



THE AGA KHAN UNIVERSITY

eCommons@AKU

Department of Anaesthesia

Medical College, Pakistan

January 2006

# Unplanned prolonged postanaesthesia care unit length of stay and factors affecting it

Khalid Samad  
*Aga Khan University*

Mueenullah Khan  
*Aga Khan University*

Hameedullah  
*Aga Khan University*

Fauzia A. Khan  
*Aga Khan University*

Mohammad Hamid  
*Aga Khan University*

*See next page for additional authors*

Follow this and additional works at: [http://ecommons.aku.edu/pakistan\\_fhs\\_mc\\_anaesth](http://ecommons.aku.edu/pakistan_fhs_mc_anaesth)



Part of the [Anesthesiology Commons](#)

## Recommended Citation

Samad, K., Khan, M., Hameedullah, ., Khan, F., Hamid, M., Khan, F. (2006). Unplanned prolonged postanaesthesia care unit length of stay and factors affecting it. *Journal of Pakistan Medical Association*, 56(3), 108-112.

**Available at:** [http://ecommons.aku.edu/pakistan\\_fhs\\_mc\\_anaesth/100](http://ecommons.aku.edu/pakistan_fhs_mc_anaesth/100)

---

**Authors**

Khalid Samad, Mueenullah Khan, Hameedullah, Fauzia A. Khan, Mohammad Hamid, and Fazal Hameed Khan

## **Unplanned Prolonged Postanaesthesia Care Unit Length of Stay and Factors affecting it**

Khalid Samad, Mueenullah Khan, Hameedullah, Fauzia A. Khan, Mohammad Hamid, Fazal H. Khan  
Department of Anaesthesia and Intensive Care, Aga Khan University, Karachi.

### **Abstract**

**Objective:** To identify the factors that prolong the length of stay in the post anaesthesia care unit (PACU).

**Methods:** This audit was conducted in the PACU of a university hospital. A special form was designed and filled for those patients who stayed unplanned in the PACU for more than two hours. All patients who were admitted to the PACU after surgery were included. Patients undergoing cardiothoracic surgery, those directly shifted to ICU and cases done under local anaesthesia were excluded. Data was collected for 20 months by a designated recovery nurse for all included patients including those admitted outside the scheduled surgery hours.

**Results:** The total number of patients who were admitted to the PACU during the audit period were 13644, out of these 1114 (8.1%) stayed in the PACU for more than 2 hours. The percentage of overstay patients on monthly basis ranged from 6.4% to 10%. The commonest reason was the need for postoperative monitoring 578 (51.8%), unavailability of beds in the special care areas 264 (23.7%), pain management 68 (6.1%) and 61 (5.4%) for postoperative ventilation.

**Conclusion:** Our results show that majority of patients stayed in the PACU for more than two hours either because they needed postoperative monitoring or because of unavailability of bed in the special care areas. (JPMA 56:108;2006).

### **Introduction**

Postanaesthesia care units (PACU) were established in 1923 with the primary objective to reduce postoperative morbidity and mortality<sup>1</sup>. All modern operating rooms now have designated areas where patients are routinely observed postoperatively. The continuous evaluation and specialized care in PACU's does not come free and excessive length of stay in this area can contribute to increasing health care expenses.

Quantifying factors that can prolong length of stay (LOS) in the PACU is difficult because appropriate and average discharge times have not been established. There is no agreement among institutions and no literature that describes an ideal PACU LOS based on objective patient variables. Nevertheless LOS in PACU has been used as a clinical indicator<sup>2</sup> and there are several studies that measure PACU length of stay as a secondary outcome when comparing different anaesthetic techniques in similar population undergoing specific procedures.<sup>3,4</sup>

We conducted a prospective observational study to identify factors that contributed to an unplanned prolonged stay in our PACU. Our secondary objective was future planning for accommodation, equipment and staffing in the PACU.

