Analysis of Anaesthetic Intensive Care Unit Admissions: The Anaesthesiologists' Perspective

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**Citation**


**Abstract**

This study was conducted during the period of January 2005 to December 2006 at Seth G.S. Medical College and K.E.M. Hospital, Parel, Mumbai. The aim of our study was to analyse the Anaesthesia Intensive Care Unit admissions and the challenges encountered in managing these patients. The Anaesthetic Intensive Care Unit is meant for any critically ill patient who needs observation in the perioperative period. Perioperative variables were assessed and the overall outcome of these patients was analyzed. Multiple factors influence the overall patient outcome. The factors which served as significant predictors of Anaesthesia Intensive care unit admissions were males aged more than 60 years, ASA Grading III or IV, abdominal explorations, emergency operations, history of intra operative arrhythmias, major blood loss, hypotension requiring inotropic support. These factors were also significant in predicting an unfavourable outcome which included death of patients or prolonged Intensive Care Unit stay. These factors also constituted a challenge rather than routine Intensive Unit Care.

**INTRODUCTION**

Anaesthetic Intensive Care Unit is meant for patients who are critically ill and who need observation during their perioperative period. Perioperative morbidity is any anaesthesia or surgery related complication which leads to prolonged Intensive Care Unit care and stay. Risk of death associated with anaesthesia is known to depend on a number of factors which may be determined intra operatively. Pre anaesthetic illness of the patients, surgical practice, anaesthesia techniques, experience of surgeons and anaesthetists and duration of anaesthesia could play a vital role in the development of perioperative complications and to comment on the avoidance of such incidents with a view to improve practice.

In recent years, there has been increasing interest in the development of risk assessment in anaesthesia. In order to improve the quality of care in anaesthetic practice by defining either the individual patient at increased risk of anaesthesia or specific areas of anaesthetic practice which account for the more common causes of morbidity and mortality.

Multiple factors influence the overall patient outcome and risk. Early recognition of complications, timely intervention and masterly monitoring is the key to avoid unfavorable outcome. Unfavourable outcome can be prevented with more knowledge, availability of better drugs, techniques and monitoring equipments.

With this background, the present study was undertaken to analyse Intensive Care Unit Admissions and their outcome.

**AIMS AND OBJECTIVES**

1. To analyse the admissions and types of complications encountered in the Anaesthesia Intensive Care Unit.

2. To evaluate the perioperative risk factors, predictors and outcome of Anaesthesia Intensive care Unit patients.

3. Recommendations on the basis of the above findings.

**MATERIAL AND METHODS**

This is a prospective study conducted during a period of two years from January 2005 to December 2006. All the patients who were admitted to Anaesthesia Intensive Care Unit were analysed.

To identify risk factors, patients were divided into three groups.
Group 1 – Informed Admissions: The anaesthesiologist decides pre operatively that anaesthesia intensive care unit admission would be required.

Group 2 – Uninformed Admissions: The admissions were not anticipated, but critical care was required due to unexpected complications arising in the perioperative period.

Group 3 – Post surgical Admissions: Patients who were admitted to the anaesthesia Intensive Care Unit forty eight hours after the primary surgery.

**INCLUSION CRITERIA**

- All patients who needed observation, ventilatory support in the postoperative period.
- All patients who needed Anaesthesia Intensive care in view of compromised hemodynamic and metabolic status.
- Patients with postoperative complications arising more than forty eight hours after primary surgery.

Exclusion criteria: Paediatric, cardiac and neurosurgical patients in view of separate intensive care unit.

Postoperative review of every patient was carried out to determine the cause for post operative admission in the uninformed group. These patients were further divided into four major categories:

Category 1: Related to central nervous system
- Unexpected depressed level of consciousness
- New cerebrovascular accident.

Category 2: Related to cardiovascular system
- Pulmonary Edema
- Prolonged hypotension requiring inotropic support
- Arrhythmias
- Cardiac Arrests

Category 3: Related to respiratory system
- Respiratory depression
- Low pO2, high pCO2

Category 4: Related to metabolic system
- Fluid disturbances
- Electrolyte imbalances

**OBSERVATION AND RESULTS**

This study involves 207 patients who were admitted to anaesthesia intensive care unit during the period of the study.

For systematic analysis, the following factors were considered:

- Pre operative evaluation
- Operative variables
- Anaesthesia Intensive Care Unit admissions
- Outcome of patients

Each factor was further analysed as follows:

Preoperative variables: This factor was studied with respect to age and sex of the patients and American Society of Anaesthesiologists' [ASA] physical status of the patient.

