



Original contribution

National incidences and predictors of inefficiencies in perioperative care^{☆, ☆ ☆, ★}



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Abstract

Study Objective: The operating room suite can be one of the most costly units within the hospital. Some of these costs stem from postoperative unplanned admissions, case cancellations, case delays, and extended recovery room times. The objective is to determine the clinical predictors of these operating room inefficiencies.

Design: Retrospective data analysis.

Setting: Operating room, postoperative recovery area.

Patients: Surgical patients whose perioperative data were reported to the Anesthesia Quality Institute's National Anesthesia Clinical Outcomes Registry from 2010 to 2015.

Interventions: We identified all cases that reported unplanned admissions, case cancellations, case delays, and extended recovery room times.

Measurements: Patient demographics, intraoperative characteristics, and provider information were collected for each case. Univariate and multivariate logistic regressions were fitted to determine if these various characteristics were associated with the outcomes of interest.

Main Results: The incidence of unplanned admissions (0.18%), case cancellations (0.05%), extended recovery room stays (1.12%), and case delays (14.43%) were reported. A positive predictor for unplanned admissions included elderly patients (odds ratio [OR], 1.34; 95% confidence interval [CI], 1.16-1.48), whereas cases not performed under general anesthesia had lower rates ($P < .001$). For case cancellations, higher American Society of Anesthesiologists classes had the highest risk (OR, 2.17; 95% CI, 1.81-2.60). Longer cases and elderly patients are the main predictors for extended postanesthetic care unit stays among all surgeries (OR, 1.54; 95% CI, 1.47-1.62; OR, 1.42; 95% CI, 1.34-1.50, respectively). Pediatric patients and monitored anesthetic care cases had highest odds for case delays (OR, 3.02; 95% CI, 2.93-3.11; OR, 4.98; 95% CI, 4.88-5.07, respectively).

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Conclusions: This study reports the national incidence and various clinical predictors for these 4 operating room metrics. This can serve as both a resource for operating room managers to compare their practice to national trends and a tool for strategically identifying at-risk surgical cases.

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1. Introduction

The operating room suite is one of the largest contributors to a hospital's economic success. However, it is also one of the most costly units within this environment [1]. Major sources of costs associated with running an operating room suite stem from unforeseen events and inefficiencies. Unplanned admissions and extended stay in the postanesthetic care unit (PACU) after surgery are examples of such a costly event [2-6]. Likewise, case cancellations and delays play a major role in the economic burden coming from operating room inefficiencies [7-10]. Prioritizing patient safety is key; however, balancing this with improving cost efficiency is exceptionally challenging.

Creating highly efficient operating rooms and reducing unforeseen events such as unplanned admissions or extended PACU stays are difficult because of the highly variable presentations of patient problems, operating types, and unexpected clinical events. Additional barriers include existing infrastructure, human resource management, scheduling variation, process flow, technology issues, and information systems [11]. One appropriate step to achieve this goal is for operating room managers to benchmark their metrics against national trends. Of course, this introduces biases because the institutions are very heterogeneous, resulting in comparisons that may not be completely accurate. In any case, it is a strategic starting point, as having these data can provide managers with a tangible goal to reach for the success of their own facilities.

Data from the National Anesthesia Clinical Outcomes Registry (NACOR) was used from the Anesthesia Quality Institute (AQI), the largest anesthesia database in the United States [12]. NACOR has collected data on more than 20% of all anesthetics administered in the United States since 2010, gathering information on all aspects of the patients who undergo anesthesia for various procedures in all settings. The data are collected from a combination of clinical programs that electively approach AQI and include billing records, clinical data, and quality outcomes, which AQI receives electronically and houses securely in their headquarters.

Here, we analyze national trends for unplanned admissions, case cancellations, extended PACU stays, and case delays, as these are all outcomes related to the subject of interest. Furthermore, characteristics related to both patient demographics and intraoperative care were analyzed and tested for association with the aforementioned outcomes.

2. Materials and methods

2.1. Data source

Data were collected by NACOR from January 2010 to June 2015 and consisted of 26,568,734 records accumulated through the NACOR from more than 100 heterogeneous sources [12,13]. NACOR is a voluntary submission registry with institutions that participate in the sharing of anesthesia-related data and outcomes to evaluate the quality of care both nationally and locally [14]. Deidentified data are abstracted from NACOR on a quarterly basis into the Participant User File (PUF), as a tool for prospective researchers. The PUF includes patient demographics, procedural, facility, and short-term outcome information (when available) from every case performed by the participating anesthesia practice for the indicated period.

2.2. Study sample

The NACOR database provides data related to outcomes for approximately 20% of the total cases from 2010 to 2015. Outcomes reported by practices are aggregated into 47 specific categories; although the AQI promulgates standard definitions for each outcome category, there remains heterogeneity in how any given measure is defined, interpreted, and collected at the local level. For this particular study, cases with the following outcomes were identified based on AQI's data dictionary and analyzed: unplanned admissions (within 48 hours of induction), case cancellation (due to medical, staffing, equipment, or other issues), extended PACU stay (due to medical, staffing, or other issues), and case delays (due to medical, staffing, equipment, or other issues) [15,16].

The methodology of data exclusion is highlighted in Figure 1. Only cases that were performed at medium-sized community hospitals were included in the logistic regression analysis, described below. Medium-sized hospitals are defined as facilities that carry from 100 to 500 hospital beds. Other facility types included in NACOR that were removed from the study included university hospitals, large-sized community hospitals (>500 beds), small-sized community hospitals (<100 beds), specialty hospitals, surgery clinics, and freestanding surgery centers to name a few. We chose to only include medium-sized community hospitals to reduce the heterogeneity inherent in how the above outcome metrics are defined across hospitals. Furthermore, medium-sized community hospitals provide

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