# THE INCIDENCE OF CRITICAL INCIDENTS AND OPERATIVE MORTALITY IN A CEE CLASS HOSPITAL

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## ABSTRACT

***Objective:*** To determine the incidence of critical incidents and operative mortality in a CEE Class (100 bedded) Hospital and to set reference values to assess quality of anesthesia related health care in future.
***Study Design:*** A retrospective study.
***Place and Duration of Study:*** This study was carried out in the Department of Anesthesia and Pain Management, Pakistan Air Force Hospital Sargodha, and retrospective data of all surgical patients from Jan 2014 to Dec 2015 were studied.
***Material and Methods:*** Two year data of all surgical patients including gynecology, obstetrics, otolaryngology, ophthalmology, orthopedics, psychiatry and emergency surgery were included in the study. Patients' documents were evaluated retrospectively for any critical incident and operative mortality and to determine whether anesthesia solely was responsible for the adverse event or patient co-morbid condition had any contribution.
***Results:*** During the two year study period 20,293 patients were given either general or regional anesthesia. Out of these 20,293 patients, critical incidents were reported in 14 cases (0.06%) with complete recovery in 12 (0.05%) patients. Mortality occurred in 2 (0.009%) cases.
***Conclusion:*** Anesthesia continues to be associated with morbidity and mortality despite the advancements made in equipment, monitors and drugs. This article may prove as reference for anesthesia related critical incidents and mortality in Pakistan.

**Keywords:** Anesthesia, Complications, Critical Incidents, Mortality.



## INTRODUCTION

There have been no convincing data available to determine anesthesia related morbidity and mortality in Pakistan. Pakistan Air Force (PAF) Hospital Sargodha is a newly recognized teaching hospital by Pakistan Medical and Dental Council for imparting training in Member of the College of Physicians and Surgeons Pakistan (MCPS) Anesthesia and is a referral hospital of PAF. The rate of complications is more in a teaching hospital as compared to other hospitals where well trained staff and doctors are responsible for the conduct of anesthesia. The paucity of anesthesia related mortality studies is due to one of the following reasons[1]: first, due to improvement in anesthesia, anesthesia-related deaths are now rare events; and to study rare events requires large sample sizes and considerable resources. Second, there is no established national surveillance data system for monitoring anesthesia mortality. Last but not the least, clinical practice of anesthesia has expanded to such an extent that it is extremely difficult to collect exposure data from different disciplines of surgery. A wide range of anesthe sia related mortality rates are mentioned in the literature due to differences in methodologies and operational definitions[2]. Furthermore it has been demonstrated that poor practical application rather than lack of knowledge leads to critical incidents.

The aim of this study is to determine the incidence of critical incidents and operative mortality in a CEE class (100 bedded) hospital and to set reference values to assess quality of anesthesia-related health care in future and to compare it with data in developed countries for

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improvement in standards of anesthesia care in this hospital.

The objectives of this study were; to study how continuous presence of a trainee anesthetist affects safety of the patients, what are the causes of critical incidents during anesthesia in a teaching hospital, and to calculate and compare morbidity and mortality during anesthesia and surgery in PAF hospital Sargodha with national and international statistics.

**Operational Definitions**

Anesthesia related mortality is defined as death under, as a result of, or within 24 hours of an anesthetic. OR

"Anesthetic death" is often defined as the death of a patient who has had an anesthetic, within 24 hours of the procedure.

Critical Incident is defined as an event under anesthesia care which had the potential to lead to substantial negative outcome (ranging from increased length of hospital stay to permanent disability or canceled operative procedure) if left to progress.

## MATERIAL AND METHODS

This study was carried out at Pakistan Air Forces Hospital Mushaf, Sargodha. Two year record of all surgical patients including emergency surgery was obtained after taking permission of hospital ethical committee. As it was a retrospective study, consent of the patients was not required. Inclusion criteria of the study were patients between the age of 2 months to 80 years of both sexes and ASA class I to IV-E, being given either general or regional anesthesia. Exclu- sion criteria included patients with severe stenotic valvular heart disease and congestive heart failure presenting for elective surgery, patients with deranged coagulation profile and moribund patients with ASA class V.

