

**EMERGENCE DELIRIUM IN ADULT SURGICAL PATIENTS IN  
POST ANAESTHESIA CARE UNIT AT KENYATTA NATIONAL  
HOSPITAL, A DESCRIPTIVE OBSERVATIONAL STUDY**

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**A DESERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE  
REQUIREMENTS FOR THE DEGREE OF MASTER OF MEDICINE IN  
ANAESTHESIA**

**July, 2019**

## DECLARATION

I certify that this proposal is my original work. It has not been presented for the award of a degree in any other institution.

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## **DEDICATION**

To Irene Wawira Ndung'u, thanks for standing by me through the long hours, you are a pillar of strength.

To my girls Natalie, Naysa and Nalani, if I did this you can make it through anything in life, and you have my full support and protection.

Mr. Waweru Francis: Am indebted to be your son and I have made you proud. REST IN PEACE AND PRIDE

REST OF WAWERU FAMILY: Thanks for enduring the hard times with me

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## **LIST OF ABBREVIATIONS**

<b>KNH:</b>	Kenyatta National Hospital
<b>U.O.N.:</b>	University of Nairobi
<b>PACU:</b>	Post Anaesthesia Care Unit
<b>WHO:</b>	World Health Organization
<b>ERC:</b>	Ethics Research Committee
<b>GA:</b>	General Anaesthesia
<b>ASA:</b>	American Society of Anesthesiologists physical status classification
<b>MRI:</b>	Magnetic Resonance Imaging
<b>IV:</b>	Intravenous
<b>P.I:</b>	Principle Investigator

## OPERATIONAL DEFINITIONS

<b>Delirium-</b>	Acute alteration /disturbance in awareness and attention to ones surrounding with disorientation and perceptual alterations.
<b>Emergence delirium-</b>	Disturbance in awareness and attention to ones surrounding with disorientation and perceptual alterations occurring immediately post operatively.
<b>Induction drugs-</b>	Drugs/agents used to achieve the triad of anaesthesia (hypnosis, analgesia and muscle relaxation)
<b>Maintenance drugs-</b>	Drugs/agents used to maintain the triad of anaesthesia. (hypnosis, analgesia and muscle relaxation)
<b>Time Zero (0) -</b>	Time immediately after reversal and extubation.
<b>Time of discharge from PACU-</b>	Time patient is fit for discharge from PACU

## **ABSTRACT**

Emergence delirium is a transient condition characterized by an alteration in awareness and inattention to one's immediate environment with disorientation and perceptual alterations like hypersensitivity and hyperactive motor behavior immediately post recovery from anaesthesia. During this time the patient is confused, agitated or disinhibited. They can be hyperactive or hypoactive. Hyperexcitability presents with crying, non-purposeful movements or hallucinations during emergence from anaesthesia. Hypoactive present with a withdrawn state with difficulty in arousal.

It poses a danger to patients, staff and also results in an increase in the utilization of resources. Studies done on emergence delirium have been done on paediatric population who encompass only a small percentage of patients attended to in KNH. The incidence was 43.7%. There are no guidelines for the management of emergence delirium in KNH currently. We need to know the incidence of emergence delirium to guide the formulation of guidelines for the same. A number of scales have been used to study to study delirium. Scales used include: Confusion Assessment Method for ICU( CAM-ICU), Riker Sedation Agitation scale (SAS), Richmond Agitation Sedation scale (RASS), Motor activity assessment scale, 3-min Diagnostic Confusion Assessment Method( 3D-CAM) New Sheffield sedation scale, Nursing Delirium Screening Scale, Confusion Assessment Method.

The study used both the CAM-ICU and the RASS scales. CAM-ICU was used to detect the presence of delirium while the RASS was used to classify the delirium into hyperactive and hypoactive.

Incidence of delirium was found to be 64.5% with hyperactive delirium at 30.9% and hypoactive was 33.6%. Risk factors for development of delirium were advanced age( >69 years), ASA 1, ENT surgery, surgery lasting 61-120 minutes and those above 360 minutes and use of Cannabis sativa. Pain and anxiety were the most reported cause of hyperactive delirium while hypoactive was as a result of inadequate emergence.

### **Objectives:**

#### **General Objective**

Was to determine the incidence of emergence delirium in adult patients undergoing surgery at Kenyatta National Hospital.

## **Research Methodology.**

The study was a descriptive observational study.

The study population were adult patients undergoing surgery under general anaesthesia. The study site was at Kenyatta National Hospital main theatre. Patients were recruited using convenient samplings according to their arrival at the theatre receiving area. Those that fit the study inclusion criteria were then followed to the specific theatre that they had surgery done.

Data collected at the receiving area included biodata, any pre-existing medical conditions, drug use, ASA classification and type of surgery being done.

In the specific theatre, data collected was induction time, induction drugs and dosages, maintenance drugs and dosages, analgesic drugs, dosages and time of administration. Time of reversal from anaesthesia was noted to enable calculation of total surgery time.

In the post anaesthesia care unit (PACU) data collected was, time of arrival, presence or absence of emergence delirium, measures taken to alleviate emergence delirium if present and the time of discharge from PACU.

The data was collected in form of an interview of the patient before entering theatre, perusal of the anaesthetic chart of the patient during surgery and actual presence from time of reversal to time of discharge from PACU. All this data was filled into a printed study questionnaire.

The data was then summarized as means and standard deviation. Categorical data was summarized by use of frequencies and proportions. P-values and 95% confidence intervals were calculated where applicable.

The main outcome was the presence or absence of emergence delirium.

Findings will help in the possible formulation of guidelines for the management of emergence delirium which will result in better patient outcomes and optimize resource utilization.

## 1.0 INTRODUCTION

Emergence delirium is a transient condition characterized by an alteration in awareness and inattention to one's immediate environment with disorientation and perceptual alterations like hypersensitivity and hyperactive motor behavior immediately post recovery anaesthesia.

During this time the patient is confused, agitated or disinhibited. They can be hyperactive or hypoactive. Hyperexcitability presents with crying, non-purposeful movements or hallucinations during emergence from anaesthesia.<sup>1</sup> Hypoactive present with a withdrawn state with difficulty in arousal.

