

COMPLICATIONS IN THE
POST - ANAESTHESIA RECOVERY ROOM
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To
Roshaimah, Ameera, and Aemellia
my loving family
who added new dimensions
to my life.

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PREFACE

The principal effort of the anaesthesiologist is to enable another therapy, surgery, to be undertaken safely. This fact is so obvious that it is seldom even acknowledged. The practise of anaesthesia and surgery has to go hand-in-hand to provide a single goal, that is, provision of treatment and care to ill patients for the betterment of health and improved outcome. It has to be borne in mind that the anaesthetics and techniques that we have recourse to have the power to impair or abolish a variety of essential bodily functions, in addition to bearing potentially serious risks to the major organ systems. Therefore, taking the patients for anaesthesia and surgery is a serious undertaking by itself. There may be a minor or major surgery, but there is no minor or major anaesthesia.

Modern technology and increased safety of anaesthetic agents have reduced the risks of adverse outcomes such that an "anaesthetic death " is fortunately a rarity. The emphasis now is on further improving operative outcome and has shifted to the post-anaesthetic care period.

Complications observed after surgery and anaesthesia may be categorized epidemiologically into those related to the surgical procedure, the anaesthetic, and to the patient's medical condition. Although the anaesthetic - related complications have been well-discussed in most textbooks and references, it is the intention to seek and establish the pattern of these complications in Hospital USM that has prompted for the study to be undertaken.

From these, it is hoped that this manuscript will provide a readily available source of practical information for doctors and nursing staff involved in the care of the patients in the immediate post-operative period; and provide an impetus for more extensive and comprehensive research work.

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ABSTRAK : KOMPLIKASI DI BILIK PEMULIHAN SELEPAS PEMBEDAHAN

Satu kajian prospektif ke atas semua pesakit selepas pembedahan yang dimasukkan ke bilik pemulihan telah dijalankan untuk tempoh 3 bulan di hospital universiti. Pesakit - pesakit yang menjalani pembedahan dengan pembiusan setempat dan mereka yang dimasukkan secara terus ke Unit Rawatan Rapi tanpa pemerhatian di bilik pemulihan tidak dimasukkan ke dalam golongan kajian ini. Untuk mengenalpasti dan menentukan pengiraan komplikasi yang berlaku di bilik pemulihan, suatu borang yang standard dengan kriteria yang telah ditentukan digunakan. Di dalam tempoh 3 bulan kajian dijalankan, terdapat seramai 1304 pesakit yang dimasukkan ke bilik pemulihan. Kebanyakan daripada mereka menjalani pembedahan dengan pembiusan am (85.28%). Seramai 110 (8.43%) pesakit mengalami suatu bentuk komplikasi. Analisa komplikasi mengikut jenis pembiusan yang dialami menghasilkan keputusan berikut, iaitu, pembiusan am (8.36%), kombinasi pembiusan am dengan pembiusan pusat (10.0%) dan pembiusan 'regional' (7.84%). Tidak seperti yang dijangkakan, sebanyak 11.1% daripada pesakit elektif dan cuma 6% daripada pesakit kecemasan mengalami komplikasi di bilik pemulihan. Status fizikal ASA merupakan faktor penting dalam menentukan insiden komplikasi secara menyeluruh, di mana pesakit dengan

