T.R.N.C

NEAR EAST UNIVERSITY
INSTITUTE OF HEALTH SCIENCES

POST ANESTHESIA AND POST–OPERATIVE COMPLICATIONS OF PATIENTS AMONG INTENSIVE CARE UNIT

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Education and Examination Regulations, this thesis has been approved by the members of the Thesis Committee and the decision of the Board of Directors of the Institute.

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DEDICATION

I dedicate my work in this dissertation to my family and friends who supported during my work by their kind words and smiles.

A special feeling of gratitude to my loving parents, who have always loved me unconditionally and been a role model who taught me to work hard for the things that I aspire to achieve.

My sisters and brothers have never left my side thanks to them. Also very special thanks for my friends who have supported me throughout the process.

I dedicate this work and give special thanks to my advisor

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POST ANESTHESIA AND POST–OPERATIVE COMPLICATIONS OF PATIENTS AMONG INTENSIVE CARE UNIT

ABSTRACT

Objective: The aim of the study is to determine post anesthesia and post–operative complications among patients in the intensive care unit.

Methodology: By using descriptive survey, the study began on October 2016 and completed on January 2017 in intensive care unit (ICU) at Near East University Hospital, North Cyprus. The survey instrument composed the demographic data, the patient's medical information's history, and patient's complications. Statistical Package of Social Sciences (SPSS) software version 20.0 was used to analyze the collected data. The methods used to analyze the data include an analysis of descriptive statistic variables such as frequency and percentages for the categorical variables. The Pearson Chi-Square test was done to determine the differences. The continuous variables were expressed by means and standard deviations. The chosen level of significance is $p < 0.05$.

Results: The number of adult patients admitted to the ICU (Intensive Care Unit) during the period of three months was 125. Gender range number was 68 male with percentage (54.4%) and 57 female with percentage (45.6%) respectively. The number patients studied 122 had general anesthesia (97.6%). 1 patient (.8%) of the total number of patients who had regional anesthesia and two patient (1.6%) of the total patients had epidural anesthesia, also 1 patient (.8%) of the total number of patients who had nerve block anesthesia . The general surgery and vascular surgery shown higher percentage in our study, the number of patient in general surgery it was 31 out of 125 and total number of vascular surgery is shown 33 out of 125. According to Crosstab test and Chi-Square Tests there were significant differences (Respectively, $p < .05$) for all surgery's, Moreover the total patient is a completely healthy fit patient **(**ASA I) & Patient has mild systemic disease (ASA II) scale that shown for Orthopedic surgery it was higher percentage that have been reported (76.5%), the main complications in our survey that shown respiratory, cardiovascular and postoperative nausea and vomiting.

Conclusion: The types of complications were related to the respiratory system, cardiovascular system, nausea/vomiting and body temperature in this descending order. Most of the complications happened to healthy ASA I and ASA II patients. Factors that play major role in determining the immediate postoperative complications were the ASA status, the level of anesthesia seniority attending the patient, the urgency and the nature of procedure.

Keywords: anesthesia, postoperative, complications, post-anesthesia care unit, nursing.

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Chapter 1 : Introduction

1. Problem Definitions

Postoperative complications may result from the primary disease, the operation, or unrelated factors. Occasionally, one complication results from another previous one (eg, myocardial infarction following massive postoperative bleeding). Early detection of postoperative complications requires repeated evaluation of the patient by the operating surgeon and other team members (Gerard et.al 2010). Complications occur after operations and surgeons must be versed in anticipating, recognizing, and managing them. The spectrum of these complications ranges from the relatively minor, such as a small postoperative seroma, to the catastrophic, such as postoperative myocardial infarction or anastomotic leak (Daniel 2012). Postoperative complications increase patient morbidity and mortality and are a target for quality improvement programs, Postoperative complications are common in general surgery patients and contribute to increased mortality, length of stay and need for an increased level of care at discharge (Sarah et.al 2013).

The Post Anesthesia Care Unit **(PACU)**, also called the post-anesthesia recovery room, is a unit that provides critical observation and care for patient in need for continuity of caring after operations or who have procedures under anesthesia.

The Post Anesthesia Care Unit **(PACU)**, is a vital unit inside the hospital which requires competent professionals & expert nurses with decision making &good communication skills to provide high quality of treatment and reduction of complications post-anesthesia(Suzanne et.al2010).

There are two phases of post-anesthesia care. Phase I which focuses on providing post-anesthesia care to patients in the immediate post-anesthesia period, transitioning them to next phase; the in-patient setting or to an intensive care setting. Phase 1 is designated for care of surgical patients immediately after surgery and patients whose condition warrants close monitoring (American Society of Prei-Anesthesia Nurses 2012). Phase II of post-anesthesia care focuses on preparing the patient and their families for care in their homes, or an extended care environment. Care is provided in phase II for surgical patients who have been transferred from a phase I post-

anesthesia care because their condition no longer requires close monitoring. However, the general aim of care in PACU is to monitor patients for return of consciousness, protective reflexes, maintain of airway, monitor the vital sign and prevent postoperative complications (American Society of PreiAnesthesia Nurses 2012).

The role of anesthesia in the development of postoperative cognitive complications remains unclear. It is remarkably common, especially in elderly patients, to experience a varying degree of cognitive dysfunction postoperatively, which can vary from mild and short lived to severe and permanent. Such manifestations are described as postoperative cognitive dysfunction (POCD) which describes a range of abnormalities (Sam et.al 2010).Such an analysis can provide important information on the changes in the characteristics of patients undergoing anesthesia for surgery and other nonsurgical diagnostic or therapeutic procedures. In addition, anesthesia has favored the development of procedures performed in the ambulatory setting and outside the operating theater (Landesberg et.al 2009).

2. Aim of the study

The aim of the study is to determine surgical post–operative complications among patients in the PICU at Near East University Hospital.

In this study we want to observe:

- Incidence and rate of anaesthesia associated post-operative complications in PACU for patients of Northern Cyprus main hospitals.
- Types and morphology of anesthesia associated post-operative complications ICU.