Emergence delirium manifests in the immediate post-operative period up to about 30 minutes after emergence from anaesthesia. There have been reports of emergence delirium lasting up to 45 minutes and even days in severe cases.<sup>2,3</sup> The patient undergoes a stressful difficult time as well as all the staff who are involved in their care and if not managed appropriately can result in morbidity. It was described by Dr. Eckenhoff in the 1960s as post anaesthetic excitement and during this period it was thought to have been as a result of the then anaesthetic agents in use—ether and cyclopropane.<sup>4</sup> Advancement of anaesthesia with time shifted from the use of ether and cyclopropane to the use of newer halogenated agents like halothane and more volatile agents—sevoflurane and desflurane but there were still reports of incidences of emergence delirium.

Emergence delirium manifests in two ways, a hyperactive delirium and a hypoactive delirium. In PACU hypoactive delirium is more frequent but the most dangerous form is the hyperactive type.<sup>5</sup>

During the hyperactive type the patient can easily harm themselves and other persons around them. Consequences can be catheter removals, falling, bruising and even injury to the staff handling the patient.

There has never been a clear cut cause of emergence delirium identified in all the studies done and all that we currently have are risk factors. The factors known so far are age, gender, pre-existing medical conditions, ASA classification, type of surgery, pre-operative anxiety, and drug use, type of anaesthesia, pain, invasive-ETT, urinary catheter, drains, need to urinate and residual block.<sup>6</sup>

## **1.2 General Objective**

To determine the incidence of emergence delirium in adult patients undergoing surgery at Kenyatta National Hospital.

## **1.3 Specific Objectives**

1. To determine the incidence of emergence delirium in adult patients undergoing surgery (elective and emergency) at Kenyatta National Hospital.
2. To determine the incidence of hypoactive delirium versus hyperactive delirium in adult patients undergoing surgery at Kenyatta National Hospital.
3. Determine risk factors for the development of emergence delirium in adult patients undergoing surgery at Kenyatta National Hospital.
4. Determine length of stay in PACU with/without emergence delirium in adult patients' undergoing surgery at Kenyatta National Hospital.

## 2.0 LITERATURE REVIEW

Delirium is a word of Latin origin which according to Marcus Terentius Varro (11BC-27BC) that means going off the programmed /ploughed track which figuratively meant a normally sane person suddenly becomes mad.

Emergence delirium was described by Eckenhoff et.al in 1960. He observed 14,000 patients who experienced unusual post-operative behavioral disturbances which were termed as “excitement” with an incidence of 5.3% of the sampled patients. These patients had increased morbidity, mortality and utilization of resources like drugs, hospital equipment and staff required. <sup>4</sup>

Card et al 2015 studied 400 patients to determine the incidence of emergence delirium at PACU. Findings were 124 patients (31%) had delirium on admission to PACU but 65 patients (16%) developed features of delirium during the stay in PACU, showing that patients do develop delirium post operatively but emergence delirium is indeed for a short duration.<sup>5</sup> The study also revealed that most cases of delirium are in fact the hypoactive type where the patients appear drowsy, sedated or unarousable while the hyperactive ones appear restless, agitated or combative. The study used a combined tool encompassing the Richmond Agitation-Sedation Scale (RASS) and the Confusion Assessment Method for the Intensive Care Unit (CAM-ICU). RASS was used to pick presence of delirium while CAM-ICU classified the delirium as hyperactive or hypoactive. Main strength of the study was the structured tool that enabled detection of delirium and still delineated it into hyper and hypoactive. Weakness was mild cognitive impairment was not assessed prior to induction of anaesthesia. There was no protocol for the management of pain and analgesic use was not followed up on the patients.

C. Lepouse’ et al 2006 carried out a prospective study termed -Emergence delirium in post surgical adult patients in PACU where 1359 consecutive patients were studied from 2003-2004. The Riker sedation scale was used to determine the presence of delirium. 4.7 % (64 patients) had delirium in PACU characterized by thrashing, violent behavior with the patients removing catheters and tubes. 17 patients were dangerously agitated, 20 very agitated and 27 agitated. Factors found predisposing patients to the development of delirium were preoperative benzodiazepines, neuromuscular blockers, anaesthesia procedure, breast and abdominal surgeries and long duration surgeries. Riker scale used was due to its ease of use

even in emergency situations and it's more sensitive in picking agitation as compared to Ramsay scale. Weakness of the scale is that it had not been validated for use in PACU.<sup>7</sup>

A cross-sectional descriptive study by Mohkamkar et al in 2014 on 747 pediatric patients showed emergence delirium had an incidence of 17.9% (134 children). Paediatric Anaesthesia Emergence Delirium Scale (PAEDS) was used to evaluate for emergence delirium. Procedures were mainly ENT, abdominal surgery, orthopedic, urology and ophthalmic surgery. Otorhinolaryngological procedures, pain and induction behavior of children were associated with higher rates of emergence delirium. Incidence of emergence delirium was higher in short surgeries. This was postulated to be due to rapid wash out of inhalational agents before analgesics reach peak effect.<sup>9</sup>

A paper titled "PITFALLS OF PEDIATRIC ANAESTHESIA" by Linda J. Mason mentions emergence delirium as one of the pitfalls. Emergence delirium incidence was 5.3% postoperatively with children having an incidence of 12-13%.<sup>11</sup> In a study by Smessaert et al in 1960 titled "Observations in the immediate post anaesthesia period, 1450 patients were observed of which 76% had a quiet recovery, 20% moderately agitated and 3% had marked delirium. In this study it was postulated that the anaesthetic agent was the significant factor to causing delirium, with other factors being site of surgery.<sup>11</sup>

Emergence delirium was also postulated to have been as a result of older agents-ether, halothane but it has been shown that it still occurs even with newer agents like isoflurane and sevoflurane. Kuratani N. et al in 2008 did a meta-analysis of randomized control trials titled – Greater incidence of emergence agitation in children after sevoflurane anesthesia compared to halothane. The findings were there was a higher incidence of emergence delirium with sevoflurane anaesthesia as compared with halothane. This has been postulated to be as a result of an irritating central nervous system effect of sevoflurane. Electroencephalography investigations during anaesthesia with sevoflurane have indeed shown epileptiform seizure waves in non-epileptic patients. Being a meta-analysis, it enabled the inclusion of a large population size (2363 patients) that would have been impossible with a randomized control study. A major limitation was that being different studies, each had a different protocol and methodology. Blinding was done in some studies while in others there was not blinding. The tool for recognizing and measuring delirium in the different studies was not always a validated tool and what was used primarily centered on behavioral changes than



psychometric factors. The meta-analysis was done on articles that spanned a period of time and had been published thus bringing a risk of publication bias with skewing of results.<sup>13</sup>