status ASA yang tinggi sering menunjukkan banyak komplikasi. Pesakit-pesakit yang menjalani pembiusan kurang dari 2 jam menghadapi paling kurang komplikasi (6.76%) sementara mereka yang menjalani pembiusan lebih dari 5 jam menghadapi lebih dari 40% kemungkinan berlaku komplikasi. Walaupun insiden komplikasi didapati lebih tinggi di kalangan pesakit-pesakit ortopedik, obstetrik, ginekologi dan pembedahan abdomen selaras dengan bilangan kes-kes yang dilakukan, pesakit urologi menghadapi insiden komplikasi paling tinggi (25.58%) jika dibandingkan insiden di kalangan kumpulan masing-masing. Disebabkan pesakit-pesakit neurosurgikal dengan status ASA yang tinggi dimasukkan secara terus ke Unit Rawatan Rapi selepas pembedahan, maka tidak terdapat komplikasi di kalangan mereka yang diperhatikan di bilik pemulihan. Komplikasi yang berlaku di bilik pemulihan boleh dikategorikan kepada sistem saraf pusat (3.91%), traktus gastrointestinal (3.07%), kardiovaskular (2.61%). sistem respiratori (0.31%) dan lain -lain (1.3%). Kesakitan (2.99%), loya dan muntah (2.45%), dan takikardia (1.38%) adalah diantara komplikasi-komplikasi yang paling kerap berlaku. Kemungkinan besar ini disebabkan oleh perbezaan di dalam praktik pembiusan, kriteria laporan dan populasi pesakit. Sebagai kesimpulan, tempuh selepas pembiusan di bilik pemulihan tetap merupakan suatu masa

yang amat kritikal kepada pesakit-pesakit di dalam proses pemulihan daripada kesan pembiusan, dan masih lagi menjadi punca kepada morbiditi pesakit.

**ABSTRACT : COMPLICATIONS IN THE POST-ANAESTHESIA
 RECOVERY ROOM**

A prospective survey was conducted over a three-months period in all post-surgical patients entering the post-anaesthesia recovery room (PARR) at a university teaching hospital, while excluding those patients who had local anaesthesia or those who bypassed the recovery room to be transferred directly to the intensive care unit (ICU). To identify and quantitate complications occurring in the PARR, a standardized collection form with predefined criteria was used. A total of 1304 patients were presented to the recovery room. The majority of them underwent general anaesthesia (85.28%). In 110 (8.43%) of the patients, some form of PARR complications were noted. With respect to type of anaesthesia, the PARR complications within groups of patients receiving general anaesthesia (GA) only, GA combined with central blockade and regional anaesthesia only were 8.36%, 10.0% and 7.84% respectively. Quite surprisingly, 11.1% of elective and only 6% of emergency patients had PARR complications. ASA physical status appeared to be an important factor in determining the incidence of overall PARR complications, with higher ASA status showing more complications. Patients who had anaesthesia less than 2

hours presented with the least incidence of 6.76% whereas those who underwent anaesthesia more than 5 hours had over 40% complication rate. Even though there were higher incidence of PARR complications amongst the orthopaedic, obstetric, gynaecological and abdominal procedure patients corresponding to the number of cases done, urologic patients developed the highest incidence of adverse outcome among themselves (25.58%). There was no complication noted in the neurosurgical patients as those with high ASA status were directly admitted to ICU. Out of the PARR complications observed, 3.91% were referable to the central nervous system, 3.07% to gastrointestinal tract, 2.61% to cardiovascular system, a mere 0.31% to respiratory system and 1.3% to others. Pain (2.99%), nausea and vomiting (2.45%), and tachycardia (1.38%) were the most frequently encountered PARR complications. The more dangerous complications such as hypotension, hypertension, myocardial ischaemia and respiratory compromise do still occur, but at a lower rate. This is most likely due to different anaesthetic practice, reporting criteria and patient population. In conclusion, the immediate post-anaesthesia period in the recovery room remain as a time of great potential danger to patients emerging from anaesthesia and a source of patient morbidity.

INTRODUCTION :

The recovery room as we know it today is a special area in which intensive monitoring and care is applied to all patients emerging from general or regional anaesthesia. It is here that support is provided for the patient through the reversing stages of anaesthesia until he is fully conscious, his protective reflexes have returned and his vital signs are stable. The recognition that the immediate post-anaesthetic period is a time of high risk of morbidity and death was first addressed by the 1947 report of the Anaesthesia Study Commission of the Philadelphia County Medical Society (Ruth et al, 1947).