Chapter 2: Literature Review

1. Preoperative Care

Perioperative nursing includes those activities performed by a professional registered nurse in the preoperative, intraoperative and postoperative phases of surgery. Perioperative nurses are registered nurses (RNs) who work in hospital surgical departments, day-surgery units (also called ambulatory surgery), clinics and physicians' offices. Perioperative nurses provide care for patients in the period prior to and right after surgery or intervention procedures. Perioperative nursing encompasses a variety of specialty roles including holding by, circulating, anesthetic,

Instrument or scrub nurse, and recovery room. Other roles include patient evaluation and education and surgeon's assistance. Perioperative nurses typically have Basic Life Support and Advanced Cardiac Life Support certification or training (Gregory et al 2013).

Enhanced Recovery After Surgery (ERAS) refers to multimodal programs which have been developed to decrease postoperative complications, accelerate recovery and promote early discharge, Interventions in enhanced recovery after surgery programs include best practices aimed at decreasing perioperative stress, postoperative pain, get dysfunction and infection, and promoting early mobilization (Adamina, et.al 2011).

Preoperative Information and Counseling

All patients should be made aware of what they can anticipate in the perioperative period as well as what is expected of them in their recovery process. Preoperative patient education is an essential component of ERAS programs. Appropriate preoperative education has been shown to decrease patients' anxiety and fears about surgery, reduce postoperative complications, as well as lessens the use of postoperative analgesia while promoting shorter hospital stays (Lassen et.al 2009).

For patients who do not have postoperative complications and have no other co-morbidities or issues which would affect length of stay, the target for the duration of stay for those having colon operations is 3 days and for rectal operations (anastomosis below the peritoneal reflection) is 4 days. Patients should receive information on approximate length of stay; preoperative fasting and carbohydrate loading; pain control; early ambulation; postoperative feeding/ time of catheter removal; and gum chewing (Aarts et.al 2013).

Fasting Duration

Patients should be allowed to eat solid foods and clear liquids until 2 to 3 hours before surgery or until they leave for the hospital and fasting 6 hours. Patients should be encouraged to drink a suitable carbohydrate rich drink, up to 800 ml at bedtime the night before surgery and 400 mL until 2 to 3 hours before surgery or until they leave for the hospital (Aarts et.al 2013).

Mechanical Bowel Preparation

Patients should have no dietary restrictions and use Fleet enema. They should later stay on clear liquids *(*Aarts et.al 2013).

2. American Society of Anesthesiologists (ASA) Classifications

Preoperatively, all patients are subjected to an evaluation system developed by American Society of Anesthesiologists (ASA), which preoperatively classifies patients based on an assessment system acceptably useful for the determination of anesthetic approach, and especially for motorization of the patients. Initially ASA classified physical condition of the patients which is one of the components of the surgical risk, (Schaumburget.al 2014) and with time the patients were divided into various categories. However, use of only one indicator of the operative risk was not considered. In 1941, the ASA physical status has been applied to address seemingly unrelated surgical issues including determining reimbursement, improving risk adjustment, and predicting morbidity and mortality (Davenport 2006). The ASA physical status, when formulated in 1941, was intended to provide a common language to describe patients before surgery, independent of the planned surgical procedure (Chieh Yang Koo, 2015).

The simplicity of the ASA physical status classification system is its greatest advantage, allowing it to be utilized in nearly any clinical setting around the world. In contrast, various other risk prediction models encompass operative risk factors or multiple laboratory results, which increase the complexity over the ASA physical status.

These scoring systems include the Charlson comorbidity index (Charlson ME1987), Lee's Revised Cardiac Risk Index (Lee TH, 1999), the Acute Physiology and Chronic Health Evaluation (Zimmerman JE2006), and the Physiological and Operative Severity Score for estimating of mortality and morbidity (Copeland GP 1991). Additional preoperative testing may increase uncertainty and some of the results may be poorly utilized in relation to modifying operative outcome (Grocott MP 2006).The current system of five categories was proposed in 1961 by Dripps et al., and adopted by the ASA in 1963 (Dripps RD, 1961). A 6th category (for organ donors) was added in 1980. An "E" modifier is added to physical status scores for emergency surgeries. The definitions of the ASA PS classes are shown in Table 1. (Marian, 2016).

The primary value of the ASA PS classification is to assess the overall physical status of the patient prior to surgery and to help in comparing outcomes among groups of ASA PS-matched patients (Wolters U, 1996). It was explicitly not intended to be used as a predictor of surgical risk because it neglects the impact of surgery itself on patient's outcomes (Owens WD, 2001).

Table 1 American Society of Anesthesiologists Physical Status (ASA PS) Classification System

ASA PS Classification	Definition	Examples, including, but not limited
ASA 1	A normal healthy patient	Healthy, non-smoking, no or minimal alcohol use. (Chieh Yang Koo, 2015)
ASA 2	A patient with mild systemic disease	Mild diseases only without substantive functional limitations. Examples include (but not limited to): current smoker, social alcohol drinker, pregnancy, obesity (30<BMI<40), well-controlled DM/HTN, mild lung disease (Chieh Yang Koo, 2015)
ASA 3	A patient with severe systemic disease	Substantive functional limitations; One or more moderate to severe diseases. Examples include (but not limited to): poorly controlled DM or HTN, COPD, morbid obesity (BMI ≥40), active hepatitis, alcohol dependence or abuse, implanted pacemaker, moderate reduction of ejection fraction, ESRD undergoing regularly scheduled dialysis, premature infant PCA < 60 weeks, history (>3 months) of MI, CVA, TIA, or CAD/stents (Chieh Yang Koo, 2015).
ASA 4	A patient with severe systemic disease that is a constant threat to life	Examples include (but not limited to): recent (<3 months) MI, CVA, TIA, or CAD/stents, ongoing cardiac ischemia or severe valve dysfunction, severe reduction of ejection fraction, sepsis, DIC, ARD or ESRD not undergoing regularly scheduled dialysis(Chieh Yang Koo, 2015).
ASA 5	A moribund patient who is not expected to survive without the operation	Examples include (but not limited to): ruptured abdominal/thoracic aneurysm, massive trauma, and intracranial bleed with mass effect, ischemic bowel in the face of significant cardiac pathology or multiple organ/system dysfunction(Chieh Yang Koo, 2015).
ASA 6	A declared brain-dead patient whose organs are being removed for donor purposes.	

