in a world where anesthesiologists' coverage is being expanded from the intensive care unit, emergency department, and operating rooms to more remote areas. Despite the benefits to patient care, the real customers for an AIMS are the hospital and administrators who control the purse strings for such systems. Clearly, any rationale for purchasing an AIMS must include a compelling return on investment (ROI), the potential for which must be recognized by the administrators.

Although AIMS technology was developed more than 20 years ago, its adoption has been slow.[1,2] Concerns over required behavior changes, costs, and legal implications have been the primary deterrents in migrating to electronic records. Advances in computational power, ease of use, and hardware pricing have diminished many of these concerns. All the while, clinicians have intuitively recognized the potential for electronic records to provide value and improve patient safety. The directors of the Anesthesia Patient Safety Foundation (APSF), a patient safety–focused group sponsored primarily by the American Society of Anesthesiologists (ASA), have gone on record to state "The APSF endorses and advocates the use of automated record keeping in the perioperative period and the subsequent retrieval and analysis of the data to improve patient safety."[3] Ironically, it was the ability to retrospectively review and analyze adverse patient events in an effort to improve patient safety that prompted Cushing and Codman (as medical students) to create the first anesthesia record.[4] This belief of the value of data analysis from electronic records is why the ASA created the new Anesthesia Quality Institute (AQI), which will be described in more detail later, with a specific mandate to begin collating clinical data.

Described by some as the "black box" or flight recorder for anesthesiology, AIMSs have been recognized and advocated as a method by which to provide better tools to analyze adverse events and near misses and to provide a global repository of outcomes data that may help to shape future safety efforts.[5] Properly configured and implemented, an AIMS should facilitate the collection of accurate and comprehensive clinical data, thereby representing the anesthetic management of a given patient. From these data, it should be easier for institutions to demonstrate compliance with regulatory requirements, better charge capture of professional fees, and clinical competency through performance measurement. However, the importance of proper configuration and deployment of an AIMS in order to realize these benefits cannot be overemphasized. The medical literature and popular press illustrate this point with examples of clinical systems that have failed miserably and, in some cases, even resulted in patient harm.[6]

RETURN ON INVESTMENT

Any AIMS purchase must be evaluated in terms of ROI to aid the customer's decision-making process. Essentially, the ultimate question is "Will this system save money or increase

revenue in a manner that will allow the customer to realize a substantial return on the purchase price and the ongoing manpower and support costs?" Few studies that evaluate ROI are available in peer-reviewed journals. Some information can be obtained from business journals or from the chief financial officer or the chief information officer of an institution. It is essential that a customer understand ROI models and be certain that the projected payback is real and not just sales hype.

ROI models have been applied to AIMS purchases, particularly computerized patient records and computerized physician order entry systems.[7] As a recent editorial argues, however, hospital administrators (customers) must be able to evaluate their return beyond the classic financial models.[8] This argument is based on the belief that AIMSs will provide more transparent access to patient data, decision support, alerts, and improved patient care, with decreased effort associated with delivering that care. As Frisse points out: "To the health care professional, the true ROI may be measured in terms of ease of use, total expended effort, and satisfaction with the results achieved."[8] Therefore, organizations should fully appreciate the implications of deploying an AIMS and understand the compelling arguments to support the purchase of such a system. The contributors to this text obviously are evangelists of AIMS and truly believe that these systems help deliver better patient care and, just as important, help physicians document that better care was delivered.

The AQI was chartered by ASA to further the goals of quality management in our specialty—with the specific mission of creating a national database of anesthetic cases and outcomes—and has named Richard Dutton, MD, MBA, as the Executive Director. The goal of this specialty-specific data collection effort is to provide ASA members and their practices with private benchmarking information that can help them reduce variability in and improve patient care. On the national level, the availability of aggregated case data will enable ASA leaders to more effectively influence federal policy, with a better understanding of what measures are important to anesthesiologists, what measures can be reasonably collected and calculated, and what areas of focus are most likely to yield tangible improvement.

With an eye toward the ever-increasing use of information technology in healthcare, the AQI is building the National Anesthesia Clinical Outcomes Registry (NACOR) via the passive collection of digital records from anesthesia practices, including data from the hospital or facility electronic records, billing systems, custom quality management systems, and AIMSs. The

ultimate goal is to link risks (patient illness, surgery type) with process (technique, fluids, medications, vital signs) with outcomes (complications, satisfaction). Using an AIMS allows a practice to collect process data in much greater detail, provides a conduit for the electronic organization of risk and outcome data, and enables automatic reporting of digital information to national registries such as NACOR. Widespread use of AIMSs is thus an important intermediate goal of the AQI.

MARKET PENETRATION OF AIMS

Updated market penetration percentages have been obtained from new correspondence with current AIMS vendors: We contacted 12 AIMS vendors that are actively marketing products and classified them into three categories. The first included vendors that sell AIMSs incorporated into clinical monitors or anesthesia machines. The second group was vendors who sold operating room management systems; and the third group was vendors who exclusively sold AIMS products. Tables I-1-3 represent the reported number of customers of these three groups. The vendors were asked to provide the number of live AIMS sites, the number being implemented, and the number under contract. This latter group is presumed to represent hospitals that have purchased an AIMS but have not yet begun to stage the implementation.

By dividing the number of AIMS sites into the number of United States (US) hospitals, projected to be approximately 5,000, we can arrive at % market penetration. If we look at the total number of systems under contract, we could assume (providing the reported data are valid) that we have reached a new inflection point in our market with a 27% market penetration, which is a significant increase even over last year. However, it may be best to only look at currently live sites and those under implementation, because it is not clear how many of the contract group will really install. This combined group represents 14.8% market penetration.

Table I-1: Vendors who sell anesthesia information management systems (AIMS) integrated with clinical monitors or anesthesia machines

Vendor	# live AIMS sites (US)	# under implementation	# under contract	# sold/not begun implementation
GE/Philips/Draeger	**197**	**76**	**273**	**0**

Table I-2: Vendors who sell anesthesia information management systems (AIMS) integrated with operating room management systems

Vendor	# live AIMS sites (US)	# under implementation	# under contract	# sold/not begun implementation
GE*/Picis/McKesson/ SIS/Cerner/Epic	**216**	**138**	**1,099**	**741**

*GE is counted twice but only once in the aggregate number of sites.

Table I-3: Vendors who exclusively sell anesthesia information management systems (AIMS)

Vendor	# live AIMS sites (US)	# under implementation	# under contract	# sold/not begun implementation
Merge/ iMDSoft/ Acuitec/Plexus**	**55**	**10**	**65**	**3**

**Merge has acquired both DocuSys and Eko.

In summation, AIMS penetration still remains below 15% of the potential market but is anticipated to grow. The reasons given for this projection are varied but primarily focus on the diffusion of innovation[9] and the need for hospitals to effectively manage OR costs and revenue. Additionally, most of these systems improve charge capture, resulting in increased reimbursement and more rapid recovery of implementation costs. The purpose of this document is to provide a roadmap for anesthesiologists who want to advance AIMS technology in their practices and to discuss the rationale and benefits of sharing patient data with national data warehouses.

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