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Cardiovascular problems in the post-anesthesia care unit (PACU)

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Abstract:
After receiving anesthesia for a surgery or procedure, a patient is sent to the PACU to recover and wake up. The PACU is a critical care unit where the patient's vital signs are closely observed, pain management begins, and fluids are given. The nursing staff is skilled in recognizing and managing problems in patients after receiving anesthesia. The PACU is under the direction of the Department of Anesthesiology.

Introduction:

Cardiovascular problems in the post-anesthesia care unit (PACU) include hemodynamic instability due to hypotension, hypertension, or arrhythmias, and complications such as myocardial ischemia or decompensated heart failure. Cardiovascular issues are the third most common problem requiring treatment in the immediate postoperative period, after nausea and vomiting or respiratory problems.[1]

The likelihood of cardiovascular problems is related to:

Severity of preexisting cardiovascular comorbidities, Invasiveness of the surgical procedure. Severity of perioperative stresses. In order to achieve the objectives of anesthesia (freedom from pain and anxiety profound muscular relaxation, amnesia, near normal physiologic parameters), drugs which are potentially lethal are administered to patients. Patients then require continuous resuscitative efforts by well-trained anesthetists. In the 1950's the risk of anesthesia considerably exceeded the risk of surgery. During the last several decades, as surgical and anesthetic techniques have improved, intraoperative morbidity and mortality have decreased. This has directed more attention toward the problems and dangers in the post anesthetic period. At the end of surgery, patients remain under the influence of anesthetic drugs, and must also recover from the trauma of the surgical procedure. The duration and severity of post anesthetic risk are dependent on the patient's original condition, nature of the surgical procedure, length of the procedure, drugs used, blood and other vital fluid loss and individual patient responses. During the immediate postoperative period, patients are particularly at risk for adverse circulatory and respiratory events. Events like total airway obstruction with attendant hypoxemia or severe hypotension, can be life threatening. Other adverse events, like mild hypertension or hypoventilation, are associated with only slightly increased risk. In order to minimize risk of adverse events following surgery, a nursing unit with specialized equipment and nursing personnel has evolved, the Post Anesthesia Care Unit (PACU). All patients who have received general or regional anesthesia, are taken to the PACU post-operatively. Patients who received local anesthesia with sedation, experienced an adverse reaction to medications or do not have a room assignment are also admitted to the PACU. The minimum length of stay for a patient in the PACU is determined by the type of anesthesia and operating procedure. For example, minimum stay requirements following simple laparoscopy in a healthy patient is 45 minutes, but following gastric bypass it is two hours.[2]

The introduction of new monitoring equipment and techniques has made a major contribution to PACU efficacy by providing nurses accurate and reliable information on which to base clinical decisions. Current standards call for physiologic variables including blood pressure, temperature, oxygen saturation and heart rate to be continuously monitored. The primary objective of such monitoring is detection of physiologic instability before a life threatening condition emerges.[3]

Discussion:

We studied 157 consecutive PACU patients. Sex, age, weight, height, type of anesthesia , ASA physical status, surgical urgency , procedure acuity, length of surgery, intra-operative vital sign ranges estimated blood loss , intra-operative urine output , presence of invasive monitoring and use of intra-operative narcotics .were extracted from standard hospital records for each patient. In addition level of consciousness, oxygen support and airway support were assessed and

scored by nursing personnel when each patient arrived in the PACU. Upon arrival to the PACU each patient was attached to a standard set of non-invasive monitors. An NIBP unit was used to measuremean arterial, systolic and diastolic blood pressure, and pulse. A physiologic monitor was used to collect ECG heart rate data. A pulse oximeter (N-200.) was used to measure heart rate and oxygen saturation. Nurses recorded data from these monitors in the PACU record. We defined five adverse physiologic events for both the intra-operative and post-operative periods. These events were hypoxia (oxygen saturation < 89), hypertension (systolic blood pressure > 180), hypotension (systolic blood pressure < 180), tachycardia (heart rate > 110), and bradycardia (heart rate < 109). In addition requirement for PACU care for longer than 150 minutes was defined as a problem, "long PACU stay" (LPACUST). The study population was 60.5% female. The characteristics of the population were [mean, ± standard deviation, (range)]: age, 48.0 ± 19.3 years (14-86); weight, 156.3 ± 38.3 lbs (100-292); duration of surgery, 160.4 ± 74.9 minutes (30-411); duration of PACU stay, 77.3 ± 48.5 minutes (8-360). Occurrence rates for PACU problems were hypoxia 35%, hypertension 12%, hypotension 8%, tachycardia 25%, bradycardia 1%, and long PACU stay 11%. More than half of PACU patients experienced at least 1 of the adverse physiologic events. Stepwise discriminant analysis, limited to the five best predictors for each problem, was able to correctly classify at least 90% of patients correctly for hypertension, hypotension and long PACU stay. It correctly classified about 60% of the other problems. [5]

We studied another1838 consecutive PACU patients. We examined the risk of long-term outcome in the PACU with hypertension, tachycardia, bradycardia, or hypotension. Patients in the PACU with hypertension or tachycardia had more unplanned critical care admissions (2.6% and 4.0% vs. 0.2% for patients with no events) and greater mortality (1.9% and 2.3% vs. 0.3% and 0.4%) ($P < 0.01$). For PACU hypertension (rate 2.0%), age, smoking, renal disease, female gender, and angina were significant risk factors. For PACU tachycardia (0.9%), intraoperative tachycardia and dysrhythmia were the major contributors. Patient factors also increased the risk of bradycardia (2.5%); namely age, ASA physical status 1 or 2, and preoperative beta blocker therapy. For hypotension (2.2%), duration of surgery > 2 h, completion after 6 PM, and gynecologic intraabdominal procedures were significant risk factors. Compared to patient, surgical, intraoperative, or PACU observations, anesthetic factors studied (premedication, induction agent, ventilation, use of opioids) provided only a small contribution in predicting these events.[6]

Conclusion:

Hypertension and tachycardia in the PACU, although infrequent, are associated with increased risk of unplanned critical care admission and mortality. Patient, surgical, intraoperative, or PACU observations contribute more to cardiovascular events in the PACU than do differences in anesthetic management identified in this study.

References:

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