

Unplanned post-operative intensive care unit admissions

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ABSTRACT

Introduction: Frequently, post-operative intensive care (Unplanned ICU Admissions, UIA) is required in an unplanned manner due to complications related to anaesthesia or surgery or underlying illnesses unmasked during procedures. There are currently no local data available on UIAs. We undertook this prospective review of UIAs to the Intensive Care Unit of the RIPAS Hospital over a period of 6 months.

Materials and Methods: All UIAs between June 2011 and November 2011 were prospectively reviewed. Demographic data, underlying comorbid conditions and reasons for admission were collected and analysed. **Results:** Over the six month period, a total of 4,900 operations were performed, and 13 of these resulted in UIAs, giving a UIA rate of 0.27%. The mean age of patients was 48 years (range 8 to 82). Eight patients were mechanically ventilated. The reasons for admissions were: five were complications related to anaesthesia, two from massive blood loss, and six attributable to underlying illnesses. The underlying problems were cardiovascular disturbances in 46%, respiratory system disturbances in 31%, metabolic problems in 7% and massive blood loss and massive transfusion in 14%. Three patients needed intensive care only for observation and monitoring. Six patients had underlying illnesses that were unmasked or precipitated during the peri-operative period. The mean duration of ICU and hospital stay were 4.5 days (range 1-24) and 3.1 weeks (range 1-11) respectively. There were two deaths (an 8-year-old boy with craniopharyngioma and an 82-year-old lady with myocardial infarction).

Conclusion: A thorough preoperative evaluation and preoperative optimisation of patients whenever possible, early recognition of complications, timely intervention and timely intensive care and monitoring are essential to improve outcomes.

Keywords: Anaesthesia, complications, operations, admission, intensive care unit

INTRODUCTION

In spite of advances in the field of anaesthesiology, there are occasions when post-operative intensive care is required in an unplanned manner resulting from unexpected complications from anaesthesia or surgery or

unmasking of illnesses by procedures or anaesthesia. These admissions are collectively referred to as Unplanned Intensive Care Unit (ICU) Admissions (UIAs). UIAs have been proposed as an indicator of safety in surgical patients.¹

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Analyses of UIAs are helpful in assessing the standard of peri-operative man-

management, quality of anaesthetic care and also planning and allocation of ICU resources.

² We undertook this prospective study to review the UIAs over a six month period to the intensive care unit of RIPAS hospital, the main tertiary referral centre in the country. The objectives of this study were to analyse the rate of UIAs from the Operating Room (OR)/Post Anaesthesia Care Unit (PACU), the types of peri-operative complications and reasons for ICU admission and outcomes and risk factors/predictors for adverse outcomes.

MATERIALS AND METHODS

Setting: RIPAS Hospital is a 550-bedded general Hospital located in the capital of Bandar Seri Begawan. It is the main tertiary referral government hospital and has most specialties apart from cardiac surgery. It has a population catchment of approximately 270,000 for general problems but accepts referral for the entire population for more complex problems.

Patients: The study period was six months, starting from 1st June 2011 to 30th November 2011. Various details regarding UIAs during this period were collected. The information recorded included demographic characteristics, presence or absence of co-morbidities, medications, ASA class and other details of the surgical procedures including timing, emergency/elective status, incidents leading to unplanned ICU admission, duration of ICU/Coronary Care Unit (CCU) stay, duration of hospital stay after discharge from ICU and finally outcome. The inclusion criteria for this audit were: all unplanned admissions to ICU/CCU within 24 hours of operation with an anaesthesiologist in attendance as a result of problems recognised in the operating room or

post anaesthesia care unit (PACU). The cases where emergency circumstances did not allow pre-operative ICU booking, in spite of anticipating need for ICU post-operatively, were excluded from this study.

RESULTS

Over the 6 month period, there were a total of 4,900 operations performed and 13 of these results in UIAs, giving an UIA rate of 0.27%.

The mean age of the UIA patients was 48 years (range 8 to 82). There were four males and nine females. Seven patients had ASA physical status 2, three with ASA 1 and three with ASA 3.

The specialty breakdown of patients was as follow: general and vascular surgery (n=5), obstetrics and gynaecology (n=4), orthopaedic (n=3) and neurosurgery (n=1). Eleven of the surgeries were carried out during the day (7am-7pm) and two at night (7pm-7am). Seven operations were electives, and six were emergency surgeries. Nine patients received general anaesthesia (GA) and two patients sub-arachnoid block (SAB). Two patients received SAB followed by GA. The duration of surgery was between two and four hours in seven cases, less than two hours in three, and more than four hours in three cases.