(Chieh Yang Koo, 2015)

3. Intraoperative Care

The intraoperative phase begins when the patient is transferred into the operating room table and ends when he or she is admitted to the PACU. In this phase, the scope of nursing activity can include providing for the patient's safety, maintaining an aseptic environment, ensuring proper function of equipment, providing the surgeon with specific instruments and supplies for the surgical field, and completing appropriate documentation. In some instances, the nursing activities can encompass providing emotional support by holding the patient's hand during general anesthesia induction, assisting in positioning the patient on the operating room table using basic principles of body alignment, or acting as scrub nurse, circulating nurse, or registered nurse first assistant (Suzanne et.al 2010).

4. Postoperative Care

The postoperative phase begins with the admission of the patient to the PACU and ends with a follow-up evaluation in the clinical setting or at home. The scope of nursing care covers a wide range of activities during this period. In the immediate postoperative phase, the focus includes maintaining the patient's airway, monitoring vital signs, assessing the effects of the anesthetic agents, assessing the patient for complications, and providing comfort and pain relief. Nursing activities then focus on promoting the patient's recovery and initiating the teaching, follow-up care, and referrals essential for recovery and rehabilitation after discharge (Suzanne et.al 2010).

Early Mobilization

Patients should dangle their legs on the day of surgery, Patients should eat all of their meals in a chair, and Patients should ambulate every 4 to 6 hours each day while they are awake until discharge (Aarts et.al 2013). Early mobilization has been suggested as one effective nursing intervention to prevent immobility-related complications and promote positive patient outcomes, early mobilization includes the movement of the patient ranging from passive range-of-motion exercises to active ambulation, depending on the physical capabilities of the patient, and is initiated within 24 hours of admission into an acute care setting (Graf C. 2006).

Postoperative Fluid Management

Patients who do not have adequate oral intake should receive not more than 75 mL/hr of with 20 mEq potassium/day, or a similar rate using a balanced salt solution if electrolyte replacement is required. Postoperatively, volume status should be assessed before fluid boluses are given (Aarts et.al 2013). Fluid management is an important part of overall surgical therapy Proper administration of fluids is critical, especially in patients who undergo major surgeries such as emergency laparotomies, bowel resections and hepatectomy procedures. Body fluid composition may change in minutes or hours, resulting in impaired wound healing and homeostasis (Selami et al 2015).

Early Enteral Feeding

Patients should be offered sips of clear fluid 2 hours postoperatively provided they are awake, alert and capable of swallowing. Patient controlled diet should be encouraged: patients should be offered a regular diet beginning postoperative day 1 and patients should be allowed to decide what and how much they want to consume each day. Patients should be encouraged to bring dry food from home (Aarts et.al 2013).Postoperative fluid management plays a key role in providing adequate tissue perfusion, stable hemodynamics and reducing morbidities related with hemodynamics. Understanding body fluid physiology and possible outcomes of different fluid management strategies is crucial for all surgeons (Selami et al 2015).

5. Post-operative complications

Postoperative complication' refers to a range of alterations in the physiological status of patients recovering from surgery (Kathryn Zeitz 2010). The Postoperative complications also happened after surgery and are classified according to the patient condition and status.

General anesthesia is a reversible state of unconsciousness that allows patients to undergo surgical procedures in a safe and humane way. Although it is increasingly safe, general anesthesia is not without risks and complications (Bainbridge, et al, 2012).

Cardiovascular and respiratory complications are the most common. Myocardial infarction, interference with lung mechanics, and exacerbation of preexisting co-morbidities can all occur, other serious complications include acute renal impairment and the development of long-term postoperative cognitive dysfunction. Minor but important complications of general anesthesia include postoperative nausea and vomiting, sore throat, and dental damage. All these complications can have a significant impact on patients and may result in prolonged hospital stay and expense (Michelle Harris, 2013).

5.1 Respiratory complications

Perioperative respiratory complications are an important predictor of morbidity and mortality. It thus affect the financial burden of health care by increasing the length of hospital stay (ferreyra, G., et al. 2009). The incidence is similar to that for perioperative cardiac complications at 6.8%; serious complications occur in 2.6 %, Anesthesia-related complications include atelectasis, aspiration, and bronchospasm; exacerbation of existing lung disease and infection are less relevant in the intraoperative period (Smetana, 2006).

5.1.1 Atelectasis

Atelectasis accounts for up to 70% of severe postoperative hypoxemia and is a risk factor for the development of pneumonia and acute lung injury, within minutes of induction of general anesthesia, mechanical compression of alveoli, reabsorption of alveolar gases, and paralysis cause diaphragm displacement (Ferreyraet al. 2009).

Several patient and surgical factors increase the risk of perioperative respiratory complications; these include advanced age, an American Society of Anesthesiologists status greater than 2, functional dependence, congestive cardiac failure, and a history of chronic obstructive pulmonary disease (Smetana, 2009) Risk increases with emergency surgery and procedures in close proximity to the diaphragm. Cigarette smoking has recently been shown to be associated with increased 30-day mortality and perioperative respiratory complications (Turan A, 2011).