Daihua Yu et al observed 2000 patients scheduled for surgery to determine the incidence of postoperative agitation and any associated risk factors. The risk factors considered included age, gender, ASA physical status, type of surgery, anaesthesia plan (I/v or inhalational) administration of neostigmine or doxapram, adequate post-operative analgesia, pain, presence of tracheal tube or urinary catheter. Population included adults (16-70 years) for surgery under general anaesthesia. Patients were excluded if they had any neurological disease due to the risk of the disease presenting with agitation or retardation. Males had a higher incidence of agitation especially in inhalational than intravenous anaesthesia. Oral and otolaryngological surgery had higher incidences than other surgeries and was mainly attributed to pain or the necessity of leaving drains after surgery. The most common factor for the development of delirium was pain. A limitation in this study is that the patients had to be stimulated before being assessed, which may have been a predisposition to the agitation.<sup>4</sup>

Studies have linked pain as one of the main cause of delirium with multiple conclusions that adequate pain management will reduce both incidence and severity of emergence delirium, but we have had studies showing the occurrence of delirium in patients that underwent anesthesia for diagnostic procedures that don't involve any pain stimuli like in MRI. In 2000 Cravero J. et al did a randomized control study on 32 paediatric patients scheduled for MRI scans. They were randomized to receive inhalational anaesthesia with either sevoflurane or halothane. Sevoflurane patients had higher incidence of emergence delirium than those who got halothane thus revealing that emergence delirium can occur in the absence of pain or even when pain is controlled. The study had two grading systems of agitation; one deemed "LOW THRESHOLD" involving crying uncontrollably for three minutes and a "HIGH THRESHOLD" where there was thrashing for three minutes. There was also no standardization of the MAC used for the inhalational agents and it was left to be a close normal to what happens in every day practice. Data analysis revealed a higher number of females in the sevoflurane group compared to halothane inferring a higher risk which has not been replicated in any other studies. The absence of a proper grading tool was a big weakness for the study, but it still brought out that pain is not the only predisposing factor to delirium as had previously been postulated.<sup>13</sup>

A number of scales have been used to study to study delirium. Scales used include: Confusion Assessment Method for ICU (CAM-ICU), Riker Sedation Agitation scale (SAS), Richmond Agitation Sedation scale (RASS), Motor activity assessment scale, 3-min Diagnostic Confusion Assessment Method (3D-CAM) New Sheffield sedation scale, Nursing Delirium Screening Scale, Confusion Assessment Method. Studies have been done to compare the different scales correlation and agreement with results in different studies in regard to delirium assessment.

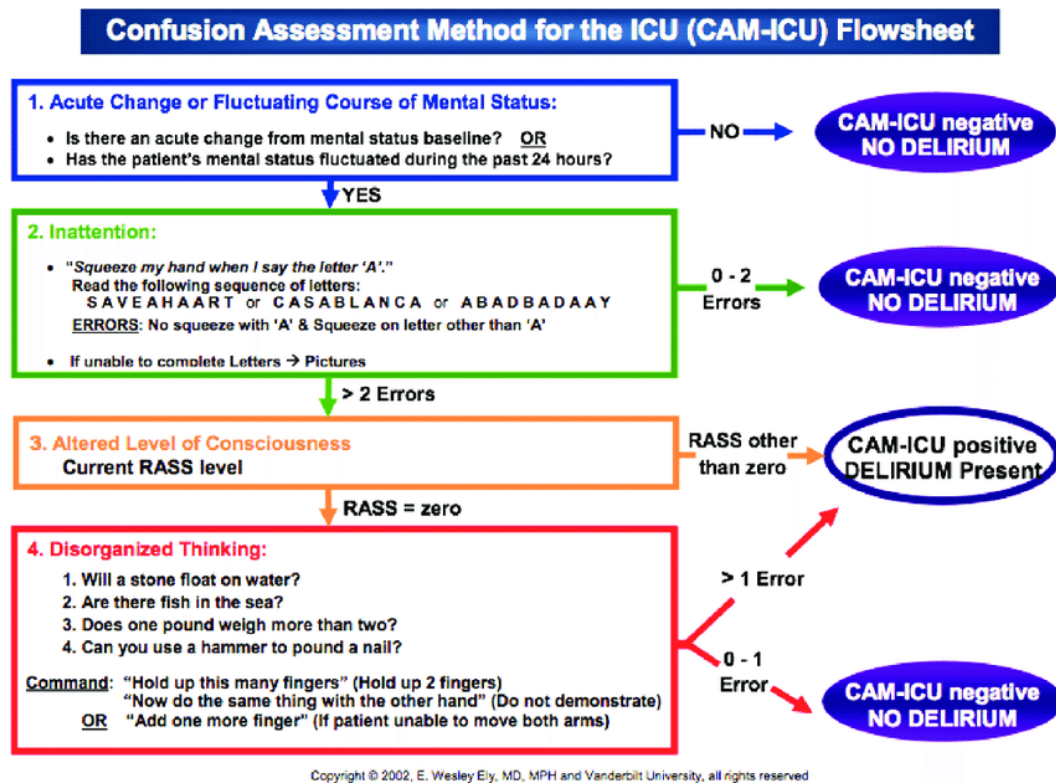
Khan B.A. et al compared SAS and RASS in evaluating patient eligibility for delirium assessment in ICU. A prospective cohort study that involved 975 patients. The objective of the study was correlation and agreement of the two scales in delirium assessment. He concluded that both scales when applied to patients had similar rates of delirium assessment.<sup>15</sup> These two scales have excellent interrater reliability. Both scales also had similar delirium rates as when CAM-ICU was used.

Card et al used CAM-ICU combined with the RASS scale in his study. CAM-ICU to determine presence of delirium and the RASS to grade the delirium as hyperactive or hypoactive.<sup>5</sup>

The 3D-CAM and CAM-ICU have been evaluated in different studies for their specificity and sensitivity in detection of delirium. Kuczmaraska et al 2016 compared the two. Results showed 95% sensitivity for 3D-CAM and 53% sensitivity for CAM-ICU. Both had a specificity of > 90%.<sup>16</sup> A downside for the 3D-CAM is that it requires patients to verbally answer questions put to them for the assessment of delirium unlike CAM-ICU. This makes CAM-ICU more superior as it can be applied to patients who are not able to talk.