As per demographic data:

**Figure 1**

<table>
<thead>
<tr>
<th>Age</th>
<th>Mean age</th>
<th>60 + 70 years</th>
<th>Fig 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>Male</td>
<td>55.4%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>45.6%</td>
<td></td>
</tr>
<tr>
<td>Physical status</td>
<td>ASA III</td>
<td>37.2%</td>
<td>Fig 2</td>
</tr>
<tr>
<td></td>
<td>ASA IV</td>
<td>42.2%</td>
<td></td>
</tr>
<tr>
<td>Operative variables</td>
<td>General surgery</td>
<td>62.2%</td>
<td>Fig 3</td>
</tr>
<tr>
<td></td>
<td>Orthopedic trauma</td>
<td>20.8%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>16.9%</td>
<td></td>
</tr>
<tr>
<td>Anaesthesia techniques used</td>
<td>General anaesthesia</td>
<td>32.6%</td>
<td>Fig 4</td>
</tr>
<tr>
<td></td>
<td>Regional anaesthesia</td>
<td>24.5%</td>
<td></td>
</tr>
<tr>
<td>Nature of surgery</td>
<td>Emergency</td>
<td>57%</td>
<td>Fig 5</td>
</tr>
<tr>
<td></td>
<td>Elective</td>
<td>43%</td>
<td></td>
</tr>
<tr>
<td>Nature of admission</td>
<td>Uninformed</td>
<td>95.7%</td>
<td>Fig 6</td>
</tr>
<tr>
<td></td>
<td>Informed</td>
<td>4.3%</td>
<td></td>
</tr>
<tr>
<td>Outcome</td>
<td>Discharged</td>
<td>95.5%</td>
<td>Fig 10</td>
</tr>
<tr>
<td></td>
<td>Death</td>
<td>4.5%</td>
<td></td>
</tr>
<tr>
<td>Cause of Death</td>
<td>Cardio pulmonary arrest</td>
<td>65.6%</td>
<td>Fig 11</td>
</tr>
<tr>
<td></td>
<td>Acute respiratory distress syndrome</td>
<td>17.2%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Acute renal failure</td>
<td>17.2%</td>
<td></td>
</tr>
</tbody>
</table>

I. Pre operative evaluation:

Age and Sex:
II. Operative variables: This factor was studied with respect to the following:

Surgical procedures

b) Anaesthetic technique:

III. Intensive care unit admissions: This factor was analysed as follows:

b) Uninformed intensive care unit admissions:
c) Patients admitted for Post surgical events:

6 patients out of 207 total patients came to Anaesthesia Intensive Care Unit after 48 hours of primary surgery for Intensive Unit Care.

d) Length of Intensive Care Unit stay:

Figure 9
Figure 9: Length of AICU stay

e) Outcome:

Figure 10
Figure 10: Outcome

f) Cause of death:

i) Nature of admissions in relation to age:
DISCUSSION

Considering that India is a developing country, the cost factor in patient care is always prohibitive. The cost of stay in anaesthetic intensive care unit is 3-4 times more expensive than ward care. Hence, though we know that the value of a human life can not be measured in terms of money, we can reduce the anaesthesia intensive care unit admissions and thereby the cost of health care, by careful patient selection, so that the sophisticated care gets available to those patients who need it the most. Thus, the patients eligible for anaesthetic intensive care unit admission have to be carefully selected.

PRE OPERATIVE PATIENT CHARACTERISTICS:

Age and sex: The maximum numbers of admissions were for the older age group more than 60 years and males aged more than 60 years accounted for the majority of the cases. This is a well established fact. Males have more co existing diseases in comparison to females. The morbidity and mortality was high in elderly surgical patients. The reason behind this might be the fact that multi organ functional reserve reduces with age and associated medical problems. The common causes of morbidity in elderly are Hypertension, Diabetes Mellitus, Coronary Artery Disease, Chronic renal, hepatic, pulmonary disorders and metabolic derangements in sequence, all of which increase the risk of anaesthesia inspite of medical therapy.