After admission, eight patients were mechanically ventilated in the ICU. Reasons for mechanical ventilation ranged from haemodynamic instability, poor respiratory effort or respiratory failure, poor GCS or abdominal surgery. Three patients were admitted for intensive monitoring purposes only. One patient who had suffered a peri-operative myocardial

Table 1: Patient demographic details, diagnoses, types of anaesthesia, surgery, incident needing UIAs and outcomes.

Case	Age/ Gender	ASA	Diagnosis	Anaesthesia	Surgery	Incident	Reason for UIA	Outcomes
1	59 / F	1	Old fracture neck of femur	SAB	DHS	Hypotension, need inotrope	Observation	Alive
2	8 / M	1	Hydrocephalus secondary to Craniopharyngioma	GETA	VP shunt	Upper airway obstruction post extubation	Ventilation	Died
3	56 / M	3	Large bowel obstruction	GETA	Hartmann's procedure	Hypokalaemia	Ventilation & optimisation	Alive
4	82 / F	2	Fracture neck of femur	Fem block & SAB	DHS	NSTEMI	Ventilation & cardiac intervention	Died
5	40 / F	2	Placenta praevia type IV	SAB fb GETA	LSCS, hysterectomy, bilateral Iliac artery ligation	Massive blood loss	Ventilation	Alive
6	52 / M	2	Fracture pelvis	GETA	Open Reduction, Internal Fixation	Acute on chronic CHF	Ventilation	Alive
7	68 / F	3	Haematoma chest	GETA	Evacuation of haematoma	Desaturation	Ventilation	Alive
8	49 / F	2	Small bowel obstruction	GETA & Epid	Laparotomy	Bronchospasm, underlying pneumonia	Ventilation	Alive
9	39 / F	2	Pre eclampsia & foetal distress	GETA	LSCS	Near-arrest & PE	Ventilation & stabilisation	Alive
10	43 / F	2	Placenta praevia type III	SAB fb GETA	LSCS	Hypotension, subdural block	Monitoring	Alive
11	61 / F	3	Incisional hernia	GETA	Repair	LVF	Ventilation	Alive
12	35 / M	2	Iliac aneurysm (right)	GETA	Aorto-femoral bypass	Anaphylaxis	Ventilation & stabilisation	Alive
13	38 / F	1	Ovarian cyst	GETA	Laparotomy	Blood loss, long surgery	Monitoring	Alive

Legends: M; Male, F; Female, ASA: Americal Society of Anesthesia, UIA; Unplanned Intensive Care Unit Admission, SAB; GETA; Epi; Epidural, PE: Pulmonary embolism, LVF; Left ventricular failure, LSCS; Lower section caesarean section, DHS; Dynamic hip screw; NSTEMI; Non ST elevation myocardial infarction, VP; Ventriculoperitoneal; CHF; Chronic heart failure.

infarction needed percutaneous coronary intervention (PCI). Another patient proceeded to further detailed cardiac work-up. Two patients received inotropic circulatory support. Five admissions were related to anaesthetic complications. There were two surgery related complications, namely massive blood loss. The remaining six cases were underlying illnesses that were unmasked or precipitated in the peri-operative period. The average duration of ICU stay was 4.5 days (range 1-24 days).

The patients' details, types of surgeries, incident needing UIAs, and outcomes are shown in the Table.

DISCUSSION

The UIAs rate in our study was 0.27% and is comparable to what have been reported in the literature; Canada 0.08 to 0.027% ^{3, 5}, United Kingdom, 0.04% ⁴, India, 0.58% ⁶, Cullen *et al* Boston, United States of America, 0.42% ⁷ and Nigeria, 0.3%. ² The wide variation in the incidence of UIAs may represent differences in the methods of data collection, differences amongst populations, or even sample size or duration of study. Differences in the institutions' practices such as their standard operating procedures and levels of awareness are important.

