Development and implementation of a dedicated postoperative evaluation service to improve compliance of postoperative visits

Joshua Charles Vacanti, Richard Dennis Urman, Pankaj Sarin, Xiaoxia Liu, Bhavani Shankar Kodali

Department of Anesthesia, Perioperative and Pain Medicine, Brigham and Women's Hospital, Harvard Medical School, Boston, MA, USA

Abstract

Background and Aims: Postoperative patient evaluation is an integral component of perioperative care. An audit of our anesthesia department's records demonstrated a compliance rate of <50%. We postulated that the development of clinical anesthesia service dedicated to performing such evaluations would improve compliance significantly.

Materials and Methods: This retrospective study examined postoperative follow-up completion rate at a large academic center. Data were collected from 58,000 anesthetics during three periods, between each of which an intervention was introduced. The first period examined completion rate when postoperative evaluations were left to the team performing the anesthetic. During the second period, this task was delegated to groups of anesthesiologists based on surgical subspecialty; these smaller groups utilized rotating residents. The third period examined completion rate after implementation of a postoperative evaluation service. All periods utilized the department's electronics database to identify operative patients. The number of adverse anesthesia events reported was also recorded.

Results: A significant difference in the proportions of compliance with postoperative evaluations among all three periods was detected. Compliance was 47% during period one and improved to 66% during period two. During period three, which employed a postoperative evaluation service, compliance was 83%. The number of adverse events reported per month increased significantly following the first study period from 95 reported monthly events to 215 and 201 in the second and third periods, respectively.

Conclusion: By creating a dedicated postoperative evaluation service using available technology, we improved postoperative evaluation completion rate from 47% to 83%, and demonstrated a significant increase in the number of adverse events reported. Based on this, we support the deployment of a dedicated service as a quality improvement initiative.

Key words: Patient safety, postanesthesia evaluations, quality improvement, regulatory compliance

Introduction

Postoperative evaluations have long been recognized as an important aspect of the practice of anesthesiology. Prior data has suggested that postoperative visits by anesthesiologists may improve patient satisfaction.[1] However, there is very limited data in the literature regarding various components of these visits;[2] it remains unclear how often anesthesiologists perform postoperative evaluations, where they are performed, and whether or not they serve as an effective means in detecting complications related to the practice of anesthesiology. In the United States, regulatory agencies such as the Centers for Medicare and Medicaid Services (CMS) and The Joint Commission (TJC) have mandated that postoperative evaluations be performed following every anesthetic within a specified time period.[3] Failure to perform and appropriately document these visits could not only reduce compensation to anesthesiologists, it could potentially affect their hospital's accreditation. As regulatory burdens on the healthcare industry continue to increase, a systematic model for ensuring compliance with such agencies becomes ever more necessary. A robust postoperative follow-up service is an integral part of a quality assurance (QA) program for both the anesthesiology department and the hospital. Appropriate patient follow-up and documentation of the visit are consistent with the evolving healthcare environment and the heavy emphasis placed on data reporting, process and outcome measurement, and patient satisfaction.[4,5]

At our institution, internal departmental audit performed in early 2008 suggested that our group's compliance with

Address for correspondence: Dr. Joshua C Vacanti,
Brigham and Women's Hospital, Harvard Medical School,
75 Francis Street, Boston, MA 02115, USA.
E-mail: jvacanti1@partners.org

these mandated visits was <50%. Although anecdotally anesthesiologists seemed to acknowledge the value of such visits, it did not appear that they were performing them regularly at out institution. The objective of this study was to determine if implementation of new postoperative follow-up processes could improve compliance with postoperative visits, and to create a practical clinical service model for other large academic institutions to adopt.

Materials and Methods

This retrospective study examined postoperative completion rate from 58,000 anesthetics during three periods of postoperative data acquisition, between each of which an intervention was introduced to improve the evaluation processes. Prior to study initiation, our department had developed a proprietary Electronic Anesthesia Reporting System (EARS) to follow patients postoperatively in an effort to better track complications related to anesthesiology.[6] EARS is an internet-based system that extracts a list of all patients who underwent surgical procedures using the operating room electronic schedule as the source. Staff and residents use it to document intraoperative, recovery room, and postoperative events occurring with any patient. Our department employs a very small number of Certified Registered Nurse Anesthetists (CRNAs) who work under the direction of staff anesthesiologists providing patient care. Although data indicated there was no statistical difference in the postoperative evaluation compliance rate between residents and CRNAs, in an effort to reduce variables that could potentially confound data interpretation we excluded the latter from our study.