The above comparisons between scales that have been used to assess delirium in many different centers under variable protocols and populations reveal that each have their own weaknesses and strengths. In view of the above, I have formatted my tool to be a combination of two scales: CAM-ICU and RASS scales will be used to evaluate patients while in PACU. The CAM-ICU to detect the presence of delirium while RASS will define the delirium as hyperactive or hypoactive.<sup>15, 18</sup>

**Table 1: Confusion Assessment Method-Intensive Care Unit (CAM-ICU) <sup>18</sup>**



**Table 2: Richmond Agitation Sedation Scale( RASS)<sup>15</sup>**

SCORE	TERM	DESCRIPTION
+4	Combative	Overtly combative, violent, immediate danger to staff
+3	Very Agitated	Pulls or removes tubes, catheters, aggressive
+2	Agitated	Frequent non-purposeful movements
+1	Restless	Anxious but movements not aggressively vigorous
0	Alert and Calm	
-1	Drowsy	Not fully alert but has sustained awakening (eye opening/contact to voice > 10 seconds)
-2	Light Sedation	Briefly awakens to voice with eye contact < 10 seconds
-3	Moderate Sedation	Movement or eye opening to voice but no eye contact
-4	Deep Sedation	No response to voice but movement or eye opening to

		physical stimulation
-5	Unarousable	No response to voice or physical stimulation

The patients were divided into two Groups- Delirious or not delirious. The delirious group were further classified as hyperactive or hypoactive delirium using the RASS scale.

### **3.0 STUDY JUSTIFICATION AND METHODOLOGY**

We have a very active and well equipped theatre at our hospital being the National referral hospital, in the last three(3) years the average number of surgeries done in a year are 20,732 with 16,585 adult cases and 4147 paedriatic cases<sup>7</sup> and yet we don't have data on one of the life threatening complications that can occur.

The study done on emergence delirium in our centre by Dr. Kirwa was done on paedriatics patients who encompass a small percentage of the total population of patients that we see and serve every day. In this study, the finding were that there was an incidence of 43.7%<sup>8</sup>

We perform surgery, for different ages, both genders, all ASA classes and also our population is exposed to medical/recreational drug uses which are all predisposing factors to the development of emergence delirium but we have no existing protocol or training to guide our staff to manage emergence delirium when it occurs.

Emergence delirium is stressful to the patients and staff and can lead to harm in both populations and thus we should be pre-empting its occurrence and be ready for its management in case it occurs.

The finding of this study will provide useful information for policy makers in order for them to plan how we can pre-empt and manage emergence delirium at the most beneficial way to the patient, staff and institution

#### **3.1 Study Design**

The study was an observational descriptive study.

#### **3.2 Study Site**

The study site was Kenyatta National Hospital Main theatre.

#### **3.3 Study Population**

All adult patients undergoing surgery under general anaesthesia at the main theatre of Kenyatta National Hospital.

### 3.4 Sample Size Determination

Sample size was calculated using the (Daniel, 1999) formula<sup>16</sup>

$$n = \frac{Z^2 \times P(1 - P)}{d^2}$$

Where,

$n$  = Desired sample size

$Z$  = value from standard normal distribution corresponding to desired confidence level

( $Z=1.96$  for 95% CI)

$P$  = expected true proportion (estimated at 31%, study of 400 patients by *Cardet al* (2015),

124 (31%) patients had features of delirium at admission in PACU.<sup>5</sup>

$d$  = desired precision (0.05)

$$n_0 = \frac{1.96^2 \times 0.31(1 - 0.31)}{0.05^2} \approx 330$$

The study sample size was 330 patients.

### 3.5 Inclusion Criteria

- i. American society of Anesthesiologists classes 1-2
- ii. Patients above 18 years
- iii. Patients who give written informed consent

### 3.6 Exclusion Criteria

- i. Patients below 18 years.
- ii. Patients who fail to give informed consent.
- iii. Patients who will be admitted into Intensive Care Unit from the operating table.

- iv. Patients with an altered Glasgow Coma Scale pre-operatively.
- v. Patients with organic brain diseases.

### **3.7 Sampling**

The sampling was done using the convenient sampling method for all patients undergoing surgery in Kenyatta National Hospital main theatre and met the inclusion criteria.

### **3.8 Recruitment**

The participants were recruited at the main theatre receiving area after they had being handed over to the theatre staff by the ward staff.

The patients were approached to give informed written consent after an explanation about the study.

#### **3.9.1 Data Management and Analysis**

Data was collected via printed questionnaire by the PI and research assistants. The questionnaires were kept in a secure and lockable place only accessible to the PI. The data was cleaned and analyzed using SPSS (Version 21.0, Chicago-Illinois).

Continuous data was summarized as means and standard deviation. Categorical data displayed as frequencies and proportions. The prevalence of delirium was calculated as the proportion of patients with at least one episode of delirium at PACU and presented as a percentage. P-values and 95% confidence intervals (CIs) were calculated where applicable. A P value <0.05 was considered statistically significant.

#### **3.9.2 Ethical Consideration**

Approval was sort from the Ethics and Research Committee KNH/UON before data collection began. The principal investigator ensured that all the participants get full and adequate information about the research. All the participants had to sign a written consent form before they were recruited in the study. Patients were free to decline participation in the study, or withdraw at any point within the study period and this would not affect their management in any way. The study was an observational as such no invasive procedure was done on any participant. No additional costs was incurred by the patients.

### **3.9.3 Study Feasibility**

Approximately 100 patients per day are operated on in KNH. There were enough patients to reach the estimated sample size within the study period. The recruitment was done every week within the duration of the study to reach the sample size.

### **3.9.4 Study Limitations**

The study was limited due to the fact that there no standard way for the provision of anaesthesia, all providers give anaesthesia according to their best knowledge and thus very different methods and drugs were used.

### **3.10 Study Findings Dissemination**

The findings of this study were disseminated through presentation to KNH-UON ERC, Anaesthesia department KNH/UON, manuscripts, presentation in seminars and conferences organized by Kenya Society of Anesthesiologists (KSA), KNH theatre team and report to KNH/UON ERC.



## 4.0 RESEARCH FINDINGS

The main objective of the study was to determine the incidence of emergence delirium in adult patients undergoing surgery at Kenyatta National Hospital.