The reasons for UIAs are varied and multifactorial, and many are beyond the scope of the anaesthesiologist's role. In our series we found 46% of our UIAs were related to cardiovascular disturbances, 31% due to respiratory system disturbances, 7% due to metabolic problems and 14% due to massive blood loss and massive transfusion. These findings are in slight contrast to other series where respiratory events were found to be the main reason for UIA.^{5, 6} Respiratory causes necessitating ICU admissions included hypoventilation, atelectasis, pneumonias, upper airway obstruction or a combination of these factors. Another study reported two main reasons for UIAs, surgical factors in the majority (n=20/26) and anaesthetic factors (n=6/26) in the remainders.² In this study, three of the six cases relating to anaesthetic factors were failures to intubate leading to asphyxia whilst the causes were not mentioned in the three other cases. The authors also observed that most of the admissions to ICU were following head and neck surgeries.

In our study, six out of 13 patients needed UIAs due to unmasking of underlying illnesses or the stress of surgeries and anaesthesia precipitating decompensation. Four out of the six cases were emergencies, possibly not allowing sufficient time for complete evaluation/optimisation or both. One patient was a 56-year-old man (Case 3) undergoing a Hartmann's procedure for rectal carcinoma causing bowel obstruction. Even though preoperative electrolytes were normal, intra operative blood gases showed persistent hypokalaemia and a prolonged surgery necessitated ICU admission. The second patient was an 82-year-old movement (Case 4) who suffered non ST elevation myocardial infarction (NSTEMI) dur-

ing placement of a dynamic hip screw. She had underlying coronary artery disease and the stress of surgery precipitated myocardial infarction. She was admitted to the ICU and later underwent a primary coronary intervention (PCI). The third patient (Case 6) was a 52-year-old man who underwent open reduction and internal fixation (ORIF) of pelvis fracture. He had underlying chronic congestive cardiac failure and acute CHF superimposed, leading to ICU admission. The fourth patient (Case 7) was a 49-year-old woman with underlying evolving pneumonia (which was revealed after admission to ICU) undergoing emergency laparotomy for small bowel obstruction. She developed bronchospasm towards the end of the procedure and did not tolerate extubation. Hence, she was reintubated. The fifth patient (Case 9) was a 39-year-old woman with chronic hypertension and pre eclampsia for an emergency LSCS who developed pulmonary embolism and had a near cardiac arrest. She was revived and transferred to the ICU for further management. The sixth patient (Case 11) was a 61-year-old woman with mitral regurgitation and atrial fibrillation undergoing incisional hernia repair. She developed acute left ventricular failure (LVF) and did not tolerate extubation at the end of procedure.

Among our UIAs, three (23%) were for observation and monitoring and no specific intervention. In such cases, a step-down or high dependency unit would have been suitable. This corresponded to the reported 20-40% incidence of low-risk monitoring admissions quoted by other series.³ A high dependency unit attached to the ICU to admit low risk monitoring cases would be an efficient addition to ICU services.⁶ This would also lead to more efficient allocation of resources when

the ICU facilities are over-stretched or over-burdened.

The two deaths in our series correspond to a mortality rate of 0.4/1000 anaesthesias (15.3%). These deaths occurred in a young patient (Case 2) with craniopharyngioma with secondary hydrocephalus undergoing placement of a ventriculoperitoneal shunt (VPS) and an elderly woman (Case 4) who sustained a myocardial infarction while undergoing DHS. *(Please provide more information on the cause of death in these two patients).* Mortality rates reported in the literature again vary with rate of 14.5% reported by Piercy et al.⁸ in Australia to rates as high as 31% in a Nigerians study² and 36% in a study from Mumbai, India.⁶

There are several limitations with our study that need to be acknowledged. Our series may be considered small and being a single centre study may not allow generalisation to the other centres within the country or other countries. However, the data can serve as a baseline data for comparisons between centres and also in the future to assess if there are any changes in the trends of UIAs.

In conclusion, we showed that the UIA rates in our centre was 0.27% (n=13) based on a review of 4,900 patients undergoing anaesthesia for surgical procedures. The predominant reasons for UIAs were cardiovascular and respiratory disturbances, and massive blood loss. Nearly a quarter of our admissions were purely for monitoring and observation. These could have been managed in a high dependency unit or step-down unit. Thus we rec-

ommend adding a high dependency unit to our hospital services. A thorough preoperative evaluation and preoperative optimisation of patients whenever possible can reduce the incidence of UIA. Early recognition of complications, timely intervention and timely intensive care and monitoring are essential to improve outcomes.

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