After documentation of the visit, EARS generates an E-mail describing all anesthetic-related events, and sends it to the anesthesiologists and residents involved in the case. Documentation of certain predefined events results in automatic notification of the departmental QA director and hospital patient safety/risk management teams for follow-up. EARS has allowed anesthesia teams at our institution to record adverse complications electronically and store them in a departmental database for audit and review; since early in 2008, it has been mandatory that physicians in our department use EARS to report complications [Figure 1]. Due to its ease of use and widespread departmental acceptance, EARS was utilized to track operative patients during all three periods of study.

During the first period of data evaluation, which extended from September 1, 2008 to August 31, 2009 (Period 1), postoperative visits were performed by the anesthesiologists and residents who performed the anesthetic. During this
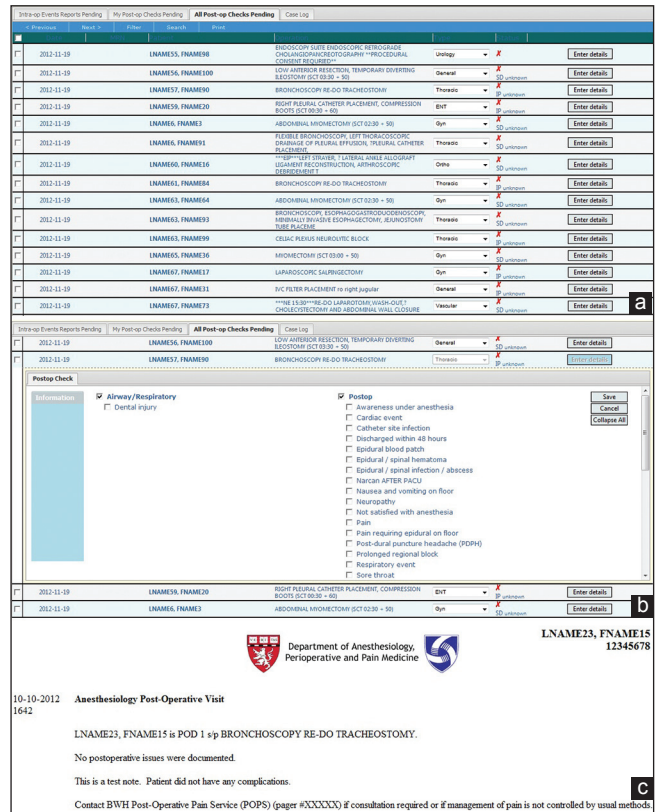
Figure 1: Examples of typical Electronic Anesthesia Reporting System (EARS) screen captures prior to (a) and during (b) data entry. Example (c) depicts a note automatically E-mailed to anesthesia providers after data entry in EARS

period of study, use of EARS for reporting of complications continued to be mandatory.

Based on the information obtained from the first period, our group initiated a second period of study. During the second period, the task of performing postoperative evaluations was delegated to groups of anesthesiologists based on the surgical subspecialty in which they routinely work; these smaller groups were encouraged to use residents rotating through specific subspecialties to visit patients following an anesthetic. The subspecialty anesthesia groups (e.g., a general surgery anesthesia group, the thoracic anesthesia group, and the cardiac anesthesia group) utilized EARS and their own group's resources to attempt to improve compliance with postoperative visits. This data was collected from September 1, 2009 to December 31, 2009.

A third and final intervention (January 1, 2010 through December 31, 2011) was made based on the data obtained from the second study period. This involved the creation of a postoperative evaluation service, akin to a preoperative evaluation service. It was hypothesized that this would result in a significant improvement in postoperative evaluation rate. A new resident rotation was developed whereby one resident

was assigned to see and evaluate all patients having undergone an anesthetic from the previous day. The rotation was divided into six shifts — One shift for each day, Monday through Saturday. All complications related to anesthetic care were documented in the patient's chart and in EARS, and a report was sent through E-mail to the primary anesthesia team.