5.1.2 Hypoxemia and hypoventilation

Hypoxemia and hypoventilation may also occur after surgery, postoperatively following the use of a spinal or epidural regional anesthetic that has blocked the spinal nerves innervating the muscles of respiration and weakening the respiratory effort. Hypoxemia usually occur when oxy-hemoglobin saturation is less than 90% or a partial pressure of arterial oxygen is less than 60 mm Hg, or during failure of ventilation–perfusion result of general anesthetic drugs. Patients suffer of hypoxemia have signs and symptoms including tachycardia, cardiac dysrhythmias, dyspnea, tachypnea and cyanosis. In this case the ICU Nurse provide adequate oxygenation and monitoring by using the pulse oxi-meter, and respiratory rate, breathing pattern and open the airway to prevent evidence of aspiration (Nagelhout J, Zaglaniczny K 2010).

5.2 Cardiovascular complications

5.2.1 Hypotension

The most common cardiovascular complication seen in the postoperative period is hypotension due to decreased blood volume resulting from preoperative fasting and intraoperative blood loss. Intervention is indicated if the pressure decreases by more than 30% of the baseline blood pressure (Reich et al 2011). Moreover, Opioids drugs and anesthetic inhalational agents and excessive bleeding may contribute to decreasing blood pressure, However treatment of hypotension in postoperative depends on the patient status and the underlying cause.

5.2.2 Myocardial Infarction

Recent studies suggest up to 5% of patients undergoing elective non-cardiac surgery have MI (Devereaux et al. 2011).In the presence of 1 cardiac risk factor, the incidence is 4.4%, with the risk of cardiovascular death approximately 1.6% (Devereaux, et al. 2010). Perioperative MI is common but can be hard to predict and prevent. It usually occurs in the first 48 hours postoperatively (Landesberg, et al. 2009). Most perioperative MIs result from oxygen supply-demand mismatch. Anesthesia and surgery confer a physiologic stress test to the patient that increases O2 demand. Hypotension, anemia, and coronary artery disease prevent this demand from being met. Thrombus formation or plaque rupture account for only one-third of events (Devereaux PJ.2010).

5.2.3 Thromboembolism

Venous thromboembolism (VTE) includes both deep vein thrombosis (DVT) and pulmonary embolism (PE) and is a significant cause of morbidity and mortality in the perioperative period. In patients undergoing plastic surgery, the overall incidence of VTE is 1.69%, however this varies according to the presence of risk factors (Pannucci CJ. 2011). Several tools exist to help assess and stratify the risk of VTE for each patient.

The Carprini Risk Assessment Model has been validated for use in plastic surgery patients by the American Society of Plastic Surgeons, (Murphy RX 2011). Current recommendations on thromboprophylaxis in surgical patients are based on the calculated risk of VTE and consideration of the risk of bleeding associated with any intervention, (Gould MK. 2012).

5.3 Neurologic complications

Postoperative cognitive dysfunction (POCD) is defined as a decline in cognitive levels from preoperative function as detected by changes on neuropsychological testing (Rudolph, 2010). It occurs in approximately 9.9% of patients (Evered, 2011). Postoperative delirium is defined as an acute change in cognition and attention, which may include alterations in consciousness and disorganized thinking. (Rudolph, 2011) The incidence varies according to the type of surgery and is highest (35%–65%) in patients undergoing hip fracture surgery.

5.4 Hypothermia

Hypothermia was defined as an esophageal or rectal temperature of less than 97°F, Heat loss during surgery is due to reduced basal metabolism and the anesthetized patient’s inability to shiver to produce heat to maintain body temperature. By addition the heat loss and hypothermia occur as a result of sympathetic blockade due to vasodilation during regional anesthesia (Reich DL, Hossain S, Krol M 2011). Hypothermia is considered as a seen sign and symptom of wound infections so during dressing procedure the nurse should check body temperature despite of presence of wound infection for patients with complex surgery that may be at risk of postoperative hypothermia (Randa et al 2013).

5.5 Hemorrhage

Hemorrhage is an uncommon yet serious complication of surgery that can result in death (Finkelmeier 2010), According to the time frame there is three of classifications of hemorrhage the nurse must note their signs and symptoms. First hemorrhage referred as Primary hemorrhage which happens at the time of surgery. The second hemorrhage is referred as intermediary hemorrhage which happens during the first few hours after surgery. The third hemorrhage is referred as secondary hemorrhage and happens after surgery when the patient s admitted to the unit.

However, the hemorrhage occur when the patient have a lot losing of blood and the main signs and symptoms is shown on the patient , the skin become pale, cold, moist , hypothermia and tachycardia (Canadian Anesthesiologists' Society Guidelines to the practice of anesthesia 2014).

5.6 Nausea and vomiting

Postoperative nausea and vomiting (PONV) is one of the more common problems in the PACU and is a frequent cause of postoperative hospital admission, (Philip BK, Cheng Y-T 2011).The nurse should intervene at the patient's first report of nausea to control the problem rather than wait for it to progress to vomiting. Vomiting is regulated by the vomiting center located in the medulla and receives stimuli from the gastrointestinal tract, many medications are available to control nausea and vomiting without over sedating the patient; they are commonly administered during surgery as well as in the PACU (Meeker & Rothrock, 2009).

5.7 Pain and pain management

Pain is consider the fifth vital sign and is divided into types among duration. The first one is acute pain and the second one is chronic pain. Acute pain is often described as sharply pain, while chronic pain is usually expressed by subjective patient description. Accordingly pain is classified to chronic post-surgical pain (CPSP) which is associated with increased analgesic use, restriction of activities of daily living, significant effects on quality of life, and increased health-care utilization. (Chronic post-surgical pain Continuing Education in Anesthesia 2010). The ICU Nurse will use pain assessment tools to describe such pain to decrease patient suffering and determine the rational treatment.

The first pain assessment tool is the Onset, Provokes or Palliates, Quality, Radiates, Severity and Time (OPQRST) tool, which is a useful mnemonic (memory device) for learning about patient's pain complaint. It is a conversation starter between you, the investigator and the patient (Greg Friese, 2009).

The second pain assessment tool is Numeric Rating Scale (NRS) which should be based on a collaborative decision between patient and ICU Nurse (McCaffery, M., Beebe 2012). The scales is designed to evaluate the pain intensity over time so to determine the effectiveness of pain treatments and need for changes in treatment.

