

Implementing an AIMS as Part of an Enterprise EHR

An anesthesia information management system (AIMS) offers great potential benefit to anesthesiologists and their patients. An ideal AIMS will result in an accurate, legible electronic record of anesthesia care that is easier to use and less distracting than paper documentation. An AIMS should facilitate electronic billing for anesthesia services and produce clinical data within a system that allows effective data use for a wide variety of purposes: quality improvement, risk management, clinical research, administrative management, regulatory compliance, and reporting to federal and state quality reporting programs as well as clinical data registries.ⁱ

However, fulfilling the potential of the ideal AIMS depends largely on the quality of its implementation, as well as on the resources and supporting structures in place within the enterprise.

1. Decision to implement an anesthesia information management system

The decision to implement an anesthesia information management system (AIMS) may accompany an enterprise electronic health record (EHR) implementation. That decision to implement a system-wide EHR is a pivotal one for the enterprise, and anesthesiologists can only have a voice in such a decision and in EHR system selection if they are active in the enterprise leadership.

Anesthesiology interests and priorities

The quality of the anesthesia component of an enterprise-wide EHR solution is usually not the basis for selecting an enterprise system, and that component will not be duly considered without leadership from anesthesiologists. Anesthesiology leaders should understand EHR contracting, minimal service level agreement requirements, business language and the terminology of information technology, in order to negotiate effectively with administrators and vendors. In addition, anesthesiologists should work to develop leaders in clinical informatics.ⁱⁱ

In the United States, financial benefit from the federal EHR Incentive Program, or “Meaningful Use,” is a prominent reason for the recent interest in enterprise EHR systems. However, payments or penalty avoidance for Meaningful Use should be weighed against the cost of system implementation and maintenance, and a majority of anesthesiologists do not participate in Meaningful Use. As of this writing, anesthesiologists have a hardship exemption from the EHR Incentive Program and are currently protected from incurring a downward payment adjustment.

Implementing an AIMS as Part of an Enterprise EHR

Deciding whether or when to implement an AIMS entails several considerations. Benefits of AIMS include improved legibility of records, less distraction during anesthesia care, potential for improved billing and documentation compliance, integration with institutional EHR systems, and leveraging of data for quality improvement and clinical research. Impediments to an AIMS implementation include product immaturity, inadequate resources for implementation, disruptive change in documentation and questionable cost effectiveness for the institution.

EHR and AIMS selection

In some cases anesthesiologists may have input into EHR selection. Although substantial differences exist between EHR vendors, the quality of an AIMS may depend more on the work put into optimizing it than on the system that exists “out of the box” when purchased. In any case, vendor evaluation should involve a formal request for proposal, and input from current users of each prospective system should be solicited.

Fortunately the quality of every commercial AIMS continues to improve. Some may say the longer you wait, the better the system will be. However, integrating an AIMS of one brand with an enterprise EHR of another may be very difficult. If the enterprise is set on one system, in the long run it may be somewhat impractical to use a different brand of AIMS. Inevitably anesthesiologists will need to access information from the EHR for patient care. Integrating information from other providers and using tools in the EHR as part of the preanesthesia and post-anesthesia workflows is much easier if all the EHR components are designed to integrate well, and implementation resources for a different brand may be limited.

2. General principles of EHR implementation

Strategic planningⁱⁱⁱ

Enterprise clinical information systems (CIS) must align with the healthcare organization’s overall strategic plan (vision, mission objectives, and strategies). Clinical, financial, and service delivery strategies should link to CIS implementation with the intent to provide high quality care and improve outcomes. CIS integration can be integral to the organization’s financial success, rather than an added cost.

Implementing an AIMS as Part of an Enterprise EHR

The support structures needed to develop an EHR system implementation plan include governance (an effective EHR steering committee at the top is critical), the implementation team including clinicians, a project management office or professional, financing including budget support plus contracting and purchasing, and an external audit that entails security and keeps the project on track.