In an effort to help manage the newly created postoperative evaluation service, our departmental information technology group developed an electronically-generated list of inpatients organized by location, utilizing the information gathered by EARS. A standardized postoperative note was created to be included with each patient's anesthesia record [Figure 2]. During the implementation of the new service, individual anesthesiologists and residents were encouraged to see their own patients postoperatively, and were instructed to use the standardized postoperative note and to document their evaluation in EARS. Residents assigned to the postoperative service were supervised by a faculty member.

Basic descriptive statistics were reported as mean ± standard deviation or median and interquartile range, as appropriate. The proportional differences of compliance incidence among the three periods were compared using Pearson Chi-square test. In an effort to assess the significance of compliance improvements, we retrospectively queried the EARS database for the number of events reported during each month of all three study periods. The Kruskal–Wallis nonparametric analysis of variance (ANOVA) test was used to compare the differences of event numbers among the three periods. *Post-hoc* pairwise comparisons were carried out using Bonferroni correction. ANOVA was used to analyze the differences between the numbers of reported events across 3 time periods. All statistical tests were two-sided, with a Type I error of 0.05. A $P < 0.05$ was considered to be statistical significance.

The statistical analyses were performed with SAS version 9.3 (SAS Institute Inc., NC, USA). Data gathered from the service is represented in Figure 3.

Results

Both interventional periods demonstrated a statistically significant improvement in compliance with postoperative evaluations ($P < 0.0001$) [Table 1]. The number of events reported in EARS per month across all three periods of study is demonstrated in Figure 4. The number of events reported per month increased significantly after the first study period ($P < 0.0002$) [Table 2]. The pairwise comparison showed that there was a significant increase in monthly events reported between periods 1 and 2, as well as between periods 1 and 3. However, there was no difference in the number of monthly events reported between periods 2 and 3. ANOVA demonstrated a statistically significant difference in average monthly event reporting in each of the three study periods ($P < 0.0001$) [Figure 5].

Period 1

Despite compelling reasons for performing postoperative visits, an audit of EARS revealed that over a 1-year period from September 1, 2008 to August 31, 2009, only 8260 out of a total of 17,542 patients (47%) admitted to the hospital after an anesthetic were evaluated by our department following discharge from the recovery room. A manual audit of random patient charts during the same time period supported this data and estimated our department's compliance to be <50%. During this initial period of study, an average of 95 anesthetic-related complications per month were detected and reported in EARS.

Figure 2: Postoperative evaluation note. Example of a blank, standardized postoperative note created and utilized by our department to document postoperative issues and compliance metrics. The note is automatically printed with the anesthetic record at completion of care, and is included in the patient's chart
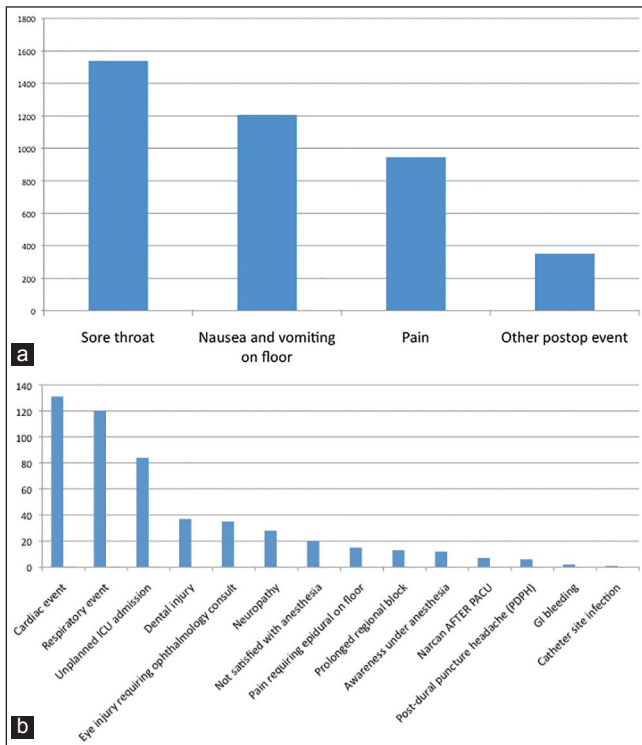
Table 1: Compliance with postoperative evaluations during the three study periods