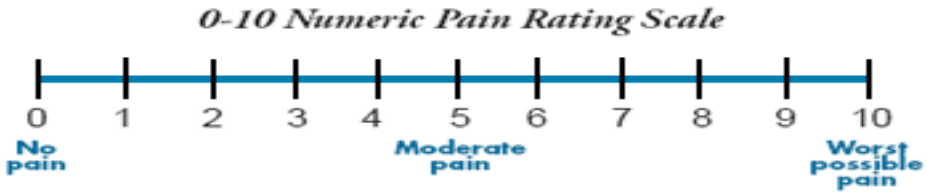

Fig1 Numeric Rating Scale (NRS). (McCaffery, M., Beebe 2012)

The third pain assessment tool is the Visual Analog Scale the nurses used this scale in ICU for patient older than 7 years of age. (Fig 2)

Visual analog scale is a measurement instrument that tries to measure a characteristic or attitude that is believed to range across a continuum of values and cannot easily be directly measured. (Wewers M.E. & Lowe N.K. 2010).

Fig 2: Visual analog scale (VAS)

The fourth pain assessment tool is the Wong-Baker Faces Pain Rating Scale. Its carried by explaining to the patient that each face is for a person who feels happy because he has no pain (hurt) or sad because he has some or a lot of pain. Face 0 is very happy because he doesn't hurt at all. Face 1 hurts just a little bit. Face 2 hurts a little more. Face 3 hurts even more. Face 4 hurts a whole lot. Face 5 hurts as much as you can image, although you don't have to be crying to feel

this bad. Ask the person to choose the face that best describes how he is feeling (Wong DL, Hockenberry-Eaton M 2001).

Fig 3: (Wong-Baker Faces Pain Rating Scale)

The last one is the FLACC Scale this is a behavior scale that has been tested with children and patients with cognitive impairment. Each of the five categories (Faces, Legs, Activity, Cry, Consolability) has a score from 0-2 and the scores are added to get a total from 0-10. Behavioral pain scores need to be considered within the context of the child's psychological status, anxiety and other environment factors (Suzanne et.al 2010).Pain assessment in summary is important in the care of postoperative surgical patients and their pain management. Pain management requires a multidisciplinary care to improve patient outcomes.

5.8 Surgical wound infections

Surgical Wound Infections is considered as one of the main complications in the intensive care unit. It increases a patient's length of stay in hospital by an average of 7 to 10 days, and they are the main cause of 60% to 93% of deaths (Anaya DA, Dellinger EP 2010). The type of procedure, reason for surgical intervention, presence of comorbidities, and operating room environment are all factors that affect surgical wound infections. Surgical site infections can lead to compromised wound healing and failure of components in addition to increased medical costs, morbidity, and mortality (Evans 2009). During the treatment period in the intensive care unit (ICU) nurses shall use aseptic procedures, standard precautions and follow infection control policies such as hand washing, hand rub and dressing and signs & symptoms of infections to provide high quality of treatment and reduce spread of infectious microorganisms.

According to Centers for Disease Control (CDC) there is four classification of surgical wounds, (Clean wounds (Class I) Uninfected operative wounds where no inflammation is present and no signs of infection, Clean contaminated wounds (Class II) Operative wounds that involve entering

the respiratory, alimentary, or genitourinary tracts, Contaminated wounds (Class III) Open, fresh, accidental wounds, Dirty-Infected wounds (Class IV) wounds that involve an existing clinical infection (Association of Perioperative Registered Nurses 2011).

CHAPTER 3: Methodology

6.1 Study Design

The study was planned with descriptive design.

6.2 Study Setting

The study will be conducted at the Near East University Hospital, North Cyprus. The Near East University hospital is the largest and leading university of Cyprus which is located in northern part of Nicosia, the capital of North Cyprus. The services of Hospital of Near East University 209 private, single patient rooms, 8 operating theatres, 30-bed Intensive Care Unit, 17-bed Neonatal Intensive Care Unit, an advanced laboratory where a wide array of medical and experimental tests can be carried out, 22 other labs specializing on certain medical tests**.**

6.3 Sample of the study

All adult patients admitted to the PACU who had surgery (elective and emergency) under general anesthesia (GA), Regional Anesthesia (RA), Epidural and Nerve block anesthesia were included in the study , during three months the sample is 125 patients.

Exclusion criteria:

- Pediatric patients.
- Patients who had surgery under local anesthesia only.
- Patients admitted to PACU in the course of transferring them to the Intensive Care Unit (ICU).

6.4 Study Tools

A questionnaire that was developed by the researchers on the basis of the literature will be used as data collection tool in this study (Faraj et al 2012). The survey instrument used is composed of three pages check-box form. The first part is to collect

demographic data, the second part to collect patient's medical information's history, and the last part for complications. Prior to the survey, a meeting was held with all members of the anesthesia department and the PACU nursing staff to review the survey data sheet, and to determine the areas of weaknesses and/ or difficulties. The survey sheets were accordingly revised and restructured.

6.5 Data Collection

Data will be collected using a questionnaire between October until December 2016. The questionnaires will be administered by researchers on patients while they are on the admitted to the PACU who had surgery (elective and emergency) with face to face, self-completion method. This study was conducted by personally interviewing all the patients during the first postoperative day while still in hospital, thus reducing the risk of memory lapse found with subsequently self-completed questionnaires. Completion of the questionnaire will take almost 20 minutes.

6.6 Pilot Study

A pilot study will performed on ten patients after approval from the Near East Institutional Reviews Board (IRB) of Near East University Hospital. After the pilot study, questionnaire will be revised for clarity.

6.7 Data analysis

Statistical Package of Social Sciences (SPSS) software version 20.0 was used to analyze the collected data. The methods used to analyze the data include an analysis of descriptive statistic variables such as frequency and percentages for the categorical variables. The Pearson Chi-Square test was done to determine the differences. The continuous variables were expressed by means and standard deviations and analyzed using the independent samples T-test and one-way ANOVA. When F statistic was significant. The chosen level of significance is $p < 0.05$.

