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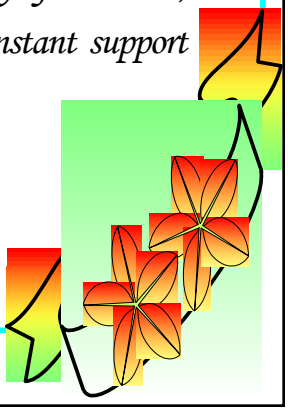

CONTENTS

LIST OF ABBREVIATION

5-HT	: Serotonin
AKI	: Acute Kidney Injury
APH	: Acute Postoperative Hypertension
ARDS	: Adult Respiratory Distress Syndrome
ARF	: Acute Renal Failure
ASA	: American Society of Anesthesiologists
BP	: Blood Pressure
CEI	: Continuous Epidural Infusion
CNS	: Central Nervous System
COX	: Cyclooxygenase Enzyme
CPAP	: Continuous Positive Airway Pressure
CPR	: Cardio-Pulmonary Resuscitation
CPSP	: Chronic Post-Surgical Pain
CSF	: Cerebrospinal Fluid
CTZ	: Chemoreceptor Trigger Zone
CVP	: Central Venous Pressure
DBP	: Diastolic Blood Pressure
ECG	: Electrocardiogram
GIT	: Gastrointestinal Tract
HRQL	: Health Related Quality of Life
ICU	: Intensive Care Unit
IM	: Intra Muscular
IV	: Intra Venous
LMA	: Laryngeal Mask Airway
MH	: Malignant Hyperthermia
NIBP	: Non-invasive Blood Pressure
NK	: Neurokinin
NSAIDs	: Nonsteroidal Anti-inflammatory Drugs
OR	: Operation Room
PACU	: Postanesthesia Care Unit
PADS	: Post anesthesia Discharge Scoring System
PCA	: Patient Controlled Analgesia

LIST OF ABBREVIATION (CONT.)

PCEA	: Patient Controlled Epidural Analgesia
PEEP	: Positive End Expiratory Pressure
PONV	: Postoperative nausea and vomiting
PVCs	: Premature Ventricular Contractions
RR	: Recovery Room
SBP	: Systolic Blood Pressure
SpO_2	: Oxygen saturation
T	: Thoracic Vertebrea
TENS	: Transcutaneous Electrical Nerve Stimulation

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Management of Postanaesthesia Care Unit Emergencies

An essay
Submitted for partial fulfilment of Master Degree in Anaesthesiology and Intensive Care

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معالجة طوارئ
وحدة رعاية ما بعد التخدير

توطئة للحصول على درجة الماجستير في التخدير

مقدمة من

الطبيب / أحمد محمد إيهاب معوض

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INTRODUCTION

Successful completion of a procedure in the operating room does not ensure a smooth and uneventful recovery from anesthesia and surgery. Individualized monitoring and assessment are necessary to ensure adequate recovery. Postoperative complications severe enough to require treatment occur in 7-10% of general postanesthesia care unit (PACU) admissions. The magnitude of this treatment frequently depends on the patient's underlying medical problems and the rapidity with which the problem is identified. ***(Rosenfeld and Oyos, 1998)***.

Many problems are commonly encountered in the early postoperative period:

Post operative nausea and vomiting are common problems following general anaesthesia, occurring in 20-30% of all patients ***(Stadler et al., 2003)***.

Moderate to severe postoperative pain in the PACU can be managed with parentral or intraspinal opiod, or specific nerve blocks ***(Mulroy et al., 2003).***

Airway management is often challenging in the PACU or critical care unit. Even patients considered as having an ‘‘easy airway’’ in the operating room can pose airway challenges in the PACU or critical care unit ***(Burkle et al, 2006).***

The most common circulatory disturbances in the PACU are hypotension, hypertension, and arrhythmia ***(Rose et al, 1996).*** Acute postoperative hypertension occurs with a reported incidence of 4 to 35% and may lead to serious neurologic, cardiovascular, renal and surgical site complications ***(Haas et al, 2004).*** Hypotension in the PACU is

often a sign of hypovolemia and often responds to intravenous fluid boluses (***Pinsky, 2007).***

Although surgical bleeding or pre-existing medical conditions complicate early postoperative recovery, many PACU problems are the result of adverse physiologic and pharmacologic effects of anaesthetic drugs and techniques. Careful communication of information from anaesthesia provider to PACU nurse, and monitoring of anesthetized patients needs to continue until the effects of anaesthesia have been satisfactorily reversed and protective reflexes re-established. ***(Rosenfeld and Qyos, 1998)***.

AIM OF THE WORK

Reviewing the various postoperative emergencies commonly encountered in the PACU including airway, cardiovascular and other complications, and also to demonstrate that prompt recognition, diagnosis, and treatment of such emergencies are essential for improving postoperative morbidity and mortality outcomes.