Study period	Compliance		*P* value
	No *n* (%)	Yes *n* (%)	
One 9/1/2008-8/31/2009	9282 (52.9)	8260 (47.1)	<0.0001
Two 9/1/2009-12/31/2009	1999 (33.6)	3949 (66.4)	
Three 1/1/2010-12/31/2011	6122 (17.4)	29,061 (82.6)	

The differences in compliance rate between the three observed periods were of statistical significance. P < 0.0001

Table 2: Descriptive statistics of the number of reported events in EARS per month among three study periods

Study period	Months number	Mean	Standard deviation	Median	Lower quartile	Upper quartile	Range
One 9/1/2008-8/31/2009	12	95.33	24.59	89.00	77.50	113.00	76.00
Two 9/1/2009-21/31/2009	4	214.75	39.20	202.00	192.50	237.00	89.00
Three 1/1/2010-12/31/2011	24	201.04	81.20	198.00	149.50	220.00	367.00

The average number of events reported per month increased significantly after the first study period. P<0.0002. EARS = Electronic Anesthesia Reporting System

Figure 3: Common (a) and less common (b) anesthesia events detected and recorded in electronic anesthesia reporting system during the third study period

Figure 4: Number of anesthetic events reported per month during all three study periods

Period 2

Of a total of 5948 patients admitted following anesthetics, only 3949 were evaluated postoperatively after admission to a hospital floor (66%). During the second study period, the number of reported complications increased to an average of 215 anesthetic-related complications per month.

Period 3

For a period of 24 months from January 1, 2010 to December 31, 2011, a total of 35,183 anesthetics were administered that resulted in admission to the hospital. Of these, 29,061 patients received a postoperative evaluation compliant with CMS and TJC guidelines, for an overall compliance rate of 83% during the study period. About 17% of patients did not have electronic documentation of a postoperative evaluation. During the final, 2-year period of study, an average of 201 anesthetic-related complications were reported per month in EARS. This was a significant increase from the first study period, but did not represent a significant change from period 2.

Discussion

Postoperative patient follow-up has gained increasing importance as regulatory bodies and payers place greater emphasis on quality improvement, reporting of outcomes, and decreasing costs of care. The American Society of
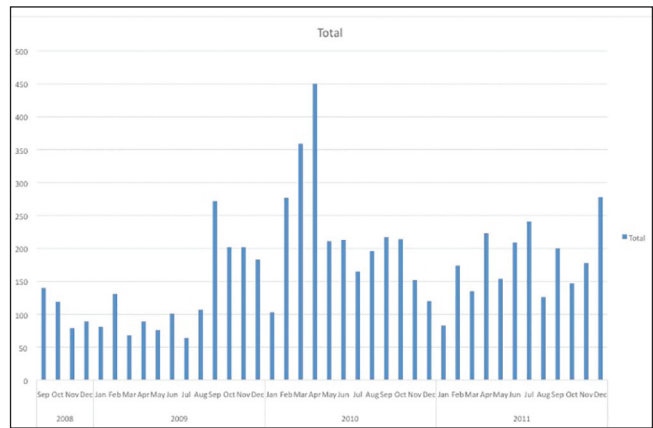
Anesthesiologists Practice Guidelines for Postanesthetic Care do not give guidance for postoperative evaluation once the patient is discharged from the recovery room.[7] The CMS conditions for participation for anesthesia services outline who can complete the evaluation, the time period within which it needs to be completed (48 h) following surgery, and patient-specific documentation requirements such as inclusion of patients' vital signs, mental status, pain, nausea and vomiting and apparent complications.[3] Although care models exist for preanesthetic patient evaluation, none have been validated for postoperative evaluation.

Our innovative care model involves consolidating the responsibilities of performing postoperative evaluations to a limited number of physicians, explicitly outlining the service's goals, and utilizing available technology to reduce logistical and data-collection burdens. By adopting this model, we improved our department's postoperative completion rate from 47% to 83%. This represents a statistically significant increase in the compliance rate, although there is clearly room for improvement.