### 4.1 Patient characteristics

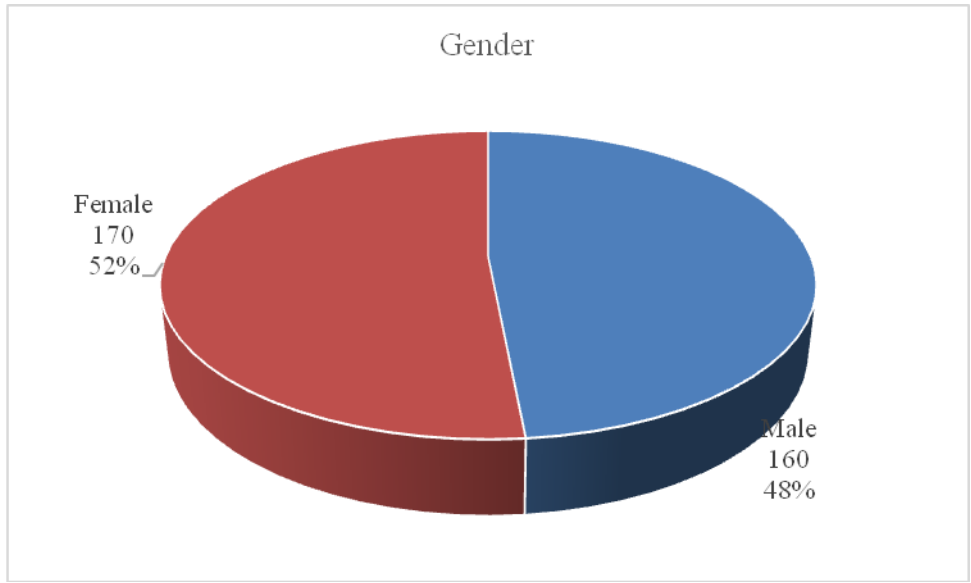
This section describes the characteristics of the patients that were enrolled in the study.

The characteristics of the patients were as shown by the table below.

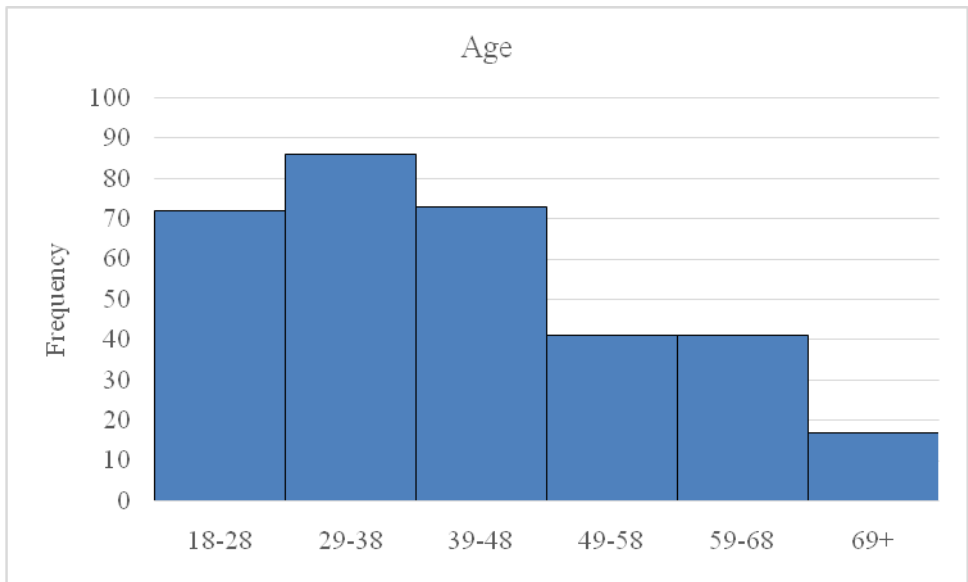
**Table 3: Patient characteristics**

	Frequency	Percent
<b>Sex</b>		
Male	160	48.5
Female	170	51.5
<b>Age</b>		
18-28	72	21.8
29-38	86	26.1
39-48	73	22.1
49-58	41	12.4
59-68	41	12.4
69+	17	5.2

The mean age of the patients was 41.5 (SD=14.6) years, while the median age was 40.0 (IQR=22) years.



**Figure 1: Gender(male and female in percentages)**



**Figure 2: Age distribution (in years)**

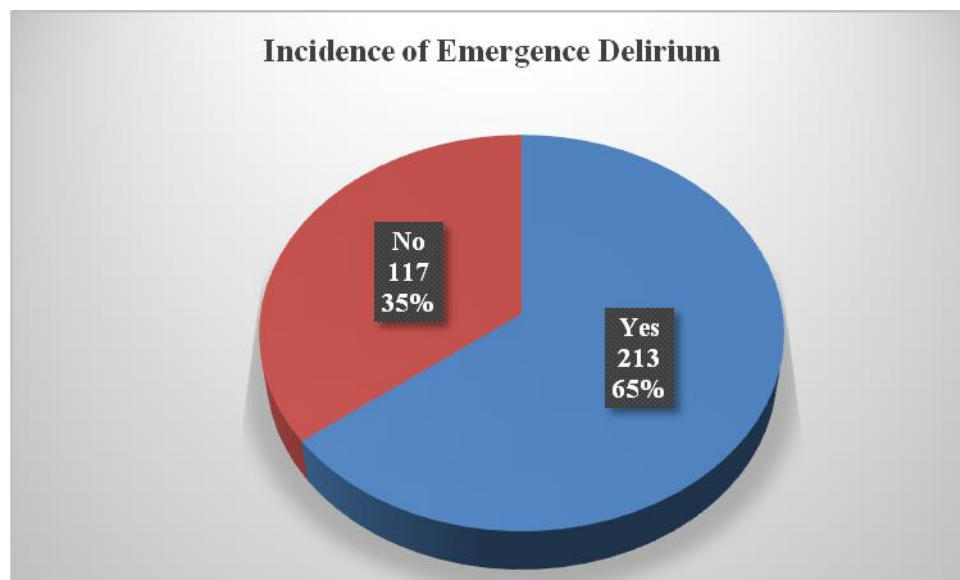
## 4.2 Incidence of Emergence Delirium

This section presents the results of the incidence of emergence delirium in adult patients undergoing surgery (elective and emergency) at Kenyatta National Hospital.