Development in surgery have enabled more ambitious operations to be attempted and performed than ever before, while similar advances in anaesthesia and monitoring have meant that many patients who were previously considered unfit now undergo surgery (Eltringham et al, 1983). It is essential that standards of patients care during surgery are continued post-operatively until the depressant effects of anaesthesia have worn off and patients are deemed safe to be returned to the wards or to their homes. During this short stay in the recovery room, a variety of complications may arise, some of which are serious and potentially fatal;

given the diversity of preoperative and intraoperative conditions of patients and the deleterious effects of potent anaesthetic drugs and surgical procedures have upon their body systems.

The detection of early warning signs and the institution of appropriate therapy before an irreversible situation is allowed to develop may avoid many of the serious complications. Equipment for monitoring blood pressure, pulse and ECG must be at hand; as well as a resuscitation trolley, anaesthesia apparatus and a ventilator. With these, it is very important to have adequate well-trained nursing staff to man the area.

The range of figures reported for post-anaesthetic complications varies widely from 5% to 30% (Chaplan & Feeley, 1990). Recent epidemiologic studies of adverse events associated with anaesthesia have described low mortality but strikingly high morbidity during the perioperative period. A study done in Australia, i.e " The Australian Incident Monitoring Study" showed that even though the incident in the recovery room constituted only a small percentage of overall perioperative incident, they were associated with significantly more adverse outcomes (Van der Walt et al, 1993).

Therefore, the aim of this study is to identify and quantitate the complications that occur in the post-anaesthesia recovery room after general or regional anaesthesia in Hospital USM; and possibly to determine its relation to certain presenting factors. The prevailing outcome will enable doctors and researchers to make some comparison with the results of studies done in other centres.

From the study, it is hoped that doctors and staffs in the recovery area are made aware of the possible complications that can arise, the relative frequency and severity of various complications and the importance of vigilance in early detection and prompt therapy as to avert an irreversible situation. Observation and management of patients should be geared in such a way as to enable them to pass through this treacherous period of immediate post-surgical trauma and infringement upon their physiological status safely without any more untoward events.

LITERATURE REVIEW :

Since the first successful anaesthesia, accomplished by Morton on 16th October, 1846, with ether, anaesthesiology has opened up undreamt-of avenues to operative medicine and has spared suffering man a great deal of pain and torture. Yet, from the beginning, the price for this progress has remained linked with a considerable threat to life, and the first historically confirmed anaesthetic death occurred as early as January 28th, 1848, when a 15-year-old girl died suddenly during chloroform induction for an operation for an ingrown toe nail (Sykes, 1961). Since then all anaesthetic statistics have been burdened with tragedies, and Sykes estimates that the number of fatal anaesthetic complications that occurred in England and Wales alone from 1846 to 1946 during the first century of modern anaesthesia was more than 24,000.

Beecher and Todd (1954) found, during a period of 5 years (1948-1953), 384 fatal results out of 600,000 anaesthetics in ten American university clinics. This showed a ratio of 1 anaesthetic death per 1,500 anaesthetics, which has been confirmed by more recent investigations (Kok & Mullan, 1969).

It took, however, close to one hundred years for the medical community to realise that patients who have undergone the "severest" surgical procedures under anaesthetics, required intensive monitoring well after the completion of both surgery and anaesthesia. In 1863, Florence Nightingale wrote on the use of special areas put aside in country hospitals for the recovery of patients from the immediate effects of surgery. But it is Dandy and Firor who deserve the credit for the first recovery room; the neurosurgical three-bed unit that they opened at Johns Hopkins Hospital in 1923 (Frost & Goldiner, 1990).