6.8 Ethical Consideration

The study is approved by the Near East Institutional Reviews Board (IRB) of Near East University Hospital that assigned this research as being just observational study and just initials were used during the study without recording patient's location or other related not clinical essential individual data.

Chapter 4: Results

Table 2. Demographic data of the patients

Characteristics	Number	%
• Gender		
Male	68	54.4
Female	57	45.6
• Age		
18-28	16	12.8
29-39	9	7.2
40- 50	16	12.8
51- 60	18	14.4
61-70	37	29.6
71-80	25	20.0
Total	125	100

The number of adult patients admitted to the ICU (Intensive Care Unit) during the period of three months was 125. Gender range number was 68 male (54.4%) and 57 female (45.6%) respectively, According to age of our participants that were 37 of 125 in age (61-70), and in age (71-80) it was 25 from overall participants, so that shown the major age in our study that old age.

Table 3. Distribution of the patients according to their ASA status

ASA	Number	%
I	11	8.8
II	66	52.8
III	36	28.8
IV	12	9.6
Total	125	100

Table 3 shows Patients classified as American Society of Anesthesia (ASA) category 1 patients were 11 (8.8%), patients classified category two were equal to 66 (52.8), patient classified category three were equal to 36 (28.8), and the patient classified category four were 12 (9.6).

Table 4. Distribution of the type of surgery according to their ASA status.

Type of surgery	ASA II		ASA III	
	Number	Percent	Number	Percent
General surgery	17	25.8	7	19.4
Chest surgery	3	4.5	0	0.0
ENT	3	4.5	0	0.0
Orthopedic	13	19.7	4	11.1
Urology	4	6.1	0	0.0
Vascular	15	22.7	10	27.8
Neurology	13	19.7	10	27.8

Table 4 shows the percentage of patients in vascular surgery was higher according to ASA II and ASA III (22.7% , 27.8%), the second most common was neurological surgery (19.7%, 27.8%), then general surgery (25.8%,19.4%).

Table 5. Distribution of patients among the anesthesia staff.

Anesthetist staff.	Number	Percent
Consultant	30	24
Specialist	95	76
Total	125	100

Table 5 shows thirteen patients out of the 125 were anaesthetized by consultants. The majority of anesthesia was administered by specialists (95) however the more critical the patients and the procedures the more consultants were involved.

Table 6. Distribution of patients to the type of anesthesia

Type of Anesthesia	Number	Percent
General Anesthesia	122	97.6
Regional	1	.8
Epidural	1	.8
Nerve block	1	.8
Total	125	100

Table 6 shows the number of patients who received General Anesthesia (97.6%). 1 patient (.8%) of the total number of patients who had regional anesthesia and two patient (1.6%) of the total patients had Epidural anesthesia, Also 1 patient (.8%) of the total number of patients had Nerve block anesthesia.

Table 7. Distribution type of surgery

Type of surgery	Number	Percent
General surgery	31	24.8
Chest surgery	7	5.6
ENT	3	2.4
Orthopedic	17	13.6
Urology	4	3.2
Vascular	33	26.4
Neurology	30	24.0
Total	125	100

Table 7 Shows types of surgery the general surgery and vascular surgery were seen higher percentage in our study, the number of patient in general surgery it was 31 out of 125 and total number of vascular surgery is shown 33 out of 125.

Table 8. Distribution type of positions during surgery

Type of positions	Number	Percent
Supine	90	72.0
Prone	26	20.8
Lateral	9	7.2
Total	125	100

Four categories of patient's positions during surgery were identified; ninety patients underwent to surgery in supine position (72.0%), the prone position come second (20.8%), and the third category was lateral position (7.2%) (See Table 8).

Table 9. Type of complications

Type of complications	Number	Percent
Desaturation	72	57.6
Postoperative nausea and vomiting (PONV)	87	69.6
Cardiovascular Complications		
Hypertension	44	35.2
Hypotension	48	38.4
Tachycardia	33	26.8

ASA Scale	Complications	p value
I, II, III,IV	Hypertension	0.002
	Hypotension	0.005
	Tachycardia	0.041
	Hypoxia	0.041
	Postoperative nausea and vomiting	0.05
Age Group	Complications	p value
	Hypertension	0.05
	Hypotension	0.04
	Tachycardia	0.05
	Hypoxia	0.02
	Postoperative nausea and vomiting	0.05

The type of complications is characteristically of cardiovascular system in the first place 77.6%. Secondly, Postoperative nausea and vomiting (PONV) 69.6%, thirdly Respiratory system complications 57.6% in which desaturation was mainly due to hypoventilation while other causes such as bronchospasm were documented too (Table 9). Also in our survey that shown respiratory and cardiovascular it was significant except postoperative nausea and vomiting that were not significant. According to age group that comparing with complication that shown not significant.

Table 10. Types of surgery correlation with ASA Scale

ASA Scale with General Surgery	YES	NO	Percent	*p* value
ASA I & ASA II	71.0	58.5	61.6	= .000
ASA III & ASA IV	29.0	41.5	38.4	
ASA Scale with Chest Surgery	YES	NO	Percentage %	*p* value
ASA I & ASA II	100.0	60.7	61.6	= .050
ASA III & ASA IV	0.0	39.3	38.4	
ASA Scale with Ear , Nose, Throat (ENT)	YES	NO	Percentage %	*p* value
ASA I & ASA II	100.0	60.7	61.6	= .050
ASA III & ASA IV	0.0	39.3	38.4	
ASA Scale with Orthopedic	YES	NO	Percentage %	*p* value
ASA I & ASA II	76.5	59.3	61.6	= .000
ASA III & ASA IV	23.5	40.7	38.4%	
ASA Scale with Urology	YES	NO	Percentage %	*p value*
ASA I & ASA II	100.0	60.3	61.6	= .050
ASA III & ASA IV	0.0%	39.7	38.4	
ASA Scale with Vascular	YES	NO	Percentage %	*p value*
ASA I & ASA II	48.5%	66.3	61.6	= .000
ASA III & ASA IV	51.5%	33.7	38.4	
ASA Scale with Neurology	YES	NO	Percentage %	*p* value
ASA I & ASA II	59.3	62.2	61.6	= .000
ASA III & ASA IV	40.7	37.8	38.4	

As shown in Table 10, according to Crosstab test and Chi-Square Tests there were significant differences (Respectively, $p < .05$) for all surgery's, Moreover the total for patient is a completely healthy fit patient **(**ASA I) & Patient has mild systemic disease (ASA II) scale that shown for (YES) Orthopedic surgery it was higher percentage that have been reported (76.5%). The rate of postoperative complications was found to be closely related to the ASA class reported in (Table 10).

