

III. BENEFIT OF AN AIMS

AIMS DECISION SUPPORT

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An increasing number of US academic institutions have implemented anesthesia information management systems (AIMSs) over the past several years.¹ Some AIMS vendors have incorporated clinical decision support (CDS) tools into their commercially available offerings, a natural progression after the introduction of automated recordkeeping software. Almost 20 years ago, medical decision aids were defined as

“active knowledge systems that use two or more items of patient data to generate case-specific advice.”² According to the American Medical Informatics Association, a CDS system “provides clinicians, staff, patients, or other individuals with knowledge and person-specific information, intelligently filtered or presented at appropriate times, to enhance health and health care.”³ Ideally, integrating CDS as part of the AIMS design could allow clinicians to accomplish specific tasks more effectively while improving the quality of patient care.⁴ CDS design could be based on aggregated data obtained from an ongoing registry, such as the one being developed by the Anesthesia Quality Institute (AQI), whose vision is “to become the primary source of information for quality improvement in the clinical practice of anesthesiology.”⁵ Potentially, CDSs could improve patient outcomes and transform our perspective of knowledge management.⁶

Passive Versus Active Clinical Decision Support Systems

Current CDS designs can be categorized as either passive (user initiated) or active (automatic), based on the user-system interaction. Passive systems require the clinician to explicitly access available tools or information, similar to finding an algorithm for medical management in a reference manual or on the Internet. Conversely, an active system might modify the clinician’s behavior by using dynamic notifications that are automatically triggered by changes in a patient’s clinical condition. This can be accomplished by using on-screen, paging, or e-mail messages.⁷ In reality, the passive versus active dichotomy is an oversimplification. The automation levels in the design for a specific CDS are more complex, ranging from offering no assistance to physicians—

who would make all decisions and take all actions—to a system that makes all the decisions based on the information available and acts autonomously, ignoring physician involvement. Between these extremes, CDS systems can offer more flexible tools such as recommending alternative actions, presenting tailored selections, or simply informing the user of automatically performed tasks.⁸

Clinical Decision Support in Medicine

CDS systems are generally recognized as important technological tools that can help physicians improve clinical decision-making while performing complex tasks.⁹ CDSs can provide alerts (eg, medication ordering systems); interpretation (eg, automatic echocardiography reports); assistance (eg, tailored order lists, dose rate calculators, specific patient care protocols, etc); critiques of current management (eg, evaluating ventilator settings); and patient diagnoses.¹⁰ Studies have evaluated the role of CDS applications in promoting cost-effective clinical practice, reducing medication errors and adverse drug events, improving diagnostic decision-making, predicting clinical course, increasing guideline adherence and compliance, and improving the quality of clinical documentation.

Cost-effectiveness

Implementation of CDS has been shown to reduce the cost of medical treatments.¹¹⁻¹³ Evans et al¹⁴ integrated CDS into the order-entry process to significantly

reduce the cost of antiinfective agents, the total length of stay, and the total cost of hospitalization. In a cluster-randomized trial in Spain, researchers used CDS to manage hypercholesterolemia based on recommendations of medical societies. Successful modification of physician behavior resulted in a reduction in treatment costs.¹⁵ In another clinical trial, researchers incorporated a simple algorithm to significantly reduce the costs of managing patients presenting with upper abdominal symptoms.¹⁶

MEDICATION ERRORS AND ADVERSE DRUG EVENTS

CDS systems can be used to identify and prevent potential drug-related problems.¹⁷⁻¹⁹ Australian researchers designed a knowledge-based system to assist pharmacists providing medication reviews. When compared to experts acting alone, the system found significantly more potential medication-related problems.²⁰ Reducing medication errors in intensive care units (ICUs) not only improved clinical care but also led to considerable financial savings.¹³ However, the implementation of medication-related CDSs should be done carefully because many clinical aspects, such as the presence of allergies, drug dosage, drug interactions, and comorbidities must be evaluated.²¹ Balancing the value gained by provider alerts with the well-described alert fatigue can be a challenging task.²²

Diagnostic Decision Making

Another promising application of CDS is diagnostic evaluation. This process need not be limited to merely predicting the correct diagnosis. The diagnostic process can include identifying possible etiologies, interpreting clinical signs and symptoms, analyzing laboratory results, and even executing postmortem studies.²³ To quantify the clinical benefits of using CDS applications for diagnosis, institutions should develop quality measurements to assess the influence on the clinician's management.^{24,25} Although some medical specialties may find it difficult to incorporate CDS as a diagnostic aid,^{26,27} the ability to diagnose clinically critical events in real time may prove valuable in anesthesiology.^{28,29}

Prediction

Forecasting the effects of decisions during actual practice is an added featured that can be found in some CDS systems. Researchers used sophisticated CDS to predict the risk of patients developing bacteremia.³⁰ Their findings could help practitioners avoid unnecessary treatment in low-risk patients or, conversely, choose a different treatment modality for high-risk individuals. Murthy et al³¹ showed that when combining the sensitivity of CDS with the judgment of nurses, the overall sensitivity for predicting preoperative investigations could increase to 98.2%. In one study, advanced practice nurses considered the ability to forecast accurately the outcome of patient care before making decisions as their main reason to incorporate a CDS into their practices.³²

Guidelines Adherence and Compliance

CDS is one tool that may increase the levels of adherence to clinical guidelines.⁶ Examples include intraoperative glucose control, temperature control, beta blockade in high-risk cardiac patients undergoing noncardiac surgery, and the prevention of perioperative deep venous thrombosis and embolism.³³ O'Reilly et al³⁴ demonstrated a significant increase in compliance for timing and administration of antibiotic prophylaxis—from 69% to 92%—1 year after a CDS program began. Similarly, using automated reminders Kooij et al³⁵ evaluated adherence to guidelines for postoperative nausea and vomiting prevention and found that the percentage of patients prescribed prophylaxis increased from 38% to 73%. Conversely, when the support system was deactivated, the effect on guideline adherence disappeared almost entirely. Others have seen an increase in the appropriate use of antimicrobial agents.³⁶ Likewise, Kaushal et al¹⁹ found a substantial decrease in adverse drug events in multiple studies evaluating CDS systems for antibiotic therapy.

Improving Clinical Documentation

Incomplete or inconsistent anesthetic records occur in paper-based and electronic medical record (EMR) systems. Although the implementation and efficient usage of an AIMS can increase the quality of anesthesia documentation,^{33,37} the completeness of the clinical record ultimately relies on the user interface.³⁸ Vigoda et al³⁷ showed high quality

assurance documentation completion rates, reaching levels of 94% after the study period, by implementing a consecutive series of active interventions that included education, workflow integration, and individual performance feedback. Likewise, applying customized CDS for detecting missing clinical information during anesthesia, Sandberg et al³⁹ showed a significant reduction of the documentation error rate, from a 30% baseline to 8.2% within days of implementation. Kheterpal et al⁴⁰ demonstrated how automated electronic reminders for arterial catheterization in the perioperative setting can enhance compliance with medical record documentation, resulting in improved professional fee reimbursement.