The idea of a postoperative service evolved based, in part, on the relatively low compliance of 66% seen in the second study period. In developing this quality improvement initiative, we postulated that narrowing the responsibility of completing evaluations to groups of designated individuals would make oversight of this complex process easier, and would allow us to identify and correct deficiencies more efficiently. For example, if one specific group demonstrated low compliance we looked for systems issues unique to that group and developed a plan to resolve them. After data demonstrated low but significantly improved compliance, we took the additional step of further consolidating the responsibilities to a single individual. This allowed us to assess systems issues based on specific feedback from one individual at a time, and rapidly make changes to
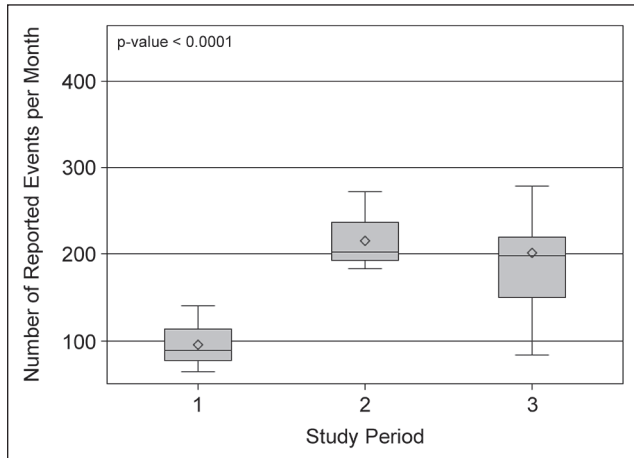
Figure 5: Average number of anesthetic-related events reported per month in each study period. A statistically significant difference in monthly event reporting was demonstrated using analysis of variance $P < 0.0001$

our model. Programming EARS to generate and print a daily inpatient list sorted by location and other metrics serves an example of this change.

Our data evaluation shows that 17% of patients still did not have electronic documentation of a postoperative evaluation even after instituting a dedicated service. The data indicate that the majority of these patients belonged to subspecialties that tend to discharge patients early the next morning (23 h admits), such as the gynecologic surgery and urology services; it is likely that many of these patients were discharged prior to a visit by the postoperative evaluation service. Other possible reasons for this deficiency involve programming issues with EARS. These may include surgical patients inadvertently omitted from the hospital programs queried by EARS, or patients that were not detected by EARS because of scheduling changes. There is also the possibility of human error during physician documentation of visits in EARS. With programming adjustments to EARS to ensure that all patients receiving an anesthetic are captured, and by addressing the order in which patients are seen by the service, we should be able to improve our compliance rate further.

The improvement in the compliance rate also illustrates a possible discordance between the perceived importance of postoperative visits and the matter of actually performing them. The study data, which shows a significantly lower rate of completion in the first and second study periods, suggests that visits become a lower priority with a lower rate of completion when the responsibility for performing them is placed on the primary anesthesia team. This was seen whether tasked to individual anesthesiologists or residents, or the subspecialty groups described in the second study period. Only after the task of evaluating patients was consolidated to the responsibility of one individual did the compliance rate

approach an acceptable range. We speculate that this lack of emphasis on completion of postoperative evaluations may be attributable to several factors including lack of dedicated time for these visits during routine days, previously arranged call and postcall obligations, lack of direct financial incentive to individual physicians, and the belief among anesthesiologists that complications following anesthetics are extremely low.[8]

We acknowledge that a postoperative service, specifically for a large academic practice requires a significant amount of resources, including the use of both attending staff and resident trainees. Based on experience and feedback, we estimate that each patient visit requires between 5 and 10 min depending on the complexity of the case and the specific needs of the patient. For a busy operating room that produces 50-80 inpatients per day, evaluating this many patients amounts to a full time job that could potentially take between 4 and 13 h. For many practices, a service of this nature may be cost prohibitive, particularly since CMS guidelines mandate that these visits be performed by an individual who is qualified to administer anesthesia.[3] However, compliance with regulatory agencies, like CMS is nonnegotiable, and we emphasize that the daily task of evaluations takes a finite amount of time regardless of whether they are performed by one individual or multiple providers. Our data suggests that consolidating the task to one individual may be a more efficient approach. In this case, the development of a dedicated clinical service aided by electronic record keeping successfully addressed this specific deficiency in our group. Although it is clear that these visits require significant resources and this model may not be applicable to smaller, community-based practices, the per-patient cost in time remains the same. For these reasons, our department continues to support the existence of a postoperative evaluation service.