The results of the incidence of emergence delirium is as shown by the table below.

**Table 4: Incidence of Emergence Delirium**

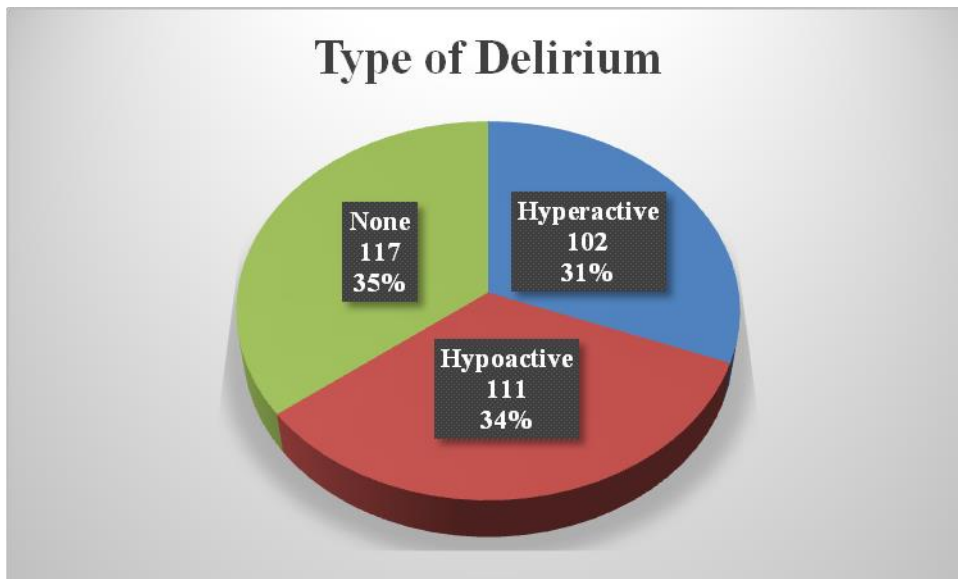
	<b>Frequency</b>	<b>Percentage</b>
Yes	213	64.5
No	117	35.5
<b>Total</b>	330	100.0



**Figure 3: Incidence of Emergence Delirium**

**Table 5: Type of Delirium**

	<b>Frequency</b>	<b>Percent</b>
Hyperactive	102	30.9
Hypoactive	111	33.6
None	117	35.5
<b>Total</b>	330	100.0



**Figure 4: Type of Delirium**

**Table 6: Result of delirium (N=119)**

	<b>N</b>	<b>Percent of responses</b>	<b>Percent of cases</b>
Require restraining	78	40.8%	65.5%
Require additional staff	66	34.6%	55.5%
Catheter removal	13	6.8%	10.9%
Bleeding	23	12.0%	19.3%
Injuries to self	11	5.8%	9.2%
Injuries to staff	0	0%	0%

Out of the 119 patients, 78 (65.5%) required restraining, 66 (55.5%) required additional staff, 13(10.9%) had catheter removals, 23(19.3%) resulted in bleeding and 11(9.2%) resulted in injuries to self (patient).

There was no observed/reported injury to any healthcare provider.

**Table 7: Cause of delirium(N=209)**

	N	Percent of responses	Percent of cases
Pain	58	20.9%	27.8%
Anxiety	56	20.1%	26.8%
Presence of urinary catheter	15	5.4%	7.2%
Inadequate emergence	141	50.7%	67.5%
Presence of tracheal tube	1	.4%	.5%
Presence of nasal pack	4	1.4%	1.9%
Presence of drain	1	.4%	.5%
Nasogastric tube	2	.7%	1.0%

Out of the 209 patients the probable cause of delirium was as follows: 58 (27.8%) pain, 56 (26.8%) anxiety, 15(7.2%) presence of urinary catheter, 141 (67.5%) inadequate emergence, 1(0.5%) presence of tracheal tube, 4(1.9%) presence of a nasal pack, 1(0.5%) presence of drain and 2(1.0%) was presence of a nasogastric tube.

#### **4.3 Risk Factors for Development of Emergence Delirium**

This section presents the results of risk factors for the development of emergence delirium in adult patients undergoing surgery at Kenyatta National Hospital.

Risk factors for the development of emergence delirium are as shown in the table below.

**Table 8: Risk Factors for Development of Emergence Delirium**

	Delirium		Total	p-value
	Present	Absent		
<b>Sex</b>				
Male	105 (49.3)	55 (47.0)	160 (48.5)	0.691
Female	108 (50.7)	62 (53.0)	170 (51.5)	
<b>Age</b>				
18-28	42 (19.7)	30 (25.6)	72 (21.8)	0.231
29-38	59 (27.7)	27 (23.1)	86 (26.1)	0.360
39-48	46 (21.6)	27 (23.1)	73 (22.1)	0.757
49-58	26 (12.2)	15 (12.8)	41 (12.4)	0.872
59-68	25 (11.7)	16 (13.7)	41 (12.4)	0.610
69+	15 (7.0)	2 (1.7)	17 (5.2)	0.036
<b>ASA</b>				
1	123 (57.7)	90 (76.9)	213 (64.5)	<0.001
2	90 (42.3)	27 (23.1)	117 (35.5)	
<b>Type of surgery</b>				
Cardiothoracic	12 (5.6)	6 (5.1)	18 (5.5)	0.833

ENT	39 (18.3)	3 (2.6)	42 (12.7)	<0.001
General surgery	54 (25.4)	39 (33.3)	93 (28.2)	0.136
Gynaecology	29 (13.6)	24 (20.5)	53 (16.1)	0.110
Maxillofacial	13 (6.1)	5 (4.3)	18 (5.5)	0.473
Obstetric	1 (0.5)	1 (0.9)	2 (0.6)	1.000
Ophthalmology	1 (0.5)	0 (0)	1 (0.3)	1.000
Orthopaedic	27 (12.7)	22 (18.8)	49 (14.8)	0.134
Plastic	17 (8)	10 (8.5)	27 (8.2)	0.858
Urology	20 (9.4)	7 (6)	27 (8.2)	0.280
<b>Duration of surgery (mins.)</b>				
<60	5 (2.3)	3 (2.6)	8 (2.4)	1.000
61-120	59 (27.7)	46 (39.3)	105 (31.8)	0.030
121-180	67 (31.5)	39 (33.3)	106 (32.1)	0.727
181-240	40 (18.8)	16 (13.7)	56 (17)	0.237
241-300	19 (8.9)	10 (8.5)	29 (8.8)	1.000
301-360	14 (6.6)	3 (2.6)	17 (5.2)	0.115
>360	9 (4.2)	0 (0.0)	9 (2.7)	0.029
<b>Catha edulis(Khat)</b>				
Yes	7 (3.3)	3 (2.6)	10 (3.0)	1.000
No	206 (96.7)	114 (97.4)	320 (97.0)	
<b>Cannabis sativa(Bhang)</b>				
Yes	13 (6.1)	0 (0.0)	13 (3.9)	0.005
No	200 (93.9)	117 (100.0)	317 (96.1)	