PAF Hospital Mushaf, Sargodha is a CEE class (100 bedded) teaching hospital of Air-force with Department of general surgery, anesthesia, medicine and gynecology/obstetrics recognized by College of Physicians and Surgeons of Pakistan (CPSP) for fellowship and membership training. The surgical patients included in the study belonged to general surgery, orthopedics, pediatrics, otolaryngology, ophthalmology, gynecology and obstetrics and patients of psychiatry undergoing electroconvulsive therapy. Patients were selected by non-probability purposive sampling technique.

As per standing operating procedure (SOP) of anesthesia department, on arrival of patients in operation theater in pre-operating room, patients' documents were checked, investigations reviewed and brief pre-anesthesia assessment was made before proceeding with anesthesia and surgery. In the operating room, intravenous line was secured by passing 18 G IV cannula. Essential monitors were attached and vital signs were plotted on anesthesia proforma and included pulse oximetry, non invasive blood pressure monitoring (NIBP), electrocardiogram (ECG) and capnography.

A second year resident anesthetist was continuously present and was directly responsible in each operation theater for the smooth conduct of anesthesia and was indirectly being supervised by consultant anesthetist. At this time, it was not known to the resident nor the consultant that the patient's documents would be reviewed, so as per standing operating procedure each resident was told in the initial phase of his/her training to be vigilant and document any critical incident, if at all happens, in the patient's document along with its management done at that critical time.

All the patients recovering from anesthesia were shifted to post anesthesia care unit (PACU) where they were monitored and supplemental oxygen was given. All the patients were then shifted to either intensive care unit or post-operative ward depending on the condition of the patients. Data was analyzed in SPSS version 19. Frequency and percentages were calculated for the data.

## RESULTS

During the two year study period 20,293 patients were given either general or regional

anesthesia. Out of these 20,293 patients, critical incidents were reported in 14 cases (0.06%) with complete recovery in 12 (0.05%) patients as shown in table-I & II.

Mortality occurred in two cases out of total of 20,293 cases (0.009%). Morbidity and mortality figures are depicted in table-I.

One patient who developed pulmonary edema was managed conservatively and she did not have to be placed on ventilatory support but had to stay in hospital for five days before being discharged and was counseled for follow up in medical out patient department. She was given spinal anesthesia for vaginal hysterectomy. The other patients in whom critical incidents occurred were managed on the spot in the operation theater with no residual morbidity.

Two patients died during the period of two years, one patient had mesenteric vessels infarct, was of old age of 70 years and had co-morbid diseases like diabetes and hypertension and was in septicemia. The patient died 6 hours after prolonged surgery of 5 hours duration. In this case anesthesia was partially responsible for mortality as anesthesia is a high risk activity.

The second patient was a known case of ischemic heart disease, diabetes and hypertension with ejection fraction of 40%. High risk consent was obtained and she was anesthetized for emergency surgery for perforated appendix. She developed fatal pulmonary edema unresponsive to medical management including ventilatory support and died within 18 hours after surgery. As she had fairly stable cardiovascular status, anesthesia may be solely responsible for mortality. The case was discussed in the hospital audit meeting and diabetic nephropathy was pointed out as the cause of non compliance of the patient.

**Table-I: No of morbidity and mortality cases.**

| S. No | Critical incidents | No. of cases | Percentage | Morbidity with remarks | Mortality No. of Cases |
|---|---|---|---|---|---|
| 1 | Failed intubation | 2 | 0.009 | Yes, patient awoken and surgery canceled | - |
| 2 | Pulmonary edema | 2 | 0.009 | Yes, out of two, one patient recovered completely | 1 |
| 3 | Myocardial infarction | 1 | 0.0049 | Yes, managed, discharged from hospital | |
| 4 | Cardiac arrest | 1 | 0.0049 | Yes, could not be revived | 1 |
| 5 | Anaphylactic reaction | 1 | 0.0049 | Yes, managed promptly | |
| 6 | Drug over dose | 2 | 0.009 | Yes, recovered completely | |
| 7 | Hypotension | 2 | 0.009 | May be Effects of spinal anesthesia, managed | |
| 8 | Bradycardia | 2 | 0.009 | Managed with atropine | |
| 9 | Wrong labeling | 1 | 0.0045 | Yes, managed | |

**Table-II: Summary of Critical incidents and mortality.**

| S. No | No. of cases | Critical incidents | Mortality |
|---|---|---|---|
| 1 | 20293 | 14 | 2 |