Limitations and Barriers

Physicians may accept a generic CDS system as long as they are still able to exert some control over the system.^{26,41} However, widespread implementation of CDS will likely only occur after designers can improve the human-computer interface; disseminate best practices in CDS design, development, and implementation; summarize patient-level information; prioritize and filter recommendations to the user; combine recommendations for patients with comorbidities; and use free-text information to drive clinical decision support.⁴²

Researchers have shown how CDS can erroneously affect physician performance. In a study by Tsai et al,⁴³ incorrect advice on electrocardiography findings provided by a computer significantly influenced interpretations by internal medicine residents. In a retrospective review, Eslami et al⁴⁴ demonstrated how medication prescribing errors can

occur as a consequence of using patient nonspecific default values displayed by the system. In other circumstances, CDS may not provide any benefit to clinical practice.²⁷ Despite the limitations and barriers described, the scientific community is optimistic about improvement in and increased utility of these systems.¹²

Future Directions of CDS in Anesthesia

CDS may help anesthesiologists assess clinical information, supervise patient care, and accomplish multiple complex tasks. Target-controlled infusion systems that have reliable closed-loop systems are one form of a CDS.⁴⁵ The future direction of CDS in clinical practice will be heavily influenced by the legal and regulatory landscapes. As Epstein⁴⁶ points out, when data collection results in delivering recommendations to clinicians, the software is considered to be a regulated medical device by the Food and Drug Administration (FDA). While some vendors (e.g., DocuSys, Merge Healthcare, Chicago, IL) have pursued 510(k) clearance from the FDA (and thus registered their software as medical devices), most have not. Therefore, the responsibility for the content and potential clinical consequences of the rules rests with institutions that use CDS in clinical practice. One strategy to minimize the burden on individual institutions would be the development of an evidence-based repository that could provide the basis for improving CDSs.²³ AQI may serve this purpose for our specialty.

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Rationale for decision to purchase an AIMS, Anesthesia Informatics. Edited by

Stonemetz J, Ruskin K. London, Springer, 2008.

Patient Safety

The report issued in 2000 by the Institute of Medicine (IOM), *To Err is Human: Building a Safer Health System*, brought national attention to patient safety and prompted coordinated efforts at reducing errors.⁴⁷ In addition to unnecessary deaths, errors were responsible for \$17–\$29 billion in financial losses. The IOM report called for a concerted

effort at creating tools, protocols, and research studies to enhance the science behind patient safety. The 2001 follow-up report, entitled *Crossing the Quality Chasm: A New Health System for the 21st Century*, called for increased focus on six health care goals, referred to by the acronym STEEEP: safe, timely, effective, efficient, equitable, and patient centered.⁴⁸ This report specifically indicated that electronic systems could support quality improvement and potentially eliminate errors through computerized physician order entry, automated reminders, clinical decision support, and an alignment of financial incentives for both patients and practitioners.

Core Measures

Various health care safety organizations, such as The Joint Commission, the Leapfrog Group, the Institute for Safe Medication Practices, and the Institute for Healthcare Improvement, began to advocate adoption of electronic clinical information systems for reducing errors at the point of care. In 1997, The Joint Commission initiated the collection of outcome measurements, referred to as ORYX data. Starting in 2002, hospitals were required to report specific core measures that were collected and compared with those of other hospitals. Beginning in 2004, in collaboration with the Centers for Medicare and Medicaid Services (CMS), The Joint Commission defined these core measures as hospital quality measures, and both organizations required them for comparative analyses.⁴⁹ Today, all accredited hospitals are clearly focused on capturing and improving these core measures. Most hospital administrators who must operate within budgeted dollars to purchase new clinical information systems are becoming

keenly interested in using these expensive electronic systems to capture and report core measures. Therefore, in addition to reducing costs and increasing reimbursements, AIMSs can help hospitals capture critical data elements necessary for reporting to regulatory and accrediting agencies. In fact, CMS has begun to reimburse physicians and hospitals for reporting quality data through the PQRI and the Reporting Hospital Quality Data for Annual Payment Update programs, respectively.

National efforts at improving patient safety and demonstrating that each institution is highly reliable have become status quo.⁵⁰ Ten years after the IOM's shocking revelation that our health care system is not perfect, leaders have finally accepted the reality that we must focus on process improvement and safer patient care. As we attempt to achieve demonstrable improvements, most will attest that paper-based efforts are too imperfect and too cost prohibitive.

Surgical Care Improvement Program

Subsequent to the IOM reports noted above, additional attention has been directed toward reducing surgical errors and improving outcomes. Primary among these efforts is the Surgical Care Improvement Project (SCIP), a national partnership of organizations under the auspices of both CMS and the Centers for Disease Control and Prevention (CDC) that focuses on improving surgical care, with a goal of reducing postoperative complications by 25% nationally by 2010.⁵² Toward this end, the SCIP initiative primarily assesses processes associated with improved outcomes in areas such as

surgical-site infections, postoperative sepsis, and respiratory, cardiovascular, and thromboembolic complications.⁵³

While the SCIP initiative focuses on process, the National Surgical Quality Improvement Program (NSQIP) concentrates on outcomes, becoming the first successful risk-adjusted database of perioperative outcomes in the United States. NSQIP currently contains more than 1 million surgical encounters and allows the Veterans' Health Administration (VHA) to compare performance among all VHA hospitals using standard surgical outcomes. Simply by capturing the relevant data and providing comparative analysis, the VHA was able to improve the performance levels of its hospitals.⁵⁴ Private hospitals and surgical groups became interested in this effort and created the American College of Surgeon's NSQIP (ACS NSQIP) program. However, it remains to be seen whether the private-sector hospitals involved in this subsequent effort will be able to reproduce the VHA's results. The primary difference is that unlike private hospitals, the VHA uses a standardized EMR in all its hospitals. One standardized system facilitates comprehensive data collection for surgical encounters at each institution and allows comparison among hospitals. In NSQIP's first 10 years, the 30-day postoperative mortality for major surgery decreased by 27%: from 3.1% in 1991 to 2.2% in 2002. An even more dramatic decline was seen in postoperative morbidity. The number of patients undergoing major surgery in the NSQIP who experienced one or more of 20 predefined postoperative complications decreased from 17.8% to 9.8% over 10 years. At the same time, the median length of stay declined by 5 days. It is unlikely that there has been a better demonstration of the value of electronic health records. The combination of an increased focus on reporting of core measures, SCIP initiatives, and better risk

assessment is clearly leading to a place where paper records will be inadequate. Unless all hospitals adopt electronic records with standardized nomenclature and semantics, it will be a long time before we are able to achieve a real impact on patient safety and improved surgical outcomes.