### **Patients and Methods**

This prospective observational study was conducted as part of our continuing quality improvement programme at the Aga Khan University Hospital, Karachi, Pakistan, a

500 bed tertiary care hospital. The main operating room suite has eight operating rooms attached to a 10 bedded PACU. Approximately 9000 patients pass through the general PACU each year, another 1000 patients are sent directly to neonatal, cardiac or general intensive care units. All patients bypassing the PACU were excluded. Patients operated in the surgical day care unit and obstetric suite were also excluded because these areas have their own PACU.

Our PACU is staffed around the clock. The nurse to patient ratio varies from 1: 1 to 1: 3, depending on staffing, patient condition and load according to the laid down criteria. A designated anaesthesia resident is available in the PACU at all times. We routinely use Aldrete Scoring System for discharging patients from our unit, patients are assessed every 15 minutes and kept in recovery until the score is equal to or greater than 9.5. After stabilization in the PACU, patients are discharged either to special care units or to the ward depending upon their status. The hospital had 10 surgical, five pediatric and two obstetrics and gynecology special care beds when we started conducting this audit.

A booking register is maintained by the nurse incharge of the PACU and prior bookings can be made by the surgical and / or anaesthesia teams preoperatively for patients who are expected to have a prolonged stay in the PACU postoperatively.

Before conducting the audit PACU LOS was predefined as the time from the patient's admission to

postanaesthesia care unit, to the time that the patient left the unit as recorded by the postanaesthesia care unit nurse. PACU nursing staff was asked to fill a specifically designed form for every patient whose length of stay in the recovery exceeded two hours and where no prior booking had been received. This included non surgical patients requiring ventilation because of unavailability of beds in intensive care unit. Data collection was around the clock including weekends. Data collection included type of surgery and anaesthesia, American Society of Anesthesiology (ASA) status of the patient and documentation of reasons for staying longer than 2 hours. Data was tabulated monthly by the principal auditor. Collected data was presented on a four monthly (R) basis at the departmental quality assurance meeting to look at the trends. We are presenting the results of the audit for the first 20 months. Based on the data of first eight months the number of special care beds were increased to twenty for surgical patients and ten for pediatric patients.

### Statistical Analysis

Four monthly data was analyzed by calculating means and percentages to see the trends and Chi-square test was applied to test level of significance before and after expansion of beds in special care units. A p-value of <0.05 was considered to be significant.

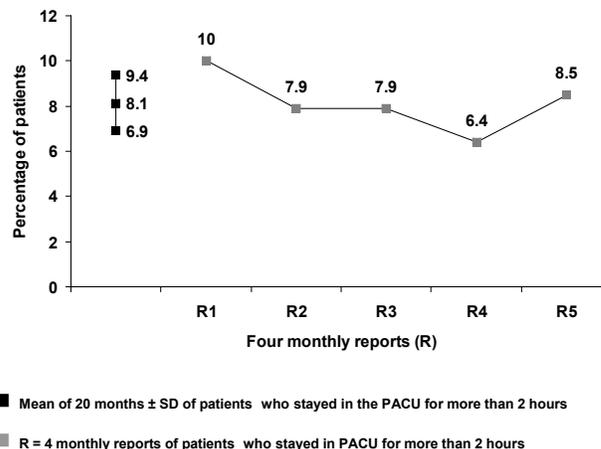
### Results

During the audit period of twenty months 13,644 patients passed through our recovery room. One thousand one hundred and fourteen (8.1%) stayed in the PACU for more than 2 hours without any prior booking. The percentage of overstay patients on monthly basis ranged from 6.4% to 10%. Graph 1 shows the trends of five four monthly reports and its variation (mean  $\pm$  SD). Ninety eight percent of overstay patients underwent general anaesthesia, 0.75% received monitored anaesthesia care, 0.84% spinal anaesthesia and 0.37% of the patients had epidurals in situ. Nine percent were ASA I, forty percent ASA II, thirty six percent ASA III, thirteen percent ASA IV and 0.53% ASA V.