Governance Strategies

The enterprise administration needs to form a powerful guiding coalition that can create a vision for the successful EHR, then communicate that vision and empower others to act on it. Building short-term “wins,” features that will immediately be perceived positively, can facilitate user acceptance.^{iv} Managing user expectations during such change is important, and change is more accepted when physicians can perceive benefits of the implementation. Making available relevant clinical content can aid in clinical decision support, although meaningful decision support is still difficult to attain.^v

Processes for change requests and bug reporting should be defined before implementation begins. Transition planning is key and includes determining whether the EHR implementation will occur as a “big bang” where the system is put into use everywhere throughout the enterprise all at once, or whether there will be a staggered rolling out of the system, either by individual facilities or by individual system components. For example, if the EHR overall is mature but the AIMS is nascent, beginning use of the rest of the EHR and delaying the AIMS rollout may be beneficial. If this occurs, ensuring there will still be adequate resources at the time of initial AIMS use is critical.

Perhaps most importantly, the current workflows in patient care need to be understood so the system adapts to them, not the other way around. Providers should not have to change the way they care for patients to accommodate the EHR.

3. Principles of AIMS Implementation

Device integration

Once the decision to implement an AIMS is made, device integration should be one of the first priorities. Reliable device data correctly populating the record is a necessity and is the most basic functionality of an AIMS. Each monitor and anesthesia machine is connected to an interface that reliably translates the data coming from the device into the correct

Implementing an AIMS as Part of an Enterprise EHR

parameters for automated data transfer to the EHR. A device integration interface can be either a separate piece of hardware between the device and the AIMS computer or a software solution within the same computer as the AIMS.^{vi}

Recommendations for successful device integration include:

1. Start early. Device integration testing almost always takes longer than first estimated.
2. Ensure that hardware is available and properly configured when it is needed it to start testing. One of the most common problems with EHR implementation generally is delayed hardware acquisition.
3. Involve someone with clinical expertise in device testing. Technical people who validate parameter testing often are unfamiliar with how to operate the devices and what values and units are appropriate for the validated parameters.

Minimizing distraction during anesthesia care

When faced with adopting an AIMS, anesthesiologists often express concern that they will be more distracted with electronic documentation than with paper records. In fact, a well-implemented AIMS should be less distracting than documenting on paper, and minimizing distraction should be the guiding principle for AIMS design. Anesthesia workstation configuration is critical to reducing disruption of care and distraction. Position and adjustability of the AIMS workstation should permit documentation without turning away from the patient or monitors. If a touch screen interface is used, the display size, selection, resolution, and touch technology all are important. An AIMS touch screen setup should permit a user to reliably select the correct elements on the screen using a variety of implements, including a gloved finger and a soft stylus. Too high a display resolution or too small a display prevents a touch screen from being optimally effective. User interface design should minimize the time necessary to enter routine documentation. User interface design elements and anesthesia tools should be configured so that most documentation can be entered with the touch screen and mouse with minimal need for typing.^{vii}

4. Practical aspects of AIMS implementation

Preanesthesia Evaluation and Documentation

A structured preanesthesia evaluation can improve care for patients and provide value to both the facility and the providers. Preanesthesia software can prompt providers to enter important information to ensure its availability. Prompts are useful to improve

Implementing an AIMS as Part of an Enterprise EHR

documentation of comorbidities, which may increase reimbursement for the institution and can integrate with illness severity scores. The anesthesia record output format should be designed so that critical information, such as airway documentation, is easy to find and to transfer to the preanesthesia documentation for the patient's subsequent anesthetic. In the preanesthesia interface, preconfigured documentation elements to minimize typing should allow rapid completion of the evaluation.

In an enterprise preanesthesia workflow, a preoperative clinic may begin a preanesthesia document that then becomes part of the final evaluation completed on the day of anesthesia care. The AIMS can support this workflow, but customization of enterprise EHR tools may be necessary.

Intraoperative anesthesia documentation

As minimizing distraction during anesthesia care is so important, appropriate time and resources must be devoted to optimizing intraoperative anesthesia documentation. The AIMS should permit a large majority of the documentation to be done without typing. The more free text entry is minimized, the more discrete data can be designed and captured in the documentation. For example, airway documentation can contain predetermined choices for typical elements such as degree of mask ventilation difficulty, laryngoscope blade, and grade of laryngoscopic view. When such details are entered from discrete predetermined choices rather than in free text, analyzing and reporting from the documentation is much easier.