Outcome Analysis and Performance Improvement

At the Long-term Outcome Workshop sponsored by the Anesthesia Patient Safety Foundation (APSF) in September 2004, Dr. Robert Lagasse suggested that EMR systems may be able to enhance our ability to link intraoperative events to short- and long-term outcomes but that this effort is currently hindered by the “relative lack of sound risk-adjustment models to assess outcomes independent of the many underlying variables that can affect them.”⁵⁴ Studies have demonstrated that patients with more extensive comorbid conditions and more complex surgical procedures may have different surgical outcomes than those with less severe conditions or simpler procedures.⁵⁵ An effective predictive model that correlates readily available patient data and anesthetic variables with hard outcomes such as length of stay, total costs of care, and mortality has not been identified. Prediction of outcomes based on risk-adjustment models were first demonstrated by Charlson.⁵⁶ The American Society of Anesthesiology’s (ASA’s) Physical Status Classification inadequately predicts perioperative outcomes primarily because of a lack of consideration of surgical and anesthetic management as confounding variables.⁵⁷ Khuri and the group responsible for the VHA NSQIP study were able to demonstrate better predictive values with a system based on preoperative classification of

comorbid conditions and ASA Physical Status but lack the intraoperative factors available through an AIMS.⁵⁸

Unfortunately, the capture of preoperative medical conditions and intraoperative management continues to occur predominately in paper format and is often fragmented, thus limiting its usefulness. Capture of this information into an AIMS that is available to anesthesiologists allows for more proactive assessment and management of surgical patients. An outstanding example of using an AIMS to improve patient safety was recently demonstrated by Keterphal et al⁵⁹; they were able to review a large data set of anesthesia cases and correlate some specific variables to the development of renal failure postoperatively in patients who were not expected to develop this complication. This type of study is a great example of the power of a clinical information database that is meaningfully tied to outcomes. Ideally, a fully implemented AIMS that commences the moment a patient is scheduled for surgery would allow better assessment of surgical patients, possibly segregating the preoperative management into different care pathways that are dependent upon risk stratification. Again, this function is literally impossible in the current paper world.

The lack of an AIMS may severely hamper the ability to adequately establish and monitor clinical effectiveness and quality improvement. Handwritten anesthesia records poorly reflect the true incidence of adverse intraoperative events linked to mortality,⁶⁰ whereas an AIMS may be able to establish the causes that led to the adverse event, which would otherwise be unknown.⁶¹ Unfortunately, current AIMS without sophisticated decision-support systems typically require a degree of self-reporting of adverse events, and as such, actual occurrence rates may be underreported or underestimated.⁶² Vigoda et

al³⁷ were able to demonstrate that interventions such as education, workflow integration, and individual feedback dramatically increased comprehensive documentation compliance. Their findings showed that improved user interface designs are critical to enhanced documentation. Continual feedback from users to the vendors of AIMS should ultimately facilitate the ease of documentation and thoroughness of record completion.

National Patient Safety Goals

All anesthesia departments and, ultimately, all anesthesiologists are compelled to participate in a formal process-improvement plan if they currently staff an accredited facility. Primarily under the oversight of The Joint Commission or other accrediting organizations, such as the Accreditation Association for Ambulatory Health Care or the American Accreditation Association of Ambulatory Surgical Facilities, health care facilities must demonstrate a well-documented effort at quality improvement. These efforts include (a) identification of errors and other patient care concerns and (b) methodology to address and correct these concerns. The inability to correlate paper documentation to actual events has led to modification of the accreditation process and prompted The Joint Commission to adopt unannounced surveys with tracer methodology to help drive measurement of indicators closer to patient encounters. In 2003, The Joint Commission also began to publish National Patient Safety Goals based on reported sentinel events.⁶³ In particular, specific safety goals that are applicable to an anesthesia practice concern the following:

- Goal 1—Improve the accuracy of patient identification, using at least two patient identifiers
- Goal 2—Improve the effectiveness of communication by reporting critical results of tests and diagnostic procedures on a timely basis
- Goal 3—Improve the safety of using medications by labeling all medications, medication containers, and other solutions on and off the sterile field in perioperative and other procedural settings
- Goal 7—Reduce health care–associated infections by complying with CDC and World Health Organization hand hygiene guidelines, implementing evidence-based practices to prevent health care–associated infections due to multidrug-resistant organisms, and implementing evidence-based practices to prevent central line–associated bloodstream infections (CABIs)
- Universal Protocol—Reduce wrong site, wrong procedure, and wrong person surgery through implementation of a preoperative verification process, marking the operative site, and a time-out immediately before starting the procedure.

All of these patient safety goals have been facilitated through the application of AIMS. Patient identifiers—such as name, date of birth, medical record number, age, encounter number, planned procedure, and surgeon—are often prominently displayed by an AIMS intraoperative record for preoperative verification. Many AIMS are integrated with laboratory databases to facilitate timely reporting of all test results with computerized flags for critical results. Some AIMS also include readers for premixed barcoded medications to minimize the risk of syringe swaps. CABI protocols and

compliance documentation are easily incorporated into an AIMS along with documentation of the time-out during which the surgeon, operating room staff, and anesthesia provider pause to the correct patient, surgical site, objective of the surgery, and availability of equipment required prior to the procedure. Documentation of this latter practice is critical to compliance with Joint Commission standards. More importantly, an AIMS makes this information available to all interested parties, so that deficiencies can be corrected prior to the final time-out.

Adverse Events

In addition to documenting actions required for Joint Commission compliance, anesthesia departments must demonstrate that they participate in an active program for evaluating and responding to adverse events. Obviously, any sentinel event will require a detailed analysis and performance of a root-cause analysis; however, many adverse events may be considered near misses and consequently help identify potential risks and system problems. The capture of specific events while anesthesia is being given is facilitated with an AIMS. For example, instances of difficult airway management can be documented and collated as a report made available to the department chairman or compliance officer. Occasional difficulty with airway management is to be expected, but chronic recurrence, particularly with one specific provider, may indicate that the provider has a competency problem or that a system problem exists, such as inadequate equipment or inadequate preoperative evaluation.

Maintenance of Certification in Anesthesiology

As part of their Maintenance of Certification in Anesthesiology, anesthesiologists who are certified by the American Board of Anesthesiology (ABA) after 2000 are required to provide documentation of ongoing self-assessment and lifelong learning, continual professional standing assessment, and periodic self-directed assessments of practice performance and quality improvement; they must also regularly undergo an examination of cognitive expertise. In the paper world, coordinating, tracking, and documenting compliance with these requirements entail significant manpower and an additional burden to most anesthesia departments. An AIMS can automatically generate an accounting of the number of each type of case, procedures performed, and complications encountered. For example, the ABA suggests that management of hypothermia, postoperative nausea and vomiting, antibiotic prophylaxis, and perioperative beta blockade are appropriate for practice performance assessment. Capture of these data on a case-by-case basis is therefore essential to the ABA and remains the purview of all anesthesia providers.

Committee on Performance and Outcomes Measurement

The ASA has recognized the crucial role of performance improvement and has taken a leadership role in establishing guidelines for its members. The Committee on Performance and Outcomes Measurement (CPOM) was created to establish guidance and leadership in this area (ASA Bylaws 7.162). In accordance with the ASA's strategic plan,

one of the specific mandates for CPOM was to: “create a mechanism to support practice management programs, improve communications and marketing of the specialty, and identify and promote professional opportunities” (Goal 2).

Within this goal, Objective 2.5 further stipulates: “Develop a mechanism for measuring performance and clinical outcomes.” With consideration of this objective, CPOM created a national database for reporting adverse perioperative outcomes. Although CPOM feels that this type of clinical repository will eventually become a mandate (particularly after VHA’s NSQIP demonstrated improved care across its entire network of hospitals), the costs of this data collection and analysis can be prohibitive. As the entire industry moves toward collection of the discrete data elements of patient care and outcomes, a national database of performance measures to be maintained by the ASA will be a compelling concept. The ASA CPOM established Guiding Principles for the Development of Performance Measures, and ASA continues to take a lead in establishing the role of AIMSs in this national database by setting standards for data capture, semantics, and ontology of care events.