Chapter 5: Discussion

This survey was designed to investigate the incidence of postoperative complications and to ascertain the degree of discomfort after every day surgery surgical techniques, In our study there were no deaths, but other studies reported a higher tendency to complications and deaths as the clinical condition of the patient becomes more compromised (Faraj et al 2012). The type of anesthesia has been classified during this study as General anesthesia, Regional, Epidural, or Nerve block. According to this classification the general anesthesia out numbers all others.

The data obtain from our survey shows that the number of critically ill patients or complex procedures that were cared for by Specialist level. Also it was observed that the most significant number of patients was cared for by the consultants and no number was cared for by resident. This may lead to more chances for accurate observation and treatment, thus justifying for less number of complications seen in this study.

Respiratory complications remain one the most important areas of concern regarding major morbidity and increase mortality in the post anesthesia period. Respiratory complications were also more common after major surgery; these patients should receive different anesthetic management, closer monitoring, and probably a longer surgical intervention (Danielaet al 2014). They were also more likely to have a poor preoperative status, which may also have affected the incidence of desaturation**.**

Of the 125 patients who had documented complication in PACU, the most common single occurring adverse event detected is desaturation, the reported incidence in our survey is 57.6%. Desaturation is found to be mainly related to hypoventilation and airway obstruction, all resolved by simple airway manual technique, oxygen therapy and salbutamol nebulizer for those with bronchospasm except for one patient who had desaturation after orthopedic procedure and admitted to ICU suspected to have fat embolism (Faraj et al 2012). Cardiovascular complications are a major component of PACU adverse events. These complications range from hypotension to cardiac arrest. In our survey hypotension occurred in 38.4% of patients, responded to fluid challenge.

Our study having shown that patients experiencing two cardiovascular events (hypertension and tachycardia) were at greater risk for unplanned admission to the critical care unit and at greater risk of dying illustrates that the occurrence of these two intermediate events are markers of increased risk for long-term outcomes.

Hypotension occurrence in PACU is mostly due to hypovolemia, blood loss and medication side effects (Faraj et al 2012). In our survey, the incidence of hypertension and tachycardia in PACU were 35.2 % and 26.8 % respectively. Rose et al reported that Hypertension and tachycardia in PACU are an infrequent finding (Rose et al 2011), however it is associated with increased risk of unplanned ICU admission and mortality irrelevant to anesthetic management. Yet our analysis of the relative contribution of the five factor groupings (patient, surgical, anesthetic, or observations, and other PACU observations) revealed that specific anesthetic choices contributed little toward these cardiovascular events.

Perioperative care has improved over the last few decades, as a result of developments in anesthesia practice, mainly in monitoring, equipment's, short acting anesthetics with fewer side effects and certainly in perioperative medicine and the availability of anesthesia clinic usually run by senior anesthetists with good infrastructure and experience; all in all have a great impact on outcome. Some postoperative morbidity and mortality is inevitable, especially as more surgical procedures are now performed on older, sicker patients (Faraj et al 2012).

The Post Anesthesia Care Unit environments are ideal for the detection of early perioperative cardiovascular problems because patients are intensively monitored, standardized protocols, and treatment regimens are used. Nonetheless, this study, which relied on the anesthesiologists and PACU nurses to recognize and record physiologic parameters outside a defined range, may not have recorded all occurrences. Although definitions of PACU events were directly available from PACU records, we cannot rule out variations in interpretation, and recording of events stopped at the time of

PACU discharge (Scott et al 2011). Postoperative nausea and vomiting was the third most common complication (69.6%), and is the second major complaints from the patients' perspective. This may have increased the overall incidence of postoperative nausea and vomiting although the anesthetic techniques used were representative of current practice elsewhere. Multiple interventions should be reserved for high-risk patients, yet the issue of PONV remained complex and distressing. In this population the incidence of nausea a vomiting after regional anesthetic (mostly spinal) was greater than that reported elsewhere but our sample size in this study was too small to exclude chance variation. Incidence of PONV is multifactorial depending on patient factors, intra-operative and postoperative risk factors. Patient factors include female gender, non-smoking, ambulatory patients, diabetes and history of motion sickness, meanwhile intra-operative factors such as the use of opioids, inhalational anesthetic, reversal agents and type of surgery such as gynecology, and strabismus (Faraj et al 2012).In our study the incidence of PONV is lower complications in ENT and ophthalmic and Urology patients can be the underlying reason of the low incidence though gynecological and pediatric patients were not excluded.

THE ROLE OF THE PACU NURSE

As anesthetic and surgical procedures have evolved, the need for a specialized nursing service in the acute post-operative phase was recognized (Radford, 2003).The Australian Council of Operating Room Nurses (ACORN) (2008, NR 6:1) defines the role of the Post-Anesthesia Recovery (PAR) nurse as providing ‘care for patients immediately following an anesthetic (general anesthesia, sedation or regional anesthesia), surgery or any procedure that has the potential to produce life threatening complications. The role of nurses in the PACU environment is seen as essential to the safe post-operative care of the patient (ACORN, 2008; Australian and New Zealand College of Anesthetists (ANZCA), 2006; Hatfield & Tronson , 2001). supports this by stating that ‘The most important ingredient in a successful PACU is a well-educated, highly skilled, flexible nursing staff’, It appears that the need for professional

registered nurses to provide direct patient care is reinforced by the need to incorporate the maintenance of a safe environment and necessary equipment (Drain (2003, p 12).