## DISCUSSION

Anesthesia is a high risk medical profession[2]. There is usually little interaction between anesthetist and the patients who are mostly unaware of risks involved. Anesthesia related deaths are mostly due to drug overdose 46.6% followed by adverse effects of anesthetic agents in therapeutic dose 42.5%. In one Brazilian study[2], peri-operative mortality during the period 1982-1984 was 10 per 10,000 anesthetics. Adverse effects of drugs occur more frequently in anesthesia as compared to other fields of medicine[2]. To

avoid these mishaps, it is important that drugs should be prepared by the anesthetist himself or the nurse anesthetist and properly labeled. Checking of the equipment and monitors and care of the patient during induction, maintenance and recovery phase of anesthesia is of prime importance to reduce chances of mishap. Mortality triggering factors may be related to patient disease, surgical procedure or anesthesia itself[3]. Furthermore, higher peri-operative mortality has been reported in patients who underwent general anesthesia as compared to regional anesthesia.

Anesthesia related mortality in most developed countries is <1 : 50,000 anesthetics[4] while death attributable to anesthesia alone was 0.05 per 10,000 anesthetics. In our study, mortality was 1 : 10,000 anesthetics as 2 patients died in a total of 20,293. In one study conducted in 1989, perioperative death rate solely due to anesthesia was approximately 0.001% for healthy persons[5]. Death associated with anesthesia procedure is rare and varies between 0.1 to 0.9 per 10,000 anesthetics. Higher rate up to 3.4 has been reported from under-developed countries[6]. The contribution of anesthesia towards patient mortality should be discussed to enable improvement in patient safety and quality of anesthetic care. Patient safety can be improved by learning from lessons from incidents and near misses, rather than by not accepting that they actually happened[7].

Patient safety is one of the greatest challenges in health-care[8]. In the operating room errors are frequent and often consequential. Very little data is available to determine anesthesia related critical incidents and mortality due to fear of legal issues. Residents and consultants usually do not document critical events in real terms in patients' documents to avoid litigation[9]. Factors associated with high mortality include advancing age, higher ASA status, emergency surgery and complex surgical procedure[5]. In fact anesthesia related critical incidents and deaths are usually due to one of the following causes[5];1) circulatory failure due to hypovolaemia in combination with overdosage of anesthetic agents 2) hypoxia or failed intubation or equipment failure or aspiration of gastric content, 3) anaphylactoid reac- tions and 4) human negligence or error of judgment. Preventable factors include human error, inadequate preoperative preparation, improper postoperative care and lack of supervision by the senior doctors[10].

Anesthetic death is a very stressful event experienced by the anesthetist[5]. It is not only on emotional trauma for any anesthetist to loose a patient on the operation table but it also affects his professional competence. Furthermore, relatives of the patient react in hostile manner and may seek litigation against the anesthetist. It is therefore important to have pre-anesthesia visit of the patients so that queries of the patient and attendants are addressed before anesthesia and risk explained[11].

Continuous monitoring of the patients and timely intervention helps avoid complications and long term morbidity[12]. Pulse oximetry is used extensively in the perioperative period and might improve patient outcomes by enabling early diagnosis and, consequently, correction of perioperative events that might cause postoperative complications or even death[13]. All the patients in this study who developed critical incident were managed timely due to the presence of dedicated resident and trained staff who were quick enough to timely respond in appropriate manner as per internationally accepted protocol to manage such critical events[13]. Consultant anesthetist was always available for care of all the patients. In fact there is a well established relationship between volume of work and outcomes in health care, particularly for surgery. A high patient volume and turnover might impede the provision of high quality care to the patients[14]. Higher mortality rate in under-developed countries may not only be due to lack of qualified anesthetist and trained staff but it may be attributable to electricity breakdown during surgery, lack of proper equipment and resuscitative monitors and drugs[15]. Thus all out efforts should be made not to compromise on patient safety by strictly adhering to continuous monitoring of the patients for best anesthetic care[11]. Population-based cohort studies that

strictly include all episodes of disease occurring in residents of a geographically defined region are commonly accepted as the optimal design for such purposes. However, these designs have rarely been used in the critical care medical literature[16]. It should be recognized, however, that although studies that suffer from such selection bias may provide useful clinical information, results should not be generalized to unlike patient cohorts, and rarely, if ever, to the population as a whole[17,18].

## CONCLUSION

Anesthesia continues to be associated with morbidity and mortality despite the advancements made in equipment, monitors and drugs. This article may prove as reference for anesthesia related critical incidents and mortality in Pakistan.

## CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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