In October 2008, the ASA House of Delegates approved funding for AQI, which was chartered in December 2008. Although established by ASA, AQI is a separate organization that intends to become the primary source of information for performance measurement and subsequent quality improvement in the clinical practice of anesthesiology. This information will be managed in the National Anesthesia Clinical Outcomes Registry (NACOR). The AQI expected to have 20 anesthesia groups participating in NACOR by the end of 2010. Currently, the bulk of the data being collected is electronic claims data, but the plan for the future is to collect data from

automated anesthesia records. The Data Dictionary Task Force, which was initially sponsored by the APSF as a subsidiary organization of ASA, has evolved into the International Organization for Terminology in Anesthesia, with the goal of establishing a standardized database language to allow data from various proprietary AIMS systems to be shared in a common registry such as NACOR

Pay for Performance

Growing frustration at the inability to substantially reduce errors has begun to force payers to seek value-based purchasing through pay-for-performance (P4P) initiatives aimed at inducing health care providers to do better jobs. Concerned that the insurance industry may develop payment incentives without proper guidance, several physician groups initiated discussions regarding appropriate parameters for establishing incentive programs. In 2004, a conference of 250 physicians and medical managers was convened under the auspices of the Johns Hopkins University and a for-profit organization known as American Healthways. This conference proposed a consensus statement that included design principles for metric attributes, data collection, and incentives. Foremost among these design principles was the need for measures to be based on scientific evidence and involve the smallest possible data collection burden on providers. The consensus statement was adopted by the ASA House of Delegates in 2006 as the Principles for Quality Incentive Programs in Anesthesiology. In this document, the ASA states that (a) performance incentive programs must be designed to allow their adoption with minimal administrative burden and cost and (b) electronic clinical records

are desirable in this regard. However, the current level of market penetration would make this suggestion too restrictive to be a prerequisite for participation.

Examples of potential P4P measures that meet the recommended criteria include:

1. Timing and choice of antibiotics
2. Maintenance of normothermia for colorectal surgery
3. Maintenance of perioperative serum glucose at or below 200 mg/dL

during cardiac surgery

4. Appropriate use of perioperative beta blockade

These measures reflect processes that are directly under the control of anesthesiologists. It is fairly easy to envision how an AIMS could assist in the documentation and reporting of these measures. An AIMS may also be necessary to ensure that evidence-based process measures are continually linked to the best possible outcomes. Along those lines, the ASA CPOM proposed that the mere use of an AIMS be promoted as a P4P measure.

Physician Quality Reporting Initiative

Through the Physician Consortium for Performance Improvement (Consortium) first convened in March 2000, the American Medical Association (AMA) has been a major force in the development of performance measures for physicians. The Consortium comprises more than 100 national medical specialties, the Agency for Healthcare Research and Quality, the CMS, and others. As put forth in 2000, the original mission of

the Consortium was to improve patient health and safety by developing evidence-based clinical performance measures that enhance quality of patient care and foster accountability. The Consortium's mission changed dramatically in 2006, when the AMA signed a pact with Congress called the Joint House-Senate Working Agreement. In this document, the AMA promised to develop 140 physician performance measures covering 34 clinical areas. It also agreed that in 2007, doctors would voluntarily report on 3 to 5 performance measures and would receive additional payment to offset the burden of collecting the data. As a result of this agreement, the President of the United States signed the Tax Relief and Health Care Act of 2006, which established the PQRI under the CMS.⁶⁴ Of the 190 current performance measures, three apply to anesthesiologists: timely administration of antibiotics within 60 minutes before incision; use of sterile technique during central line placement; and maintenance of normothermia. Provided that anesthesiologists achieved an 80% compliance with these measures, they would be entitled to a 2% bonus payment on all Medicare payments over the time period that the measure was reported. Effective in 2014, physicians will actually be penalized by 2% if they are not reporting these measures. Many physicians questioned the rationale of attempting to change their systems to capture the required information and report the appropriate Current Procedural Terminology (CPT) Category II codes for such a nominal reimbursement, but the negative incentive is likely to force changes in practice. AIMS users should be able to easily incorporate these changes into their systems with minimal data collection burden. It is anticipated that AQI may eventually qualify as a CMS-approved reporting organization and be able to submit these measures to PQRI for participating groups.

As pay-for-reporting evolves into P4P with set compliance goals, AIMS functions will also evolve. For example, to be compliant with perioperative antibiotic administration measures, an AIMS can incorporate prompts to remind anesthesia providers of the need for antibiotic dosing, appropriate antibiotic selection, and timely redosing.^{34,65}

One of the founding principles of P4P is that the incentive to improve quality measures exists only where a gap between actual practice and ideal practice exists. Once the majority of anesthesiologists demonstrate compliance with a measure, it will likely be retired as an incentive measure. Without the use of an AIMS, it is unclear how any anesthesia group could possibly adapt to what may be a rapidly changing landscape with frequently evolving measures.

Measuring Quality

Since the eye-opening report by the IOM, health care providers and hospitals have become as concerned as health care consumers about who in fact is providing quality health care. This concern has led to critical evaluations of the relationship between care processes and health care outcomes by a wide spectrum of stakeholders, including patients, providers, researchers, politicians, the media, and others.⁶⁶ These same groups are seeking comparisons of health care outcomes, identification of best practices, and public accountability. One of the most common methodologies of comparing providers uses risk-adjusted mortality rates. Organizations (such as the Leapfrog Group and Healthgrades.com) that publish performance ratings often use this methodology to

compare hospitals and physicians.^{67,68} However, as demonstrated in a recent review article, risk-adjusted mortality rates are poor indicators of quality of care.⁶⁹ In fact, recent data seem to indicate that surgical site infections persist despite compliance with SCIP initiatives.⁷⁰ It seems plausible that a better approach than random postdischarge chart abstraction could be achieved by evaluating 100% of all patient encounters for compliance with these process measures; again, this feat is impossible with current paper records.

Quality Metrics

The focus on measuring quality has gained increased importance as payments are correlated with reportable measures that are thought to demonstrate quality. Many of these efforts have arisen primarily because consumers and the government perceive that health care organizations have not risen to the challenge of improving safety and quality. As reported by the Medicare Payment Advisory Commission to Congress in 2004, Medicare beneficiaries, mirroring trends in care for the rest of the population, face “significant gaps between care known to be effective and the care delivered,” especially where patient safety issues are concerned.⁷¹ Currently, physicians predominantly use reporting metrics to categorize health care entities by percentiles of quality providers. Pronovost et al⁷² commented in an editorial in *JAMA* that tracking progress in patient safety is an elusive target. In that article, they described many of the problems and dilemmas associated with reporting measures and how surveillance bias could arbitrarily cause the illusion that one provider has a higher frequency of poor measures than another

provider. They also provide a new measurement model that incorporates a culture survey into the calculations and primarily asks how often patients are harmed, how often do we learn from our mistakes, and has a safe culture been created.

Information Technology to Measure Quality

As we filter through the various policy changes that will occur in the next few years, health care providers will be tasked with an ever-expanding set of clinical performance measures to quantify and qualify quality and safety. These tasks will be impossible with a paper-based clinical record. As the science of safety expands, providers are becoming increasingly aware of the integration between safety and the organization, where the care is rendered. Simply focusing efforts on identifying and quantifying errors has not optimized patient safety.⁷³ As a result, Resar et al⁷⁴ proposed the use of trigger tools to measure and detect events related to patient harm. This methodology (a) identifies adverse events in the medical record that are ultimately linked to patient harm and (b) may provide a wider view of potentially problematic areas on which to focus attention. In the context of an AIMS, it is possible to establish trigger tools within the normal monitoring data collection that provides real-time alerts and indications of clinical scenarios that may lead to harm. Advancing the interaction between an AIMS and the user should lead not only to a safer environment but also to documentation that can demonstrate action and reaction to patient safety concerns as they occur.

