

Future Drug Investigations: Is the Electronic Health Record Replacing the Case Report Form?

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The anesthesia information management system is on a path towards increased adoption in the US.¹ In addition to providing better documentation of clinical care, electronic health records (EHR) have been demonstrated to improve quality of care and practice management. Simple EHR reminders showed that this intervention significantly improved compliance with prophylactic antibiotic administration timing (Figure 1).^{2,3,4} Other Surgical Care Improvement Program (SCIP) measures that can be facilitated by EHR include documentation of perioperative beta-blocker administration (Figure 2) and intentional hypothermia or measures to prevent intraoperative hypothermia, such as use of warming blankets. It is an obvious extension that future pharmacological studies of many types will mine the data in the EHR to facilitate research on thousands or millions of patient encounters.

Another use of an EHR is to provide decision support. In one study, a preoperative visit algorithm that alerted the clinician if a patient had multiple risk factors for post-operative nausea/vomiting nearly doubled the use of antiemetic prophylaxis for these high-risk patients.⁵ In similar fashion, a retrospective analysis demonstrated changing patterns of anti-emetic usage over time at one institution.⁶ Using an EHR to screen for intraoperative markers of complications is also helpful in identifying cases for quality assurance reviews. Electronic screening yielded many more cases of interest than voluntary reporting by clinicians.

Technologies in common use in other industries are also beginning to be used in healthcare and integrated into EHR. Use of barcodes on medication labels in conjunction with a special scanning device may decrease medication errors and improve documentation. Barcodes and radiofrequency identification tags can also be used to verify patient identity, locate patients and vital equipment, and ensure blood product compatibility.⁷

The possibility that an EHR could actually jeopardize patient safety has been considered. With clinicians free of the need to record vital signs manually, there is potential for inattention to the vital signs that are both measured and recorded automatically. This issue was addressed in two studies that concluded that the use of an EHR did not decrease vigilance in this regard. The other related consideration is whether or the clinician was able to and chose to edit the vital sign information.⁸ Editing of the record could contaminate the value of the EHR as a source document.

Levin et al demonstrated that highly accurate mapping of medication history entries that were manually typed was feasible in an EHR.⁹ The use of natural language processing is an important tool for facilitating this type of research. More classic retrospective pharmacological studies of postoperative antibiotic drug levels are also facilitated by EHR analysis.¹⁰

The interactions among drug dosing, hemodynamics, and outcomes may be one of the most fruitful research applications of the EHR in the modern era. Various studies of preoperative and intraoperative hemodynamic states have demonstrated the feasibility of the EHR as source documentation for outcome studies.^{11,12} Another intriguing application of EHR-related decision support technology is the possibility of combining inhalational and intravenous anesthetic data to create smarter assessments of depth of anesthesia.¹³

As a final comment, EHR's are limited by the lack of standardization that pervades the industry. International adoption of standards for data terminology and clinical document architecture will greatly facilitate the use of the EHR as the de facto standard for large-scale anesthesia pharmacological research in the future.¹⁴

Figure 1. EHR reminder to administer antibiotics appears prior to the “Procedure/Surgery Start” event soft-key. Currently, the text of the reminder states “Antibiotic Reminder Acknowledged” so as to comply with chart abstraction guidelines of the Surgical Care Improvement Program (SCIP).

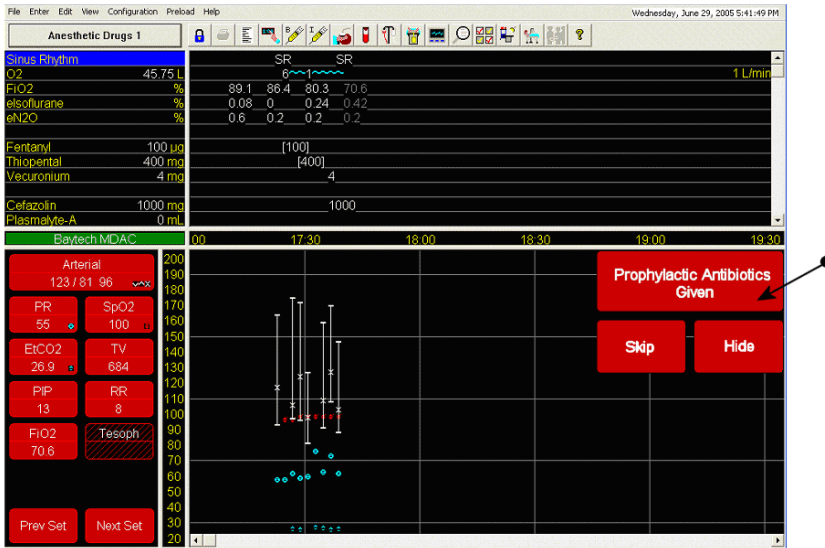
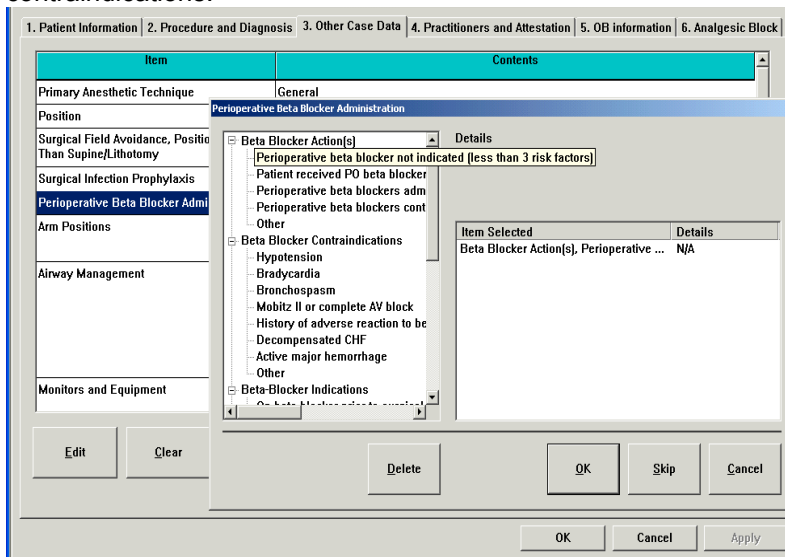


Figure 2. Modification of an EHR to incorporate documentation of beta-blocker administration, including contraindications.



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