The annual report of the section on anaesthesia of the Mayo Clinic in 1943 mentioned a post-anaesthesia observation room caring for 2,000 patients. After two immediate post-operative deaths, one in a neurosurgical patient during transport, and the other in an inadequately monitored patient after a hysterectomy, an area adjacent to the operating rooms was designated as the recovery room at the Hospital of the University of Pennsylvania in 1946 (Frost & Goldiner, 1990).

It has been accepted worldwide that all patients after general or regional anaesthesia should be nursed in a specially designated recovery area. Here, careful and frequent observation of patients who are recovering from the influence of anaesthesia are provided by trained nurses.

There are a whole range of possible problems and complications that may occur during this changing period of the reversing stages of anaesthesia. Recovery room staff should be around all the time for the purpose of promptly recognising any post-anaesthetic and post-surgical complications, and to institute therapy while alerting doctors of the arising situation.

In recent times, with improved surgical techniques and comparable advances in the anaesthetic field, more operations are being done on sicker patients. However, in spite of it, post-anaesthetic death is a rarity nowadays. Epidemiologic studies of adverse events associated with anaesthesia have described low mortality but strikingly high morbidity during the perioperative period.

As the nature of patient care has become increasingly complex, interest in identifying complications that occur during this period has increased (Atkinson, 1979 ; Lunn, 1983). Cohen et al (1960) described the outcome of a 9-year post-anaesthetic follow-up programme at a teaching hospital between the time periods 1975-1978 and 1979-1983. Their data showed a 3.1% PACU complication rate for 1975-1978 and an increase in the rate to 5.19% during the time period of 1979-1983.

Zelcer and Wells (1987) examined the frequency of post-anaesthetic recovery room complications occurring during a one month period. This prospective study showed that 30% of patients admitted to the recovery room had at least one complication; the most frequently observed were abnormal cardiovascular variables (either hypotension, hypertension, or arrhythmias) in 68 of 443 patients (15.3%), nausea and vomiting in 24 of 443 patients (5.4%), and respiratory complications (cyanosis, hypoventilation, reintubation, and laryngeal spasm) in 10 of 443 patients (2.3 %).

Despite this early interest in post-anaesthesia complications, more recent studies have been concerned with evaluating a specific practice or technique rather than defining or identifying particular complications occurring during the post-anaesthetic recovery room period (Farrow et al, 1982). In view of this, a few authors had come out with their published reports of complications in the recovery room to maintain interest in this particular aspect.

A study done by Hines et al (1992) demonstrated that approximately one in five patients (23.7%) experienced a post-anaesthetic complication in the recovery room. Earlier reported data by Cooper et al (1987) and Cohen et al (1960) showed a lower incidence of post-anaesthetic recovery room complications at 18% and 9.4%, respectively.

This may reflect differences in reporting techniques or patient populations, or both.

As reported in previous studies, the incidence of nausea varies from 5% to 60% depending on the type of surgical procedure performed (Muir et al, 1987 ; Bellville, 1961 ; Anderson & Krohg, 1976). Although various pharmacologic regimens have been advocated to reduce post-operative nausea and vomiting, they continue to be a major source of patient morbidity (Rubin & Metz-Rubin, 1951); causing discomfort to the patients during awakening from the effects of surgery and anaesthesia.

Observation of respiratory events by Hines et al (1992) demonstrated that prolonged upper airway support (to treat or prevent upper airway obstruction) was the most frequently encountered complication (6.9%). This incidence was significantly larger than in previous reports (2-4%) (Beard et al, 1986 ; Moller et al, 1990). A report by Moller et al (1990) also showed that as many as 55% of patients may experience hypoxia (diagnosed as oxygen saturation (SpO₂) < 90% by pulse oximetry) during the post-anaesthetic recovery period.

The significance of perioperative cardiovascular events has recently become a source of great interest (Katz & Bigger, 1970 ; Robinson, 1967). Hines et al (1992) found

out that 2.7% of their study patients developed hypotension requiring treatment. However, the majority of hypotension events (80%) were successfully treated by volume administration. The potential risks of perioperative hypertension and tachycardia have been well documented (Robinson, 1967 ; Gal & Cooperman, 1975). In the study series by Gal & Cooperman (1975), 50% of these patients had pain while in 30% of them no obvious cause was found.