Information management systems are also having an impact on quality in subspecialty areas of anesthesiology. Clinical information systems in an ICU setting have

been shown to significantly reduce the time spent recording common ICU data, and they are perceived as improving charting quality.⁷⁵ Similarly, the EMR, including computerized physician order entry (CPOE), has been shown to have an important effect on medical error detection and reduction in pediatric intensive care.⁷⁶ In fact, the EMR in an ICU setting offers opportunities for improved patient care through integrated results reporting systems and CDS, in addition to CPOE.⁷⁷ Integrated results reporting offers patient-centric views of clinical data, including laboratory values, diagnostic procedure results, medication use, and consultant reports. This integrated information in turn provides the basis for CDS and can include automated alerts to alphanumeric paging systems regarding the occurrence of critical or exceptional clinical events, medication alerts, and critical results.⁷⁸ And, in the area of pain management, personal digital assistants (PDAs) and electronic transfer of data provide anesthesiologists with access to real time, or near real time, patient assessments of pain and side effects, creating the opportunity for more timely interventions.^{79,80}

Conclusion: Quality Metrics

We are convinced that AIMSs are here to stay and that one can either embrace the technology and help shape it or vainly try to avoid the changes on the way. AIMSs are likely to follow an adoption pathway similar to other technologic advances, such as pulse oximetry and capnography, with eventual inclusion into standards of care. With former President George W. Bush's mandate that the American people need to be served by electronic records by the year 2014, he established a new office within the Department of

Health and Human Services, the Office of the National Coordinator for Health Information Technology, to promote and coordinate the movement toward total adoption of electronic records. All health care providers will one day be using them. Certainly, the AIMSs of 2014 will be different from the commercial versions available today, but the primary goal may be the same: automatic capture of the care processes provided so that anesthesiologists can focus primarily on the patient. Subsequent sections of this text will include illustrations of how AIMSs will provide various opportunities for a return on the capital and behavioral investments. None may be more important than the ability to rapidly and effectively demonstrate that your practice, group, or hospital is providing the highest quality care possible. This capability, from our perspective, represents the single greatest potential rationale for purchasing an AIMS.

MEANINGFUL USE: IMPLICATIONS FOR ANESTHESIA

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HITECH

On February 17, 2009, the Health Information Technology for Economic and Clinical Health (HITECH) Act, part of the American Recovery and Reinvestment Act (ARRA) of 2009, was signed into law to encourage eligible professionals (EPs) and eligible hospitals to adopt and meaningfully use certified health information technology (HIT). Through the development of a nationwide HIT infrastructure that allows for the electronic use and exchange of information, the HITECH Act hopes to improve health care quality, safety, and efficiency as well as to reduce health care costs and disparities around the country. To support these goals and accelerate the adoption of HIT, the ARRA authorized the CMS to provide monetary incentives for EPs, eligible hospitals, and

critical access hospitals (CAHs) that become meaningful users of certified electronic health record (EHR) technology by 2015.

Incentives for Eligible Professionals

On July 13, 2010, CMS published its final rule describing the provisions governing the EHR incentive programs. EPs who can take advantage of the incentives can be any of five types of professionals who are legally authorized to practice under state law and reimbursed by Medicare Fee-for-Service (FFS), Medicare Advantage (MA), or Medicaid programs: a doctor of medicine or osteopathy, a doctor of dental surgery or dental medicine, a doctor of podiatric medicine, a doctor of optometry, or a chiropractor. To qualify for the incentives, the EPs must be non-hospital-based professionals who demonstrate meaningful use of EHR technology during the reporting period for the relevant payment year (ie, any calendar year beginning with 2011). To allow for some flexibility in the first payment year, CMS proposed that the reporting period be any continuous 90-day interval within the first payment year; for all subsequent years, the reporting period consists of the entire year.

Beginning in 2011, and for up to 5 years, EPs in the Medicare FFS EHR incentive program are entitled to incentive payments equal to 75% of their Medicare fee schedule's allowed charges for covered professional services during each relevant payment year. Under Medicare FFS, the maximum incentive payment to EPs is limited to \$15,000 for the EP's first payment year (or \$18,000 if the EP's first payment year is 2011 or 2012), \$12,000 for the second payment year, \$8,000 for the third year, \$4,000 for the fourth

year, and \$2,000 for the fifth year, for a maximum total of \$44,000 (Table III-1).

However, several conditions exist: No incentive payments will be made after 2016, EPs first adopting EHR technology in 2015 or later will not receive any incentive payments, and EPs whose first payment year is 2014 will be paid starting at the \$12,000 level.

Moreover, payment years must be consecutive, which means that EPs have 5 years from the start of their first payment year to collect incentive payments.

Table III-1. Medicare Eligible Provider (EP) Maximum Incentive Payment

Schedule*

Year	EP's First Payment Year				
	2011	2012	2013	2014	2015 and beyond
2011	\$ 18,000	\$ -	\$ -	\$ -	\$ -
2012	\$ 12,000	\$ 18,000	\$ -	\$ -	\$ -
2013	\$ 8,000	\$ 12,000	\$ 15,000	\$ -	\$ -
2014	\$ 4,000	\$ 8,000	\$ 12,000	\$ 12,000	\$ -
2015	\$ 2,000	\$ 4,000	\$ 8,000	\$ 8,000	\$ -
2016	\$ -	\$ 2,000	\$ 4,000	\$ 4,000	\$ -
Total	\$ 44,000	\$ 44,000	\$ 39,000	\$ 24,000	\$ -

*These amounts are increased by 10% for EPs who furnish >50% of their services in a geographic health professional shortage area.

To further motivate EPs to adopt EHR technology, HITECH enables CMS to reduce payments to EPs who are not meaningful EHR users by 2015. Beginning in 2015,

these EPs will be penalized by receiving an applicable percent less than 100% of the Medicare fee schedule for their professional services: 99% in 2015, 98% in 2016, and 97% in 2017 and beyond. After 2017, the applicable percent can be further decreased by 1% per year, down to no less than 95%, if the percentage of EPs who are meaningful users of EHR is found to be less than 75%. Hospital-based EPs are exempt from this payment adjustment as are EPs who qualify on a case-by-case basis for a significant hardship exception. The significant hardship exception, however, may only be granted for up to 5 years and must be renewed annually.

Demonstrating meaningful use of certified EHR technology

The key to receiving incentive payments and/or to avoiding the penalties from CMS is to demonstrate “meaningful use of certified EHR technology.” Consequently, the first major step to receiving these incentives is to understand and then meet the requirements of meaningful use. According to HITECH, meaningful use requires (1) using certified EHR technology in a meaningful manner, (2) ensuring that the certified EHR technology allows for the electronic exchange of health information to improve the quality of health care, and (3) using the certified EHR technology to report on clinical quality and other measures. CMS decided to implement a phased approach to the requirements for meaningful use to encourage widespread EHR adoption that will improve health care quality while minimizing the burdens of change on health care providers and considering the short timeframe that HITECH has provide for the adoption and use of certified EHR technology. As shown in Table III-2, there will be at least three

stages of meaningful use, each with foci which will have progressively more robust criteria.