ASA grading: Admissions of patients with poor physical status and poor ASA grading based on the severity of systemic illness increases the chances of intensive care unit admissions as shown in our study.
OPERATIVE VARIABLES

Surgical procedures: Those procedures associated with general surgery increases the risk of morbidity and mortality. Maximum number of patients were operated for abdominal explorations as compared to other surgical branches like orthopedic, plastic, obstetric, gynaecological procedures. Moreover, the surgical determinants of perioperative morbidity have been shown to be associated with major procedures, especially abdominal surgery. 

Anaesthesia technique: Leigh and Tytler have said that greater vigilance on the part of the anaesthesiologist can prevent most of the complications arising because of anaesthesia or during anaesthesia. In our study, 97.6% of the total 207 patients admitted to anaesthetic intensive care unit in the post operative period had been administered General anaesthesia, while only 1.9% of patients had been administered regional anaesthesia for surgery. Worldwide, the best anaesthetic technique is controlled balanced anaesthesia with General anaesthesia, though it has controversies. In a study of Cohen et al of 100,000 anaesthesia regimens performed in Canada, the choice of anaesthesia did not provide any additional prognostic information for predicting mortality beyond that of patient disease and the surgical procedure. However, there has been a series of randomized controlled trials that demonstrate improved outcome of regional anaesthetic technique as compared with General anaesthesia.

Nature of surgery: All patients undergoing major or emergency surgery have an increased risk of severe adverse outcomes, including increased mortality. Emergency surgery has an additional risk because the preparation of the patient is not optimum. There is minimal time for correctable majors like correction of electrolyte imbalance, blood parameters, dehydration and acidosis, and the patient is in a compromised health status. In our study, out of 207 patients, 118 (67%) were emergency cases. Increased vigilance and help for the anaesthesiologist should be taken care of in emergency situations by the administrative authorities. Duration of anaesthesia may reflect the severity of underlying surgical diseases because a major surgery and longer duration of anaesthesia may change the physiology and have an adverse effect on outcome.

Intensive care unit admissions: In our study 198 (95.7%) patients out of the total number of post operative intensive care unit admissions were informed prior and the remaining 9 (4.3%) admissions were uninformed. The reasons for uninformed admissions were multifactorial. We found that respiratory disturbances accounted for 22.2%, cardiovascular disturbances for 33.3% and central nervous system disturbances for 44.5%. Keith Rose and colleagues also found that respiratory events were the main reason for uninformed critical care admissions and ventilatory management. Swann et al have studied the rationale of predictability and preventability of unplanned intensive care unit admissions.

Duration of intensive care unit stay: Anaesthesiologists have considered intensive care unit stay on the basis of ASA physical status, medical illness, expected blood loss, duration of anaesthesia, need of ventilatory support, airway problems and other expected complications. Intra operative complications like major blood loss, presence of arrhythmias, and hypotension with inotropic support were found in both informed and uninformed groups, elective and emergency groups. Keith Rose et al have noted that if percent oxygen saturation is less than 90% pre operatively, mechanical ventilation is required and post operative intensive care unit admission rate is 2.2%. David Swann and colleagues also reported post operative admission rate of 1.4 % for mechanical ventilation in both planned and unplanned groups.

OUTCOME

Forrest et al said that the major risk factors were cardiovascular, thoracic and abdominal surgery, history of cardiac failure, myocardial infarction or hypertension, age more than 50 years, ASA physical status III or IV. In our study, the major risk factors were emergency and abdominal surgeries. Pederson et al have done a prospective study of mortality associated with anaesthesia and surgery – risk indicators of mortality in hospital – the risk of death associated with anaesthesia is known to depend on a number of factors which may be determined intra- or pre operatively. Derrington and Smith et al have studied anaesthetic risk, morbidity and mortality.

The number of patient at increased risk of anaesthesia is reducing because of improved quality and care in anaesthetic practice. 27 patients in our study were admitted to the anaesthesia intensive care unit for intensive monitoring alone and did not receive any intervention. This is of the same order as the 20-40% incidence of low risk monitoring admissions reported by other intensive care units.

Intermediate care area means those patients are admitted
who need low risk monitoring so the occupancy of anaesthesia intensive care unit beds will be reduced and will be available for the high risk patients. 

**CONCLUSION**

The predictors for post operative intensive care unit admissions are (1) Males aged more than 60 years; (2) ASA grading III or IV; (3) Explorations and abdominal surgeries; (4) Emergency surgeries; (5) Intra operative arrhythmias, major blood loss, hypotension, and if patient is on inotropic support. As age advances chances of ICU admission and complications are more.

Intermediate care area is recommended for observation.

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**References**

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