The reasons documented for overstay in the PACU are given in Table 1. The largest group of patients who overstayed was due to additional monitoring requirement, these were 578 (51.8%). The other large group was due to unavailability of beds in the special care areas 264 (23.7%). Sixty eight patients (6.1%) needed supervised pain management and 64 (5.7%) were due to delayed emergence from regional block. Sixty one (5.4%) needed postoperative ventilation which was unplanned and 17 (1.5%) non surgical patients were ventilated in PACU because of nonavailability of critical care unit beds.

The other reasons e.g., delayed emergence from general anaesthesia, surgical complications, delay in signout because of unavailability of personnel etc. accounted for

Graph 1. Prolonged unplanned stay (> 2 hours) in PACU.



5.4%. There was a significant decrease in the number of overstaying patients after expansion of special care units P value < 0.05 (Table 2).

### Discussion

The purpose of the PACU is to provide care for the patients until they can safely be discharged to a general ward or home in an awake and stable condition, or transferred to a special care unit or intensive care unit (ICU) if further close monitoring and care is necessary. If adequate standards of care are not provided serious complications can occur.

PACU care incorporates expensive space, staff, and equipment. Admission and discharge policies determine how many PACU admissions will occur, and what PACU resources the average admission will consume. Level of routine monitoring provided affects capital expenditure for equipment and operating expenditure for disposables. Mix of nursing staff (e.g., amount of training and experience; salaries and benefit levels) and staffing ratios (e.g., number of patients per caregiver, number of support staff) determines the personnel cost to provide PACU care. The type of physician coverage e.g. dedicated versus on-demand coverage and response times determines efficiency of care. Patient mix affects expenditures for staffing and for equipment, including monitors, intravenous pumps, and ventilators. Administration of standard therapy like oxygen, antiemetics, respiratory therapy increases the expenditure per patient for drugs and disposables, and can add to the staffing resources required per patient.<sup>6</sup> It is therefore important that the LOC in PACU be kept to minimum.

We took two hours stay in PACU as our benchmark time because studies have shown that majority of the patients achieve a satisfactory discharge score during the first two hours after conclusion of surgery.<sup>2,5</sup>

**Table 1. Reasons for discharge delay from PACU beyond two hours**

Four Monthly Reports					
Variables	R1	R2	R3	R4	R5
Postoperative monitoring	120 (43.4)	73 (35.6)	142 (59.6)	118 (64)	125(59.2)
Unavailability of beds in ICU/CCU/SCU	65 (23.5)	87 (42.4)	51 (21.5)	32 (17.3)	29 (13.7)
Pain management	25 (9.0)	6 (2.9)	11 (4.6)	10 (5.4)	16 (7.5)
Delayed recovery from Subarachnoid block	21 (7.6)	8 (3.9)	16 (6.7)	3 (1.6)	16 (7.5)
Postoperative ventilation	12 (4.3)	13 (6.3)	10 (4.2)	13 (7.0)	13 (6.1)
Delayed recovery from general anesthesia	8 (2.8)	2 (0.9)	5 (2.1)	2 (1.0)	2 (1.0)
Non surgical patients for ventilation	5 (1.8)	5 (2.4)	1 (0.4)	3 (1.6)	3 (1.4)
Cardiovascular complications	7 (2.5)	1 (0.4)	--	1 (0.5)	--
Anesthetist busy/ delay in signing out	5 (1.8)	1 (0.4)	--	2 (1.0)	--
Surgical complications	1 (0.3)	1 (0.4)	--	--	3 (1.4)
Respiratory complications	3 (1.0)	2 (0.9)	--	--	--
Blood Transfusion	1 (0.3)	--	1 (0.4)	--	2 (0.9)
Delay in Transfer	--	2 (0.9)	--	--	--
Surgeon busy	1 (0.3)	1 (0.4)	--	--	--
Staff busy	--	2 (0.9)	--	--	--
Delay in investigations/ X-rays	1(0.3)	--	--	--	1(0.4)
Preoperative resuscitation	--	1 (0.4)	--	--	--
File not available	1(0.3)	--	--	--	--
Nausea and vomiting	--	--	--	--	1(0.4)
Over flow critical care	--	1 (0.4)	--	--	--

R - Four monthly reports. CCU - Coronary Care Unit.  
 ICU - Intensive Care Unit. SCU - Special Care Units.