Chapter 6 : Conclusion

Patients classified as American Society of Anesthesia (ASA) category 2 and 3 in this study were observed to be more likely to distribution of the patients in (ASA) scale. Postoperative nausea and vomiting (PONV) complications were the most common adverse events in our study as expected, followed by cardiovascular complications and respiratory complications. Patients who had complications were found not being affected significantly by their position during surgery, age or duration of the procedure.

This survey doesn't support the current impression of decreased incidence of postoperative complications after surgery. However, this survey has enhanced our awareness of postoperative complications and raised the possibility of recognizing patients at higher risk for developing complications.

In summary, cardiovascular events in the PACU and after PACU discharge remain a postoperative concern. While the occurrence of these cardiovascular events in the PACU was infrequent, hypertension and tachycardia were both associated with risk for long-term outcomes such as unplanned admission to a critical care unit and hospital mortality.

Recommendations:

- Adequate prophylaxis of postoperative nausea and vomiting (PONV) to reduce N&V after operative.
- Teaching patients about sign and symptoms for respiratory complications (hypoxia, airway obstructions) before and after surgery is best done during the preoperative period.
- The nurses will monitor vital sign frequently to check blood pursuer and pulse to prevent cardiac complications.

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APPENDIX

Appendix I: Questionnaire Form

Post-Anesthesia & Operative Complication of Patient admitted Intensive Care Units at NEU Hospital in Northern Cyprus

The project is carried by the near east university and the aim of the study is to find the incidence and rate of anesthesia associated post operative complication in PACU for patients of Northern Cyprus main Hospital

Age:

Gender :

Type of surgery (specify + site):	☐ **Gs** ☐ **Chest** ☐ **Ent** ☐ **Orthopedic** ☐ **Urology** ☐ **Vascular** ☐ **Ophthalmology** ☐ **Plastic surgery** ☐ **Others (specify): …….**
POSITION DURING SURGERY	☐ **Supine** ☐ **Prone** ☐ **Lateral** ☐ **Lithotomic** ☐ **Others (specify):……..…**
Type of anesthesia	☐ **GA** ☐ **REGIONAL (SPINAL)** ☐ **Epidural ,** ☐ **Nerve block**
Duration of anesthesia	**HRS : MIN:**
ASA physical status	**(1) (2) (3) (4) (5) (6)**
Attending anesthesiologist	☐**Consultant** ☐**Specialist** ☐**Resident**
Preexisting co-morbidities	☐ **Respiratory** ☐**CNS** ☐**Neurological** ☐ **Renal** ☐ **Endocrine** ☐**GIT** ☐ **Others** ☐ **None**
Intra operative complication	☐ **Yes** ☐ **No** ☐ **If (Yes) specify: ……..**

Complications detected in the PACU			
1	Cardiovascular ☐ None		
	☐ Hypertension (20% change of preop value)		
	☐ Hypotension (20% change of preop value)		
	☐ Ischemia .MI (proved 12 – lead ECG)		
	☐ Shock (type) (systolic BP<90 mmhg)		
	☐ Cardio respiratory arrest		
	☐ Angina		
	☐ pulmonary edema		
	☐ Arrhythmia requiring treatment (E.Q Atrial fibrillation)	Management	
	☐ Tachycardia (heart rate >100 beat /min)		
2	☐ Air way and respirator ☐ None	Management	
	☐ st ☐ or Aspir ☐ on wheezing	☐ Air way	
	☐ APNEA hypoventilation ☐	☐ medication	
	☐ hypoxia (spo2 <90% on oxygen)	☐ ventilation	
	☐ others		

3	☐ CNS ☐ None	Management
	☐ Continues ☐ Delirium ☐ Seizure	
	☐ Persistence sedation	
	☐ Others	
4	☐ GIT ☐ None	Management
	☐ Nausea / vomiting	
5	☐ Drug reaction ☐ None	Management
	Specify (skin rash , anaphylaxis)	
6	investigation none	Result
	☐ ABG ☐ RBC ☐ ECG ☐ CXR ☐ OTHERS	
7	☐ Medical consultation	Y N
8	☐ Remarks	
9	☐ Duration in I.C.U	

Appendix II: Ethical Approval form

EU: 416 – 2016

YAKIN DOĞU ÜNİVERSİTESİ
BİLİMSEL ARAŞTIRMALAR DEĞERLENDİRME ETİK KURULU

ARAŞTIRMA PROJESİ DEĞERLENDİRME RAPORU

Toplantı Tarihi : 22.09.2016
Toplantı No : 2016/39
Proje No : 310

Yakın Doğu Üniversitesi Sağlık Bilimleri Fakültesi / Hemşirelik Bölümü öğretim üyelerinden Doç. Dr. Ümran Dal Yılmaz'ın sorumlu araştırmacısı olduğu, YDU/2016/39-310 proje numaralı ve **"Post-Anesthesia & Operative Complications of patients admitted Intensive Care Units at NEU Hospital in Northern Cyprus"** başlıklı proje önerisi kurulumuzca değerlendirilmiş olup, etik olarak uygun bulunmuştur.

1. Prof. Dr. Rüştü Onur (BAŞKAN)
2. Prof. Dr. Nerin Bahçeciler Önder (ÜYE)
3. Prof. Dr. Tamer Yılmaz (ÜYE)
4. Prof. Dr. Şahan Saygı (ÜYE)
5. Prof. Dr. Şanda Çalı (ÜYE)
6. Doç. Dr. Ümran Dal (ÜYE)
7. Doç. Dr. Çetin Lütfi Baydar (ÜYE) KATILMADI
8. Yrd. Doç. Dr. Emil Mammadov (ÜYE)