The importance of maintaining normothermia has long been recognised. Hypothermia during the recovery period may prolong the effects of pharmacologic agents and cause shivering, resulting in an increased myocardial oxygen consumption and patient discomfort.

Results from previous studies showed that complications occurring in the recovery room still remain a significant source of patient morbidity despite improvement in surgical and anaesthetic technique. Different patient demography and severity of illness, surgical handling of patients and the differing anaesthetic technique provide for the varied observation of post-anaesthetic recovery room complications observed. Studies of events in the recovery room will continue to be an important tool in an effort to identify and reduce further incidence of post-anaesthetic recovery room complications.

METHODS :

A prospective study of all patients entering the post-anaesthesia recovery room in Hospital USM over a 3 months period from June till August 1995 was carried out. Those patients done under local anaesthesia and patients who bypassed the recovery room by being transferred from the operating theatre directly to the general or neonatal intensive care units were not included in the study.

There are 5 operating rooms in the general operating theatre catering to 4 elective lists and one emergency list every day for five weekdays. Only one or two emergency operating rooms are opened on the other two days. Out of the 4 elective lists, one operating room is mainly for ophthalmic surgery done mostly under local anaesthesia. The recovery room receives most of the bulk of cases during the elective operating hours of 9.00 am to 5.00 pm when the recovery room is permanently looked after by 2 staffnurses and is able to accomodate up to 4 cases at one time; while after office hours emergency cases are done one after another and monitored by the respective nurse who had been the anaesthetist's assistant during the operation.

All the patients in the study were moved out from the operating rooms to the recovery room on a Stryker transporter trolley while receiving supplemental oxygen and accompanied by the anaesthetist and a nurse.

They were then transferred onto tiltable beds and observed for at least 30 minutes. Patients were discharged only if they were conscious, able to lift up their heads, having intact protective airway reflexes and observations of their vital status remained stable. In the event of any untoward incident in the recovery room, the recovery nurse immediately acted upon it with appropriate measures. For dangerous complications the anaesthetist was promptly informed and therapeutic interventions instituted.

The complications observed were recorded by the recovery room nurse on a systemised assessment form according to predefined criteria (Table 1). Details of the patient's age, sex, ASA physical status score, operations and type of anaesthesia were recorded. Whether the case was an elective, emergency or day-case were noted. All data were collected from designated collection form, with any inadequate information gathered or retrieved from available resources such as anaesthetic record form, nursing record or direct consultation with the personnel who completed the case.

Table 1 : Definition of Complications

System	Reporting Criteria	
	Adult	Paediatrics
CARDIOVASCULAR -----		
Bradycardia	PR < 50 BPM	PR < 90 BPM
Tachycardia	PR > 100 BPM	PR > 180 BPM
New arrhythmia	ECG evidence	
Hypertension	SBP > 160 mmHg	SBP > 130 mmHg
Hypotension	SBP < 80 mmHg	SBP < 50 mmHg
Myocardial ischaemia	Chest pain / ECG evidence	
Bleeding	> 250 ml	
RESPIRATORY -----		
Hypoxaemia	SpO2 < 90% / cyanosis	
Hypoventilation	RR < 7 BPM	
Upper airway obstruction		
Bronchospasm		
Aspiration of gastric content		
Pneumothorax		
Re - intubation		

Table 1, continued

System	Reporting Criteria
GIT -----	
Nausea	
Vomiting	
CNS -----	
Unresponsive	to verbal command 15 minutes after arrival
Pain	
Agitated / dysphoric	
OTHERS -----	
Residual paralysis	
Shivering	
Hypothermia	T' < 35.5 'C
Hyperthermia	T' > 38.5 'C