**Table 2. Effect of expansion of special care beds on the patients staying in PACU for more than two hours**

	Pre expansion (%)	Post expansion (%)	P Value
Period of data collection	8 months	12 months	
Total number of Patients	5358	8286	
Patients who stayed in PACU for more than 2 hours	482 (8.9)	632 (7.6)	< 0.05

first two hours after conclusion of surgery.<sup>2,5</sup>

Seago et al conducted an observational study to identify indicators for prolonged length of stay (LOS) in the postanaesthesia care unit (PACU) and correlated it to patients age, pain medication administration at the time of PACU admission, length of surgery, and cardiovascular, pulmonary, and pain responses postoperatively. Patient history and postoperative symptoms predicted only a small percentage of prolonged PACU stays. Organizational factors were more important predictors.<sup>7</sup>

Our study documents the factors which delay the

PACU discharge time to more than two hours at a tertiary academic centre. The results of our study show that seventy five percent of the patients stayed unplanned in the PACU either because of unavailability of bed in special care unit or ICU or for need of postoperative monitoring.

Fifty two percent of the patients required postoperative monitoring for more than two hours. Extended monitoring was indicated either because of the general medical status, extent of surgery or some intraoperative complication. There is a need to study this particular group further and identify and quantify the root causes which may extend beyond the simple reasons cited above. Such patients should be identified at the early preoperative stage and there should be proper communication of this decision to the recovery staff. After eight months of starting this audit, three more five bedded special care units were opened to overcome the problem of unavailability of beds, but there may be genuine requirement for increasing the special care beds further.

The second large group of twenty four percent patients were those who needed special care beds including critical care and were kept in PACU till a patient was transferred from those areas and a bed became available. Even if a bed was available in the areas sometimes the simple logistics of staff communication and hospital

beurocracy prevented earlier transfer of these patients. We also plan to look at the root causes of this group in a prospective manner in order to make some valid recommendations. The need to further increase special care beds will be based on this. These patients did not include those who needed postoperative ventilation where the decision was made by the anaesthetist after the start of the case. These patients accounted for 5.4%. Another 1.5% were medical patients who were ventilated in the PAC due to unavailability of critical care beds.

The issue of PACU admission due to bed overflow in critical care areas is poorly reported in the medical literature. Ziser et al have recently published an editorial on this topic<sup>8</sup>. Physician coverage was the most challenging issue described in these reports, this is also one of the major issues at our hospital because no dedicated consultant is assigned to this area. Other problems include nurse staffing, patient safety and privacy and documentation. The operating theatre is a protected area where a minimum number of people are expected to visit. For critically ill and trauma patients who stay for a longer period of time in the PACU, we cannot ignore the family's need to visit. This might become a major problem when the patient is not expected to survive beyond a few hours. At times, several family members insist on visiting their critically ill relative. This situation of dying patients and bereaved families has a direct negative influence on other PACU patients and their families. The issue assumes greater importance in eastern cultures where a joint family system exists and a large number of family members are closely involved in decision making, this significantly increases the number of visitors.

The above mentioned problems need solution if PACU to be used as overflow for critical care beds. A designated PACU space with appropriately trained nurse staffing and medical care should be provided. The nursing staff should be flexible, since patient overflow may occur at any time during the day or night. Social and other family services should be available. Guidelines should be outlined for family visiting and for communication with the physicians responsible for the patient. The PACU should also be an integral part of the surgical and anaesthetic round, and surgical consultation should be available any time. An anaesthetist should be available to care solely for PACU patients. Patient overflow to the PACU is an institutional challenge. It can be managed successfully by a multidisciplinary approach.