Table III-2. Centers for Medicare and Medicaid Services Meaningful Use Criteria

Foci

Stage 1 (criteria proposed in January 2010 for 2011)

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- Electronically capture health information in a structured/coded format
 - Use that information to track key clinical conditions and communicate that information for care coordination purposes
 - Implement clinical decision support tools to facilitate disease and medication management
 - Report clinical quality measures and public health information

Stage 2 (criteria anticipated to be updated in 2011 for 2013)

-
- Expand upon the Stage 1 criteria to encourage the use of health information technology for continuous quality improvement at the point of care
 - Exchange information in the most structured format possible (eg, computerized provider order entry and electronic transmission of diagnostic test results such as blood tests, microbiology, urinalysis, pathology tests, radiology, etc)

Stage 3 (criteria anticipated to be updated in 2013 for 2015)

-
- Promote improvements in quality, safety, and efficiency
 - Focus on decision support for national high priority conditions, patient access to self-management tools, and access to comprehensive patient data
 - Improve population health

On July 13, 2010, CMS finalized its list of Stage 1 meaningful use criteria in its final rule, structuring the list according to the 5 health outcomes policy priorities identified by the HIT Policy Committee as underlying meaningful use: (1) improve quality, safety, efficiency, and reduce health disparities; (2) engage patients and families in their health care; (3) improve care coordination; (4) improve population and public health; and (5) ensure adequate privacy and security protections for personal health information. Until CMS publishes a new list, the Stage 1 criteria will serve as the criteria EPs, eligible hospitals, and CAHs must meet to successfully demonstrate meaningful use starting in 2011. The list is split into 2 sets of criteria: a core set and a menu set. All of the Stage 1 criteria objectives and their associated measures in the core set and all but 5 of those in the menu set must be met to qualify for the CMS incentive payments. From the menu set, EPs, eligible hospitals, and CAHs may select the 5 criteria that they will not meet and still qualify for incentive payments. The stipulation, however, is that they must meet at least one of the population and public health criteria from the menu set.

CMS has accounted for the possibility that some criteria may not be applicable to certain types of EPs or hospitals. EPs, eligible hospitals, and CAHs are excluded from those criteria for which they neither had any patients nor sufficient actions on which to base measurement of meaningful use. For instance, EPs can be exempt from both of the population and public health criteria in the menu set if they meet the exclusion criteria for both (ie, if they neither gave any immunizations nor collected any reportable syndromic information on their patients during the EHR reporting period). Moreover, each excluded criterion reduces the number of criteria that must be satisfied by one. For example, an EP

who is excluded from 3 menu criteria then only needs to satisfy 2 of them. In general, unless they can attest to meeting the exclusion criteria, EPs, eligible hospitals, and CAHs must satisfy the measure for each meaningful use objective. For a complete listing of the entire meaningful use criteria, please refer to <http://www.ama-assn.org/ama1/pub/upload/mm/472/meaningful-use-table.pdf>.

One of the core meaningful use criteria requires EPs, eligible hospitals, and CAHs to report clinical quality measures to CMS. The HITECH Act gives preference to measures that are endorsed by the National Quality Forum (NQF), including those that were previously selected for the PQRI program. For Stage 1, CMS decided to require only those NQF-endorsed, clinical quality measures whose numerators, denominators, and exclusions can be automatically calculated using certified EHR technology. CMS also limited the measures to those for which electronic specifications are currently available. The list of clinical quality measures is divided into two groups: a core group and a specialty group. EPs are required to report on all 3 measures in the core group as well as 3 measures of their choice from the 38 listed in the specialty group. EPs simply report the numerators, denominators, and/or exclusions for each of the measures once a year and are not required to meet any specific thresholds for these fields. If any of the denominators are zero for the core measures, then the EP is required to report on up to 3 of the alternate core measures. If none of the 6 core and alternate core measures apply to the EP's scope of practice or patient population, then the EP simply reports zeros for the denominators of each of the inapplicable measures. However, the EP is still required to report on 3 measures from the specialty group. Only EPs who attest that all of their clinical quality measures have a denominator of zero are exempt from reporting any.

In 2011, reporting on meaningful use, including clinical quality reporting, will occur through attestation because CMS does not believe that it will have the capacity to accept information electronically by then. In 2012, or in whatever year CMS develops the necessary capacity to accept information electronically, EPs, eligible hospitals, and CAHs will be required to submit this information electronically using their certified EHR technology and attest to the accuracy and completeness of the values submitted.

Beyond meaningful use, qualification for the CMS incentive payments requires the use of certified EHR technology. For EPs, at least 50% of their practice must occur at locations equipped with certified EHR technology. On July 13, 2010, HIT published its final rule on the standards, implementation specifications, and certification criteria for the EHR technology that EPs, eligible hospitals, and CAHs can use to achieve meaningful use. In essence, the HIT final rule specifies the minimum capabilities that certified EHR technology must include, helping EPs, eligible hospitals, and CAHs meet their meaningful use requirements. An additional certification criterion is automated measure calculation: Certified EHR technology must have the capability to electronically record the numerator and denominator for each meaningful use objective with a percentage-based measure. On the other hand, certified EHR technology does not need to provide results for meaningful use criteria whose measures simply require a yes or no for attestation. EPs, eligible hospitals, and CAHs can satisfy the requirement for certified EHR technology by using either a combination of EHR modules—EHR services and/or components that meet at least 1 certification criterion—or a complete EHR system that they test and certify as meeting all applicable certification criteria established by HIT.

Hospital-based EPs

The HITECH Act specifies that hospital-based EPs are not eligible for CMS incentive payments and are exempt from the downward payment adjustment penalties for not being meaningful EHR users by 2015. Examples of hospital-based EPs provided in the HITECH Act include pathologists, anesthesiologists, and emergency physicians, ie “those physicians who furnish substantially all of their professional services during the relevant EHR reporting period in a hospital setting (whether inpatient or outpatient) through the use of the facilities and equipment of the hospital, including the hospital’s qualified EHRs.” Consequently, CMS initially proposed to consider EPs as hospital based if they provide 90% of their services in inpatient, outpatient, or a combination of inpatient and outpatient hospital settings. To determine if an EP meets the 90% threshold, CMS decided that it would use the place of service (POS) codes that the EP reports on his or her physician claims forms. In April 2010, however, the Continuing Extension Act of 2010 changed the definition of hospital-based EPs to include only those who work in an inpatient or emergency room setting. Subsequently, CMS changed its hospital-based definition to include only those EPs who bill 90% of their POS codes as either 21 (Inpatient Hospital) or 23 (Emergency Room, Hospital).

Implications for anesthesiologists

Scenario 1: You are an intensivist who specializes in caring for critically ill ICU patients. You use the hospital’s EHR technology on a regular basis to input patient notes, view patient vitals and laboratory results, and order medications. Because you only see inpatients, 100% of your patients are billed as POS code 21, so you are considered

(rightfully so in your opinion) to be hospital based. Consequently, you are ineligible for any of the CMS incentive payments but are also exempt from any of the penalties. You feel indifferent about this as all of the equipment, medications, and EHR technology that you use were purchased by the hospital anyway.