The AIMS should support the most commonly needed intraoperative anesthesia documentation. In the general EHR build process, it is common to invoke the "80-20" rule, often in the form of an axiom stating that a system should include all the documentation necessary for 80% of cases; or that documentation that's needed in 80% of cases should be the focus of system build. While the principle has merit, consider that managing medically complex patients or complicated cases may involve unusual documentation, but at a time when one is least able to devote time and concentration on documenting in free text. Thus an AIMS should be designed to have both the documentation needed commonly for most cases as well as what is essential for the most complex cases. In addition, testing should ensure that short cases can be documented without delays.

One area where integration with other EHR components is critical is medication documentation. Collaboration with the pharmacy should ensure that all appropriate

Implementing an AIMS as Part of an Enterprise EHR

medications are available to be documented in the AIMS and that they will be present in the patient's medication administration record. Medication display and documentation settings must be optimized to ensure that this aspect of the AIMS is intuitive and easy to use. Similarly, proper interfacing with blood bank resources is necessary to ensure that blood product orders and documentation function well.

Post-anesthesia documentation

The Department of Health and Human Services' National Quality Strategy prioritizes promoting effective communication and coordination of care, and effective communication between providers at the end of anesthesia care promotes safe, coordinated care. Thus an effective transfer of care process is important. A handoff report or transfer of care note for the end of anesthesia care should be structured to include documentation considered important for effective transfer of care during this critical transition. This is also perhaps the best place to document the final anesthesia type for billing purposes, since in cases involving conversion to general anesthesia, anesthesia type may not be determined at the start of the case.

Post-anesthesia evaluation processes vary greatly, and the documentation must be tailored to accommodate the desired post-anesthesia workflow. A well-designed post-anesthesia evaluation is critical for compliance and for capturing quality data.

Order sets

Certain core order sets should be configured for anesthesiologist use. Suggested minimum order sets include orders for preanesthesia care, post-anesthesia/PACU, intraoperative testing, blood products, and labor and delivery. It may be desirable to make separate order sets for adult and pediatric use, and possibly also for different venues. For instance, order requirements may vary greatly for an ambulatory surgery setting compared to a hospital setting. Order set creation entails interfacing with EHR elements from the pharmacy, laboratory resources, and nursing care. Testing should ensure that the orders function properly for these portions of the EHR as well.

Certain actions may be appropriate to occur by protocol or policy. Nurses should be empowered to follow established protocols without the prerequisite of an order entry before the protocol can be followed. Such activities may include laboratory testing, like blood bank screening tests or pre-procedure pregnancy testing. For example, if every pregnancy test requires an order from an anesthesiologist or other provider instead of

Implementing an AIMS as Part of an Enterprise EHR

being done when appropriate by protocol as the patient is admitted to the preoperative unit, unnecessary case delays may occur.

The system design process

A dedicated team should be responsible for the content and function of the AIMS, all anesthesia documentation, plus perioperative and anesthesia scheduling. The AIMS implementation team must include a clinical anesthesia provider who has the authority to guide changes to and approve clinical content. The design process is iterative, and the responsible anesthesia provider should meet frequently on a regular basis with the team members who create and modify the AIMS content, to review the current state of AIMS components, make changes on the fly and immediately re-evaluate them. Together in person they can review the current state of AIMS components and effectively make changes on the fly. Communicating remotely, by email, telephone or web conference, is often less efficient and creates delays in new iterations of system components. Interactive demonstrations of the system are more useful than static screenshots, and the earlier that displays are selected for the AIMS, the better the build can approximate the final user interface as part of the design process.

A project plan that is updated with each meeting should clearly lay out all tasks and activities yet to be completed, and for each it should list the start date, the team member responsible for the task, its priority, its current status with respect to completion, the next step needed plus the person tasked to perform the next step, and the projected completion date. This keeps all team members aware of the outstanding tasks and helps the EHR leadership understand the necessary resources.

The AIMS team should solicit input from all relevant subspecialties to ensure that documentation meets all the needs of the department. In particular, obstetric anesthesia requirements can differ substantially from those of non-obstetric anesthesia services.

Upgrades and new features

During the initial implementation and in later maintenance, the vendor may present to options to incorporate new features of the commercial EHR system. These should always be rigorously tested before being put into the production AIMS. Ideally any new component with a major change in functionality will have been demonstrated to work successfully at another site using the same AIMS vendor before it is considered.