Another reason for prolonged stay in our PACU was pain management. Patients overstayed in PACU either for the acute management of postoperative pain or for epidural or patient controlled analgesia (PCA) infusion to be started.

The development of Acute Pain Service at our hospital has decreased the overall percentage.

Six percent of the patients stayed in the recovery room because of delayed regression of subarachnoid block, Sheila et al showed that the duration of PACU stays could safely be shortened by continuing observation in a lower-acuity setting<sup>9</sup>. This can safely be done for ASA I and II patients if normal level of consciousness, stable vital signs, adequate analgesia, and ability to flex the knees are present.

Roberta et al reported an overall incidence of PACU complications of 23.7%, of these 5.2 % patients developed cardiovascular complications, 6.9 % needed airway support and incidence of nausea and vomiting was 9.8%.<sup>10</sup> In our audit the incidence of cardiovascular and respiratory complications leading to delayed discharge from the PACU was only 0.8% and 0.4 % respectively. Incidence of prolonged stay in PACU due to severe and distressing nausea and vomiting was only 0.08%. These figures represent only the patients who had these complications even after two hours of stay in PACU and did not reflect the overall incidence of complications in PACU. Other reasons for prolonged unplanned stay were administrative and included PACU staff not being available, delay in investigations, unavailability of patients file, delay in signing out of patient and delay in transfer to another area. All of these factors can be decreased by improving proper communication. This audit has provided us with a local bench mark with which we can compare our future data.

## Conclusion

This audit identified that seventy five percent of our patients had unplanned PACU stay for more than two hours due to unavailability of beds in special care/critical care unit or for need of postoperative monitoring. We plan to prospectively audit these two groups further to find the root causes and need to increase critical care / special care beds.

## Acknowledgements

We acknowledge the help and support provided by the nursing staff of the PACU of the Aga Khan University in collecting data for the manuscript.

## References

1. Waddle JP, Evers AS, Piccirillo JF. Postanesthesia care unit length of stay: quantifying and assessing dependent factors. *Anesth-Analg*. 1998 Sp;87:628-33.
2. Short TG, Chan M, OH TE. Correspondence. Clinical Indicators: What does a stay in the recovery room for longer than two hours indicate? *Anaesth Intens Care* 1995;23:253-254.
3. Davis PJ, Cohen IT, McGowan FXJr, Latta K. Recovery characteristics of desflurane versus halothane for maintenance of anesthesia in pediatric ambulatory patients. *Anesthesiology* 1994;80:298-302.
4. Van HJ, Smith I, White PF. Use of desflurane for outpatient anesthesia: a comparison with propofol and nitrous oxide. *Anesthesiology* 1991;75:197-203.

5. Chung F. Recovery pattern and home readiness after ambulatory surgery. *Anesth Analg* 1995;80:896-902.
  6. Barash PG, Cullen BF, Stoelting RK: *Clinical Anesthesia*, 3rd edition. Philadelphia, Lippincott-Raven Publishers, 1997, pp 1279.
  7. Seago JA, Weitz S, Walczak S. Factors influencing stay in the postanesthesia care unit: a prospective analysis. *J-Clin-Anesth* 1998;10:579-87.
  8. Ziser A, Alkobi M, Markovits R, Rozonberg B. The postanaesthesia care unit as a temporary admission location due to intensive care and ward overflow. *Br J Anaesth*. 2002;88:577-9
  9. Cohen SE, Hamilton CL, Riley ET, Walker DS, Macario A, Halpern JW. Obstetrics postanesthesia care unit stays: reevaluation of discharge criteria after regional anesthesia. *Anesthesiology* 1998;89:1559-1565.
  10. Hines R, Barash PG, Watrous G, O'Connor T. Complications occurring in Postanesthesia care unit: A survey. *Anesth Analg* 1992;74:503-9
-