Scenario 2: You are a chronic pain specialist who performs facet and medial branch blocks in your own outpatient clinic. You have been thinking about going paperless for some time now; after the HITECH Act passed, you think it is the perfect time to purchase and implement a certified, ambulatory information management system. You select one that enables you to meet all of the meaningful use criteria and begin using it in 2012. Because you have adopted and then meaningfully used your certified EHR technology year after year, by the end of 2016, you will have received up to \$44,000 in incentive payments from CMS.

Scenario 3: You are a typical anesthesiologist in the US who works wherever your anesthesia group assigns you each day. Today, for instance, you will be working in the operating room of a private hospital. Tomorrow, you will be based in an ambulatory surgery center. As Table III-3 shows, only about 30% of the POS codes you submit to Medicare are 21 or 23. Consequently, you are not considered hospital based because you do not meet the 90% threshold. As a non-hospital-based EP, you are excited that you qualify for the CMS incentive payments for using the anesthesia information management systems (AIMS) at the hospitals, outpatient clinics and ambulatory surgery centers where you work. Moreover, when you review the list of meaningful use criteria, you realize that you meet the exclusion criteria for several of them; the others, you believe you will be able to meet using certified EHR technology.

Table III-3. Anesthesiologist Medicare Current Procedural Terminology (CPT)**Codes Submitted in 2008**

Place of Service (POS) Code	# of CPT Codes Submitted	% of Codes Submitted
21 - Inpatient Hospital	3,776,620	29.6%
23 - Emergency Room, Hospital	16,669	0.1%
<i>Total "Hospital-Based"</i>	<i>3,793,289</i>	<i>29.7%</i>
22 - Outpatient Hospital	3,546,483	27.8%
24 - Ambulatory Surgery Center	1,954,336	15.3%
11 - Office	3,430,705	26.9%
Other	27,972	0.2%
<i>Total Non-Hospital-Based</i>	<i>8,959,496</i>	<i>70.3%</i>
All Codes	12,752,785	100.0%

As illustrated in Scenario 3, the typical anesthesiologist in the US will not be considered hospital based and will therefore be eligible for the EHR incentive programs. In analyzing the Stage 1 meaningful use exclusion criteria, anesthesiologist EPs should be granted exclusions for at least 2 of the core set criteria—(1) use computerized provider order entry for medication orders and (3) generate and transmit permissible prescriptions electronically—and at least 3 from the menu set: (1) implement drug-formulary checks, (10) capability to submit electronic data to immunization registries, and (12) capability to submit electronic syndromic surveillance data to public health agencies (Table III-4). As mentioned previously, each excluded criterion reduces the number of criteria that the EP

must satisfy by one. Consequently, anesthesiologist EPs who meet the exclusion criteria for 3 menu set criteria only need to choose 2 more from the menu set to meet. In short, anesthesiologist EPs should be able to meet the remaining core set and 2 menu set criteria using certified AIMS EHR technology.

Table III-4. Stage 1 Meaningful Use Criteria Effects on Anesthesia EPs

Core Set

	Objective	Effect on Anesthesia EP
1	Use computerized provider order entry (CPOE) for medication orders directly entered by any licensed healthcare professional who can enter orders into the medical record per state, local, and professional guidelines	<i>Exempt (write fewer than 100 prescriptions a year)</i>
2	Implement drug-drug and drug-allergy interaction checks	<i>Meet using AIMS</i>
3	Generate and transmit permissible prescriptions electronically (eRx)	<i>Exempt (write fewer than 100 prescriptions a year)</i>
4	Record the following demographics: (A) Preferred language, (B) Gender, (C) Race, (D) Ethnicity, (E) Date of birth	<i>Meet using AIMS</i>
5	Maintain an up-to-date problem list of current and active diagnoses	<i>Meet using AIMS</i>
6	Maintain active medication list	<i>Meet using AIMS</i>

7	Maintain active medication allergy list	<i>Meet using AIMS</i>
8	Record and chart changes in vital signs: (1) Height, (2) Weight, (3) Blood pressure, (4) Calculate and display the body mass index (BMI), (5) Plot and display growth charts for children 2 to 20 years old, including BMI	<i>Meet using AIMS (recognizing that calculating/displaying growth charts is not part of the measure to meet this objective)</i>
9	Record smoking status for patients 13 years old or older	<i>Meet using AIMS</i>
10	Implement one clinical decision support rule relevant to specialty or high clinical priority along with the ability to track compliance with that rule	<i>Meet using AIMS</i>
11	Report ambulatory clinical quality measures to CMS or, in the case of Medicaid EPs, the States	<i>Meet using AIMS (recognizing that most of the measures are inapplicable)</i>
12	Provide patients with an electronic copy of their health information (including diagnostic test results, problem list, medication lists, medication allergies) upon request	<i>Meet using AIMS but potential for exemption if no requests for electronic copies of patient health information during the year</i>
13	N/A for EPs	<i>N/A</i>
14	Provide clinical summaries for patients for each office visit	<i>Exempt for the typical anesthesiologist (no office</i>

visits during the year)

- | | | |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| 15 | Capability to exchange key clinical information (for example, problem list, medication list, medication allergies, diagnostic test results), among providers of care and patient-authorized entities electronically | <i>Meet using AIMS</i> |
| 16 | Protect electronic health information created or maintained by the certified EHR technology through the implementation of appropriate technical capabilities | <i>Meet using AIMS</i> |

Menu Set

Objective	Effect on Anesthesia EP
1 Implement drug-formulary checks	<i>Exempt (write fewer than 100 prescriptions a year)</i>
2 N/A for EPs	<i>N/A</i>
3 Incorporate clinical lab-test results into certified EHR technology as structured data	<i>Meet using AIMS/hospital EHR</i>
4 Generate lists of patients by specific conditions to use for quality improvement, reduction of disparities, research, and outreach*	<i>Meet using AIMS</i>
5 Send reminders to patients per patient preference for preventive/follow-up care	<i>Choose not to meet this one</i>
6 Provide patients with timely electronic access to their health information (including laboratory results, problem list,	<i>Meet using AIMS/hospital EHR</i>

medication lists, medication allergies) within 4 business days of the information being available to the EP

7	Use certified EHR technology to identify patient-specific education resources and provide those resources to the patient if appropriate	<i>Choose not to meet this one</i>
8	The EP, eligible hospital, or CAH who receives a patient from another setting of care or provider of care or believes an encounter is relevant should perform medication reconciliation	<i>Meet using AIMS</i>
9	The EP, eligible hospital, or CAH who transitions their patient to another setting of care or provider of care should provide summary of care record for each transition of care or referral	<i>Meet using AIMS</i>
10	Capability to submit electronic data to immunization registries or immunization information systems and actual submission in accordance with applicable law and practice	<i>Exempt (do not give immunizations)</i>
11	N/A for EPs	<i>N/A</i>
12	Capability to submit electronic syndromic surveillance data to public health agencies and actual submission in accordance with applicable law and practice	<i>Exempt (do not collect reportable syndromic information)</i>

Opportunities for anesthesiologists

The HITECH Act's substantial positive and negative incentives are designed to encourage EPs, eligible hospitals, and CAHs to adopt and meaningfully use EHR technology. In finalizing the meaningful use criteria, CMS was very responsive to feedback from the public regarding the inapplicability of some of the criteria to certain medical specialties. In its final rule, CMS divided the criteria into 2 sets, (including one with more flexibility and reduced requirements,) provided exclusions, and eliminated criteria that were considered unreasonable to require for Stage 1. CMS's final rule is very encouraging to the typical anesthesiologist who is not considered to be hospital based and therefore eligible to receive incentive payments beginning in 2011.