Implementing an AIMS as Part of an Enterprise EHR

Downtime procedures

Thorough procedures for periods of scheduled and unscheduled downtime (loss of connectivity) must be in place.⁵ Device data connectivity may be lost, or the entire EHR system may be offline. Procedures should account for both situations and should be clearly communicated to all providers. Downtime workstations can permit access to copies of patient records stored from before downtime occurred. Downtime workstations and printers should be clearly labeled and available on all units.

User training

Detailed training materials must be created, and users should be given ample time to become familiar with the system in a non-production environment before the system is live. The best time to train users on a new clinical information system is usually shortly before going live with the system. “Shadow charting” – documenting in a non-production system environment prior to “go live” while still documenting in the official medical record in the usual way – is an essential part of training for anesthesia documentation.

Billing and compliance

All information necessary to support billing must be included in the system build. Early in the design, billing and compliance requirements should be delineated. The billing service should review whatever output will be used as the basis for billing. Records, data, and billing service access should be tested and validated before going live with the new system to avoid costly disruptions in the revenue cycle. If all communications and data transfer with the billing service are to be electronic, consideration should be given to a transition period with hard copies of electronic records available until the new electronic process is confirmed to be sound.

Compliance considerations vary between states, but federal regulations apply broadly. Each anesthesiology department may have its own interpretation of how best to document to support medical direction and compliance with Medicare regulations. The AIMS build should be tailored to incorporate these elements. For example, Medicare conditions of participation require the patient’s participation in the post-anesthesia evaluation, and the post-anesthesia evaluation can include a required field that addresses patient participation.

Data use and warehousing

Many commercial AIMS systems fall short of expectations for reporting and use of data for various purposes, including departmental administration, quality assessment and

Implementing an AIMS as Part of an Enterprise EHR

reporting, risk management, regulatory compliance, registry reporting, and clinical research.^{viii} An external data warehouse can receive transactional data exported from the EHR database and preserve it in a format that is more conducive to reporting and analyses. For the enterprise's anesthesiology department, a data mart can be created as a subset of the data warehouse with a collection of related tables and data for anesthesia-specific analyses and reports.

Anesthesiologists should work with administration leaders to align data collection goals and processes. For data to be effectively reportable and available for analyses, the system design team should include someone dedicated to understanding where in the EHR all the data elements exist that are desired for reporting. A technical expert trained to export data from the EHR database may be necessary to make effective use of data in the ways anesthesiologists expect.

Registry reporting

The Anesthesia Quality Institute's National Anesthesia Clinical Outcomes Registry (AQI's NACOR) recently was designated by CMS as a Qualified Clinical Data Registry. Anesthesia providers can have their federal quality reporting done via NACOR directly, and AQI can ensure that participating providers will have available enough reportable measures to fully meet reporting requirements for avoiding the PQRS penalty in 2017 and beyond.^{ix} Successful reporting through the QCDR requires data to be structured and transmitted in a very specific format. This should be taken into consideration whether reporting from an enterprise EHR or an external platform. CMS will phase out claims-based reporting in favor of this registry-based mechanism in the near future. Reporting clinical outcomes data to NACOR provides anesthesia groups with individual practitioner feedback as well as national benchmarks. Several other national anesthesia registries exist, including the Multicenter Perioperative Outcomes Group (MPOG) and the Anesthesia Business Group (abg). ASA and ACOG have also partnered to establish the Maternal Quality Improvement Project (MQIP) in the coming year. Exporting data to registries is essential to leveraging these registries' ability to aid in quality improvement as well as clinical research.

Importantly, quality data collected by anesthesiologists can be shared with enterprise administration or facility leadership. This not only provides value to the institution, but also positions anesthesiologists as proactive leaders in improving healthcare quality.

Implementing an AIMS as Part of an Enterprise EHR

AIMS implementation in the enterprise setting has significant potential benefit, but realizing that potential requires substantial work to optimize any AIMS to meet anesthesiologists' needs. This can only be done when clinical anesthesia providers participate in and guide the implementation process. Anesthesiologists striving to become leaders in enterprise administrations and clinical informatics will help to ensure that anesthesiologists have the opportunities to so participate and to do so effectively.

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Implementing an AIMS as Part of an Enterprise EHR

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