The significant increase in complication detection in the second and third study periods suggests that a systematic approach to completing postoperative evaluations may have value beyond improving regulatory compliance. By improving our ability to detect adverse events and address them in a proactive fashion, we believe we qualitatively improved the patient experience and increased our department's value to the hospital in treating postoperative morbidity. Although it is unclear whether or not these adverse events would have gone undetected if not for postoperative evaluations, increased detection of complications did provide our staff and residents with valuable feedback about their anesthetic technique that may have otherwise gone unappreciated. More studies are needed to determine if these theoretical changes resulted in any direct quality improvement or fiscal benefit to our department.[9,10] Furthermore, some complications may not become apparent until later in the postoperative period.[11,12]

These represent important areas of consideration given recent changes in the healthcare reimbursement that increasingly emphasize patient satisfaction and quality outcomes.[5,13,14]

Conclusion

Our experience demonstrates that the creation of a dedicated postoperative evaluation service, facilitated by electronic patient database, resulted in a statistically significant increase in postoperative evaluation compliance and the detection of adverse events. We speculate that this model may potentially serve to improve both departmental quality of care and patient satisfaction.

References

1. Capuzzo M, Gilli G, Paparella L, Gritti G, Gambi D, Bianconi M, *et al.* Factors predictive of patient satisfaction with anesthesia. Anesth Analg 2007;105:435-42.
2. Burnham M, Craig DB. A post-anaesthetic follow-up program. Can Anaesth Soc J 1980;27:164-8.
3. Center for Medicaid and State Operations/Survey and Certification Group. Revised Hospital Anesthesia Services Interpretive Guidelines Issued December 11, 2009 — State Operations Manual (SOM) Appendix A: Hospital Anesthesia Services Requirements Clarified, Types of Anesthesia Services and Anesthesia Requirements: 42 CFR 482.52, 42 CFR 482.52 (b)(1), 42 CFR 482.52 (b)(2), 42 CFR 482.52 (b)(3).
4. Glance LG, Neuman M, Martinez EA, Pauker KY, Dutton RP. Performance measurement at a "tipping point". Anesth Analg 2011;112:958-66.
5. Neuman MD. Patient satisfaction and value in anesthesia care. Anesthesiology 2011;114:1019-20.
6. Sarin P, Harnett M. Implementation of an electronic anesthesia reporting system. Anesthesiology. Poster presented at annual meeting American Society of Anesthesiologists; 2008.
7. Apfelbaum JL, Silverstein JH, Chung FF, Connis RT, Fillmore RB, Hunt SE, *et al.* Practice guidelines for postanesthetic care: An updated report by the American Society of Anesthesiologists Task Force on Postanesthetic Care. Anesthesiology 2013; 118:291-307.
8. Garfield J, Garfield F, Sarin P, Dedrick D, Vacanti JC, Mitani A. Is a postoperative visit still necessary in today's practice environment? Unpublished Departmental Data; 2009.
9. Jordan LM, Ouraishi JA, Liao J. The national practitioner data bank and CRNA anesthesia-related malpractice payments. AANA J 2013;81:178-82.
10. Sabaté S, Mazo V, Canet J. Predicting postoperative pulmonary complications: Implications for outcomes and costs. Curr Opin Anaesthesiol 2014;27:201-9.
11. Metzner J, Kent CD. Ambulatory surgery: Is the liability risk lower? Curr Opin Anaesthesiol 2012;25:654-8.
12. Metzner J, Posner KL, Lam MS, Domino KB. Closed claims' analysis. Best Pract Res Clin Anaesthesiol 2011;25:263-76.
13. Liu EH. Linking pay and performance. Br J Anaesth 2013;111:526-8.
14. Haller G, Stoelwinder J, Myles PS, McNeil J. Quality and safety indicators in anesthesia: A systematic review. Anesthesiology 2009;110:1158-75.

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