**Table 9: Breakdown of general surgery cases and delirium**

Type of surgery	Delirium Yes	Delirium No	Total	p-value
Abdomen	35 (64.8)	20 (51.3)	55 (59.1)	0.190
Breast	6 (11.1)	5 (12.8)	11 (11.8)	0.801
Others General surgery	13 (24.1)	14 (35.9)	27 (29.0)	0.215

#### 4.4 Length of Stay in PACU with/without Emergence Delirium

This section presents the results of time of discharge from PACU and length of stay in PACU with/without emergence delirium in adult patients' undergoing surgery at Kenyatta National Hospital. Cut off time was determined by resolution of delirium that also coincided with Alderete score of 9 and above. The Alderete score is used in the KNH protocol for discharge from PACU.<sup>26</sup>

**Table 9 : Time of discharge from PACU**

<b>Time of discharge from PACU –Cut off time (mins)</b>	<b>Frequency</b>	<b>Percent</b>
16 to 30	131	39.7%
31 to 45	55	16.7%
46 to 60	80	24.2%
61 to 75	45	13.6%
76 to 90	6	1.8%
91 to 120	13	3.95%

The results of the length of stay in PACU with/without emergence delirium were as shown on the table below.

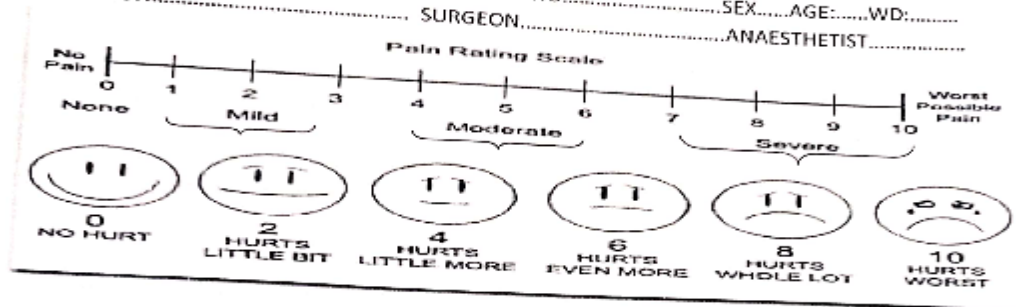
**Table 10: Length of stay in PACU**

	<b>Delirium</b>		<b>Total</b>
	<b>Present</b>	<b>Absent</b>	
<b>Length of stay in PACU (mins.)</b>			
<60	14 (6.6)	16 (13.7)	30 (9.1)
61-120	94 (44.1)	54 (46.2)	148 (44.8)
121-180	56 (26.3)	28 (23.9)	84 (25.5)
181-240	24 (11.3)	11 (9.4)	35 (10.6)
241-300	18 (8.5)	6 (5.1)	24 (7.3)
301-360	6 (2.8)	2 (1.7)	8 (2.4)
>370	1 (0.5)	0 (0)	1 (0.3)



**PAIN RATING SCORE AND ALDRETE SCORE**

NAME ..... IPNO ..... DATE .....  
 OPERATION ..... SURGEON ..... SEX ..... AGE ..... WD .....  
 ANAESTHETIST .....



**POST ANAESTHESIA CARE UNIT RECOVERY AND DISCHARGE SCORING**

MODIFIED ALDRETE SCORE :  TICK WHERE APPLICABLE

PARAMETER	DESCRIPTION OF PATIENT	SCORE	
		ADM	Discharge
Activity	Able to move 4 extremities	2	
	Able to move 2 extremities	1	
	Not able to control any extremity	0	
Respiration	Able to breathe deeply and cough	2	
	Limited respiratory effort (dyspnea or splinting)	1	
	No spontaneous respiratory effort	0	
Circulation (Blood pressure)	Systolic arterial pressure between plus or minus 20% of preanesthetic level	2	
	Systolic arterial pressure between plus or minus 20% to 50% of preanesthetic level	1	
	Systolic arterial pressure between plus or minus 51% or more of preanesthetic level	0	
Consciousness	Full alertness seen in patient's ability to answer questions and acknowledge his/her location	2	
	Aroused when called by name	1	
	Failure to elicit a response upon auditory stimulation	0	
Oxygen saturation as determined by pulse oximetry	Has level > 92% when breathing on room air	2	
	Requires supplementation of oxygen to maintain level >90%	1	
	Has level < 90% with oxygen supplementation	0	
<b>Total scores</b>			

Maximum total score is 10: a score of  $\geq 9$  is required for discharge

Scored by: Name ..... Designation ..... Signature ..... Date ..... Time .....



## 5.0 DISCUSSION

The main objective of this study was to determine the incidence of emergence delirium in adult patients undergoing surgery at Kenyatta National Hospital. The specific objectives were: to determine the incidence of emergence delirium in adult patients undergoing surgery (elective and emergency) at Kenyatta National Hospital, to determine risk factors for the development of emergence delirium in adult patients undergoing surgery at Kenyatta National Hospital, and to determine length of stay in PACU with/without emergence delirium in adult patients' undergoing surgery at Kenyatta National Hospital.

On the incidence of emergence delirium in adult patients undergoing surgery (elective and emergency) at Kenyatta National Hospital, the study found that the incidence was 64.5%. This was a combined percentage of hyperactive and hypoactive delirium. Hyperactive delirium was 30.9% while hypoactive delirium was 33.6%. Dr. Kirwa did a local study on paediatric population and had an incidence of 47.3%.<sup>7</sup> The study was focusing on hyperactive delirium and as such missed out on the hypoactive type. Card et al studied 400 patients to determine incidence of emergence delirium and the incidence was 31%.<sup>5</sup> The study also revealed that 19% had agitated delirium with 56% having hypoactive delirium at PACU admission and 92% developed delirium during the stay in PACU. The study used a structured tool to identify hypoactive and hyperactive delirium as used in our study and did infact bring out that hypoactive delirium does occur and has a higher incidence.