As a field hailed for its high standards of quality and patient safety and one that remains at the forefront of technological savvy, anesthesiology should embrace meaningful use. Besides adding functionality to existing AIMS technology, none of the core meaningful use criteria are unreasonable requirements or significantly out of the typical anesthesiologist's scope of practice. Moreover, the standards, implementation specifications, and certification criteria for EHR technology help to standardize HIT in terms of vocabulary used, content exchange processes, privacy, and security, which promotes interoperability both between AIMS and a hospital's EHR and across different EHR systems. The implications of this improved information exchange are profound: improved patient safety and quality, enhanced communication among providers within and across fields, and increased opportunities for clinical outcomes and comparative effectiveness research. For anesthesiologists particularly, improved information exchange

has the added bonus of simply making it easier to measure and convey all the work they already do.

Non-hospital-based anesthesiologists who do not currently use AIMS have even more reason now to adopt and implement it. Anesthesiologists who adopt and meaningfully use certified EHR technology by 2015 can receive substantial monetary incentives of up to \$44,000 from Medicare FFS or MA, or up to \$63,750 from Medicaid. After 2015, the incentive for anesthesiologists is to avoid the indefinite downward payment adjustments for not being meaningful EHR users. These positive and negative monetary incentives by CMS are a solid solution to the continual barrier to EHR and AIMS implementation of a lack of clear return on investment.¹ These incentives are in addition to the other evidence-based factors that result in a positive return on investment from the adoption of an AIMS: reducing anesthetic-related drug costs, improving staff scheduling and reducing staffing costs, increasing anesthesia billing and capture of anesthesia-related charges, and increasing hospital reimbursement through improved hospital coding.^{81,82}

Moreover, anesthesiologists may be able to benefit from supporting hospitals in their adoption and meaningful use of certified EHR technology. Under Medicare FFS and MA, eligible hospitals (ie, those located in the 50 states and the District of Columbia) that adopt and meaningfully use EHR by 2015 can receive up to 4 years of incentive payments according to the formula in Figure III-1. After 2015, eligible hospitals that are not meaningful EHR users are subject to penalties of $\frac{1}{4}$, $\frac{1}{2}$, and $\frac{3}{4}$ reductions to their market basket update for inpatient hospital services in 2015, 2016, and 2017, respectively, and beyond. Eligible hospitals that fail to report data on quality measures

are subject to another $\frac{1}{4}$ reduction. Due to the diminishing transition factor in the formula, eligible hospitals must become meaningful users of EHR by 2013 in order to take full advantage of the CMS incentive programs. If anesthesiologists can use AIMS to help their hospitals meet their meaningful use requirements, especially sooner than later, then the hospitals are much more likely to support the purchase of AIMS, thus eliminating a significant cost that anesthesiologists would have had to bear themselves.

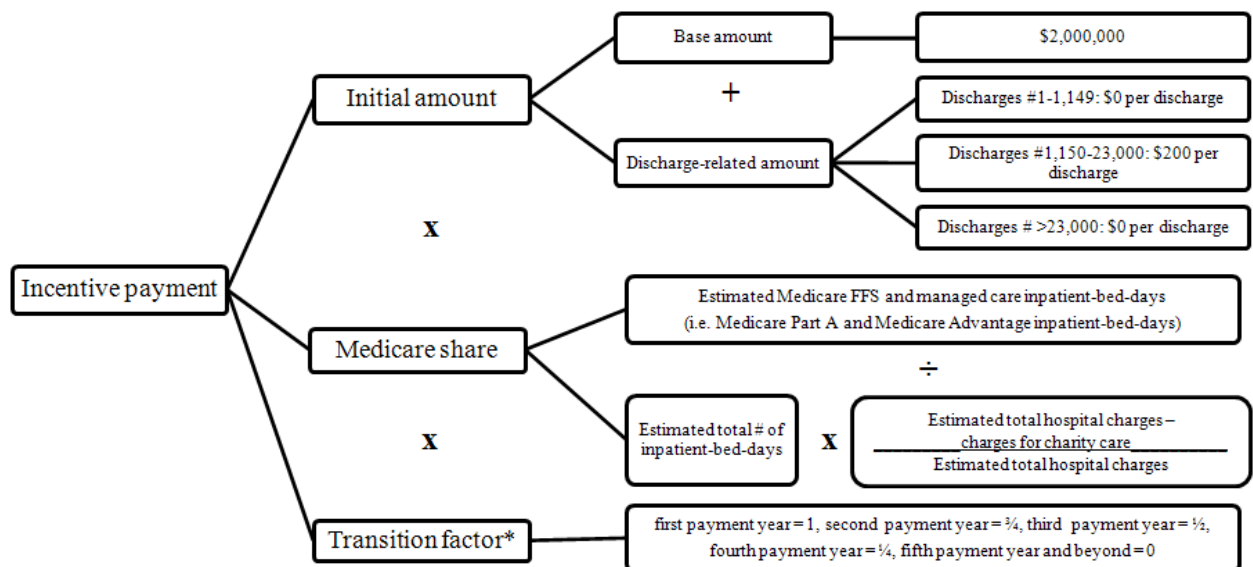


Figure III-1. Medicare Incentive Payment Calculation for Eligible Hospitals

*If the eligible hospital's first payment year is 2014, the applicable transition factor is $\frac{3}{4}$ for the first payment year, $\frac{1}{2}$ for the second payment year, and $\frac{1}{4}$ for the third payment year. If the first payment year is 2015, the applicable transition factor is $\frac{1}{2}$ for the first payment year and $\frac{1}{4}$ for the second payment year.

Regardless of how individual anesthesiologists feel about adopting EHR, the reality is that the government has stepped in and required its use by all EPs, eligible hospitals, and CAHs within the next 5 years. Within the next year, meaningful EHR users can begin receiving incentive payments. By fall 2010, certified EHR software was available for purchase. Registration for the Medicare FFS EHR incentive program began in January 2011. In April 2011, EPs can begin attesting to the use of EHR. Starting in May 2011, CMS will send payments to EPs as soon as it ascertains that they have successfully demonstrated meaningful use.

Now that CMS has finalized its meaningful use criteria for Stage 1, anesthesiologists should proceed strategically. The ASA has already reached out to CMS to ensure that anesthesiologists will be able to meet all of the applicable Stage 1 criteria using AIMS technology. Anesthesiologists should work with AIMS vendors to ensure that they have the proper functionalities, so that the AIMS will meet the certification criteria and subsequently enable anesthesiologists to meet all of the meaningful use criteria. Anesthesiologists should also seek out and work closely with HIT-authorized testing and certification bodies to assist them in evaluating AIMS appropriately.

While Stage 1 has been finalized, future stages are yet to be defined. CMS has mentioned in its final rule that it anticipates requiring additional meaningful use criteria, harder measures for each objective, and more clinical quality measures for Stage 2 and beyond. HIT has stated that it will include more standards and certification criteria for EHR in Stage 2 and beyond as well. Solidifying anesthesiology as a field that supports the meaningful use of EHR technology while keeping an open dialog with CMS and HIT

are key to ensuring that future meaningful use definitions continue to consider the field's interests and concerns.

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