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Unplanned reoperations: Is emergency surgery a risk factor? A cohort study

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ABSTRACT

Background: Unplanned reoperations have been proposed as a quality indicator in surgery but have not been studied extensively, especially concerning risk factors.

Methods: This was a prospective cohort study in a third-level general surgery service. Data regarding patients operated on between July 2007 and February 2008 and followed up for 30 postoperative days were collected. Unplanned reoperations were the primary end point. The secondary end points were 30-d mortality and length of stay. A multivariate logistic regression analysis evaluated the hypothesis that patients operated on in emergency conditions had a greater chance of being reoperated on, after adjusting for relevant covariates.

Results: There was a 5.9% cumulative incidence of unplanned reoperations. Patients operated on in emergency conditions had a 1.79 crude relative risk (RR) (95% confidence interval [CI], 1.15–2.78) of reoperation. Reoperated patients' RR of mortality was 8.94 (95% CI, 6.11–13.07). The mean postoperative hospital stay was 3 d for patients who were not reoperated on and 19 d for those who were reoperated on ($P = 0.00001$). The logistic regression model gave a 2.83 odds ratio (95% CI, 1.65–4.87) for reoperation on emergency patients when adjusted for age, gender, body mass index, American Society of Anesthesiology classification, intraoperative inotropic use, and operation complexity.

Conclusions: Tertiary general surgery service patients had a significantly increased risk of being reoperated on if the initial surgery was an emergency surgery compared with elective surgery. Unplanned reoperations led to a significantly increased mortality risk and a longer postoperative hospital stay, which could be regarded as warning signs in the care of surgical patients.

1. Introduction

Surgical care has provided a source of research regarding the improvement in quality of care; good quality indicators are thus needed for making comparisons. Morbidity and mortality have been the most used indicators for this purpose; however, there has been an urgent search for new indicators during the last decade [1–4]. Unplanned reoperations have been proposed as a quality indicator [5–7] in surgery but have not been studied extensively, particularly concerning risk factors.

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The published data concerning the reoperation incidence (measured as the percentage of patients undergoing a new operation) have shown important variability between different populations, with rates of 2%–20% reported according to definition, institution basal risk, and the services involved [3,8,9]. Most validation studies are based on large databases, although some difficulty is involved in obtaining a reliable numerator or denominator because some databases were not constructed for that purpose [7,10].

Because the unplanned reoperation has emerged as a quality indicator, it has become imperative to validate it and ascertain the risk factors to adjust and predict reoperation rates for particular populations. This study aimed to identify factors (especially emergency surgery) associated with unplanned reoperations in a reference general surgery service using prospective data to avoid the trouble of handling codes and assumptions when estimating reoperations from administrative databases.

2. Methods

2.1. Design

This was a prospective observational analytical surveillance cohort study. It was conducted in the general surgery service of the San Pedro Claver Clinic, a third-level institution in Bogotá (Colombia), attending social security system patients. The clinic has 400 beds and a large emergency service with specialists present in the institution 24 h a day, 7 days a week. The specialties include coloproctology, chest surgery, head and neck surgery, and hepatobiliary and laparoscopic surgery. Breast, peripheral vascular, cardiovascular, and transplantation surgeries are independent services, and their patients were not included in this study. No trauma patients were attended in the clinic.

2.2. Study population

All consecutive patients operated on in general surgery from July 16, 2007, to March 5, 2008, who were aged >17 y and had not been operated on at other institutions or by other services during the previous 30 d were included. Minor procedures specifically superficial lymph node biopsies, closed thoracostomies, and skin biopsies were excluded, as were patients who died during initial surgery. The study form was filled out for all patients within 24 h of the primary or index intervention; it included 38 preoperative and intraoperative variables, such as demographic data, comorbidities, clinical background, laboratory results, American Society of Anesthesiology (ASA) classification, operative time, anesthesia, intraoperative events, wound type, operative bleeding, operative transfusion, anatomical region, and the complexity of the surgery classified on a previously published 1–5 scale, with 5 being the most complex type of operation [11]. The patients were followed up by a trained registered nurse during their hospitalization until discharge. The follow-up was continued until the 30th postoperative day by collecting postoperative consultation data or by phone call. Emergency surgery was the main exposure variable, defined as surgery on a patient who did not appear in the daily surgical program and had been admitted by the emergency service. The primary end point was the incidence of unplanned reoperations during a 30-d window after the operation. Unplanned reoperation was defined as any unscheduled surgery performed on a patient after the index operation. Planned reoperations were excluded (e.g., surgical "second look" in cases of intestinal ischemia or those forming a part of standard management). Interventional radiology procedures, such as percutaneous imaging-guided catheter drainage of collections or endoscopic procedures, were excluded as unplanned reoperations. Mortality and postoperative stay were analyzed as secondary end points. Mortality was defined as death occurring within 30 d of the end of the index surgery. Postoperative stay was defined as the length of time elapsing (in days) from the date of surgery until a patient left the hospital. The decision to reoperate on a patient was made by the attending surgeon, and the study investigators were not involved in that management. Interventional radiology was available in the institution. When a localized fluid collection was diagnosed in the postoperative period, the percutaneous drainage was the first option.

According to the institution's preliminary data and literature data, a sample size of 1303 patients was calculated considering a 5% significance level, 80% power, an expected incidence of unplanned reoperations in elective surgery patients of 2.5%, an expected 2.5 relative risk (RR) of unplanned reoperations in emergency surgery, a 0.65 ratio of emergency to elective surgery, and a 10% follow-up loss rate. The protocol was approved by the Universidad Nacional de Colombia's Faculty of Medicine Ethics Committee and the Institutional Review Board of the Clinica San Pedro Claver in Bogotá.

2.3. Statistical analysis

The Stata 10 statistical program (Stata Corp, College Station, TX) was used for the statistical analyses. Frequencies and percentages were used to describe the nominal and ordinal variables, respectively. The mean, median, and interquartile range were used for continuous variables, according to their distribution. The Mann–Whitney *U* test was used for univariate analyses of continuous variables, and the chi-square test was used for qualitative variables. A backward stepwise multivariate logistic regression and Wald test were performed to find the best model of association between the independent variables and unplanned reoperations, including variables proving significant ($P < 0.05$) in a univariate analysis and those considered clinically important or that had been significant in previous studies. The Hosmer–Lemeshow goodness of fit test was used to test the model. The Universidad Nacional de Colombia's research division in Bogotá financed the study but took no active role in any part of the investigation and had no access to the data.

3. Results

Figure gives a flowchart showing the participants in the cohort; 1607 patients were analyzed (56.6% were female), and the median age was 61 y (range, 18–97). An ASA classification of ≥3 was observed in 31.1% of patients. The most common