Chapter 1

PACU Arrangements and Managements

Recovery rooms have been in existence for less than 50 years in most medical centers .Prior to that time, many early postoperative deaths occurred immediately after anesthesia and surgery. The realization that many of these deaths were preventable emphasized the need for specialized nursing care immediately following surgery ***(Morgan et al., 2006).***

At the conclusion of any procedure requiring anesthesia, anesthetic agents are discontinued, monitors are disconnected, and the patient (often still anesthetized) is taken to the PACU . Following general anesthesia, if the patient was intubated and if ventilation was judged adequate, the endotracheal tube is also usually removed prior to transport. Patients are also routinely observed in the PACU following regional anesthesia, and in most instances following monitored anesthesia care (local anesthesia with sedation). Most procedure guidelines require that a patient be admitted to the PACU following any type of anesthesia, except by specific order of the attending anesthesiologist .After a brief verbal report to the PACU nurse, the patient is left in the PACU until the major effects of anesthesia are judged to have worn off. This period is characterized by a relatively high incidence of potentially life-threatening respiratory and circulatory complication ***(McGrath and Chung, 2003).***

The postanesthesia care unit design:

The PACU should be located near the operating rooms . A central location in the operating room area itself is desirable,

as it ensures that the patient can be rushed back to surgery if needed or that members of the operating room staff can quickly attend to patients .Proximity to radiographic, laboratory, and other intensive care facilities on the same floor is also highly desirable .The transfer of critically ill patients in elevators or through long corridors can jeopardize their care, because emergencies may arise along the way ***(American Society of Anesthesiologists, 2002).***

An open ward design facilitates observation of all patients simultaneously . At least one enclosed patient space is desirable for patients needing isolation for infection control .A ratio of 1.5 PACU beds per operating room is customary .Each patient space should be well lighted and large enough to allow easy access to patients in spite of poles for intravenous infusion pumps, a ventilator, or radiographic equipment; construction guidelines dictate a minimum of 7 feet between beds and 120 square feet/patient. Multiple electrical outlets and at least one outlet for oxygen, air, and suction should be present at each space ***(American Society of Anesthesiologists, 2002).***

Equipment :

Pulse oximetry (SpO_2), electrocardiogram (ECG), and automated non-invasive blood pressure (NIBP) monitors for each space are desirable but not mandatory .However, all three monitors should be immediately available for every patient . Some PACUs monitor only SpO_2 and NIBP for every patient in the initial phase of recovery from anesthesia (phase 1 care); the ECG is used only for patients with a history of cardiac problems or who exhibit ECG abnormalities intraoperatively . Decreased monitoring may be appropriate subsequently .Most PACU incidents leading to serious morbidity or mortality are related to inadequate monitoring . Monitors with the ability to transduce at least two pressures simultaneously should be available for direct arterial, central venous, pulmonary artery,

or intracranial pressure monitoring .Capnography may be useful for intubated patients.Mercury or electronic thermometers should be used if an abnormality in temperature is suspected .A forced-air warming device, heating lamps, and warming/cooling blanket should be available ***(Hines et al., 1992).***

The PACU should have its own supplies of basic and emergency equipment, separate from that of the operating room .This includes oxygen cannulas, a selection of masks, oral and nasal airways, laryngoscopes, endotracheal tubes, laryngeal mask airways, and self-inflating bags for ventilation . An ample supply of catheters for vascular cannulation (venous, arterial, central venous, or pulmonary artery) is mandatory . Transvenous pacing catheters and a generator should also be available .A defibrillation device with transcutaneous pacing capabilities and an emergency cart with drugs and supplies for advanced life support and infusion pumps should be present and periodically inspected . Tracheostomy, chest tube, and vascular cutdown trays are also important ***(Morgan et al., 2006).***

Respiratory therapy equipment for aerosol bronchodilator treatments, continuous positive airway pressure (CPAP), and ventilators should be in close proximity to the recovery room . A bronchoscope for the PACU is desirable but not mandatory ***(Morgan et al., 2006).***

Staffing :

The PACU should be staffed only by nurses specifically trained in the care of patients emerging from anesthesia .They should have expertise in airway management and advanced cardiac life support as well as problems commonly encountered in surgical patients relating to wound care, drainage catheters, and postoperative bleeding ***(Cohen et al., 1999).***

The PACU should be under the medical direction of an anesthesiologist .A physician assigned full-time to the PACU is desirable in busy centers but is not mandatory in smaller facilities .The management of the patient in the PACU should not differ from management in the operating room and should reflect a coordinated effort among the anesthesiologist, surgeon, and any consultants .The anesthesiologist still manages the analgesia as well as airway, cardiac, pulmonary, and metabolic problems, whereas the surgeon manages any problems directly related to the surgical procedure itself . Based on the assumptions that the average PACU stay is 1 hour and the average procedure lasts 2 hours, a ratio of one recovery nurse for two patients is generally satisfactory ***(McGrath & Chung, 2003).*** Staffing for nursing care should be tailored to the unique requirements of each facility .A minimum of two nurses generally ensures that if one patient requires continuous nursing care, other patients will still be cared for adequately .When the operating room schedule regularly includes pediatric patients or frequent short procedures, a ratio of one nurse to one patient is often needed ***(Cohen et al., 1999).***

Routine Recovery :

General Anesthesia :

Airway patency, vital signs, and oxygenation should be checked immediately on arrival .Subsequent blood pressure, pulse rate, and respiratory rate measurements are routinely made at least every 5 minutes for 15 minutes or until stable, and every 15 minutes thereafter .Pulse oximetry should be monitored continuously in all patients recovering from general anesthesia, at least until they regain consciousness .The occurrence of hypoxemia does not necessarily correlate with the level of consciousness .Neuromuscular function should be assessed clinically, e.g, head-lift .At least one temperature measurement should also be obtained .Additional monitoring