On the risk factors for the development of emergence delirium in adult patients undergoing surgery at Kenyatta National Hospital, the study found that gender was not a risk factor for the develop of emergence delirium. The study had 330 participants of which 160(48.5%) were male and 170(51.5%) were female. In the male population, 105(49.3%) developed delirium while 55(47%) had no delirium. In the female population, 108(50.7%) developed delirium while 62(53%) had no delirium. The P-value for gender comparison was 0.691, which was not statistically significant. Daihua et al studied 2000 patients for incidence of postoperative agitation and risk factors.<sup>4</sup> In the study, it was found that being male was a risk factor for the development of delirium,  $p=0.017$ . This study was however limited in that patients had to be stimulated before assessment of delirium and thus the results seen might

have been as a result of patient temperament. In our study, no stimulation was done and patients were assessed as they presented in PACU.

Advanced age (69 years and above) was found to be a risk factor for the development of emergence delirium with a p-value of 0.036. The study had 17 participants who were above 69 years and 15 of them developed emergence delirium. This is partly in keeping with a study done by FM Radke et al titled Risk factors for inadequate emergence after anaesthesia: emergence delirium and hypoactive emergence where 1868 patients were sampled and age below 40 years and above 64 years was found to be significant risk factor.<sup>19</sup> In a study on, Risk factors and incidence of postoperative delirium in elderly patients after elective and emergency surgery by L. Ansaloni et al, (1997), 357 patients were enrolled all above 65 years.<sup>20</sup> Independent variables found to have an association with post operative delirium were age above 75 years, co-morbidity, pre-operative cognitive impairment and diabetes. This is also in keeping with our study findings that advanced age above 69 years is a risk factor for the development of emergence delirium.

Previous studies included ASA classes I-III but our study inclusion criterion was ASA I and II. In the previous studies, results showed that ASA III was associated with an increased risk of emergence delirium, however in our study ASA I had a p-value of <0.001, which was statistically significant. C. Lepouse et al did a study on 1359 patients on risk factors for development of emergence delirium; results showed that ASA classification was not an independent risk factor for emergence delirium.<sup>8</sup> Caumo W. et al studied 712 patients on risk factors for postoperative delirium.<sup>21</sup> Participants were adults (18-60 years) and ASA I-III, undergoing elective surgery under general anaesthesia. The study suggested that ASA III was associated with a higher incidence of delirium though it recommended further studies on the impact of ASA classification on delirium. This shows that there has been no clear causal relationship explanation between ASA classification and emergence delirium.

Type of surgery as a risk factor for the development of delirium was assessed and ENT surgery was found to be a strong risk. A p-value of <0.001 was found that was statistically significant. Clinically significant was that the study had 42 patients undergoing ENT surgery and 39 of them developed delirium. Ophthalmology and obstetric surgery were found to be least statistically significant with p values of 1.

The results for ENT are in keeping with multiple studies that reveal it as a significant risk. Daihua et al studied 2000 patients undergoing surgery, for post operative agitation, and found that oral cavity and otolaryngological surgery was a risk compared to other forms of surgery.<sup>4</sup> This was attributed to pain and presence of endotracheal and tracheal tubes. They recommended adequate analgesia and early removal of endotracheal tubes and catheters to avoid delirium. Hyo-Jin Kim et al studied 792 patients retrospectively; to identify risk factors of emergence agitation in adults undergoing general anaesthesia for nasal surgery.<sup>22</sup> The finding was an incidence of 22.2%. Risk factors were young age, recent smoking, sevoflurane anaesthesia, pain, presence of tracheal tube and urinary catheter. The study concluded that emergence delirium was a common complication in nasal surgery (ENT). Lepouse et al studied 1359 patients undergoing surgery and results showed that breast and abdominal surgery were risk factors for development of delirium.<sup>8</sup> In this study, the two surgeries were encompassed in General surgery which had a p-value of 0.136. Individual calculated p-values for abdominal and breast surgeries compared to other types of surgery did not reveal any statistical significance with p-values of 0.190(abdomen) and 0.801(breast).

On duration of surgery, surgery lasting between 61-120 minutes and those above 360 minutes were found to be risk factors for development of emergence delirium with p-values of 0.030 and 0.029 respectively. Patients who had surgery of between 61 and 120 minutes were 105(31.8%) and of this, 59 (27.7%) had delirium while 46 (39.3%) had no delirium. The 59 that developed delirium, 28 (47.5%) had hyperactive delirium while 31(52.5%) had hypoactive delirium.

Pain was reported by 9(27.3%), anxiety 19(57.6%), presence of urinary catheter 3(9.1%), presence of tracheal tube 1(3%) and nasal pack 1(3%). The highest cause of delirium was anxiety, and this was found in all the different types of surgeries done as tabulated below but with the highest frequency seen in ENT surgery.

Anxiety was more frequent in ENT and delirium was resolved by an explanation to the patient. The anxiety was due to the packing of the nasal cavity and the patient feeling as if they are being choked. The patients reported later after resolution of delirium that they had not been briefed that they will have a pack or they will have to breathe through the mouth.

Pain was also a causative factor in this group and required rescue analgesia, of which morphine was used. Perusal of intra-operative analgesic use revealed that patients were not given multimodal analgesia or they had been under dosed. Opioids were missing from the

charts and the anaesthesia provider felt that the surgeries were too short to give opioids with the fear of post operative respiratory depression.

Cannabis sativa (Bhang) use was a statistically significant risk factor for the development of delirium. 13(3.9%) study participants were found to be users of Cannabis sativa and all of them developed delirium post operatively with a p-value of 0.005.

Pain and anxiety are the common factors for the development of hyperactive delirium with inadequate reversal resulting in hypoactive delirium. The results are in keeping with studies done that showed delirium in the absence of pain. Cravero et al studied children undergoing MRI under sevoflurane and revealed a higher incidence of delirium.<sup>13</sup> This might have been as a result of anxiety in the children. Zeev N.K. studied preoperative anxiety and emergence delirium and post operative maladaptive behaviors on 1613 patients retrospectively and revealed a higher incidence of emergence delirium in patients who had anxiety preoperatively.<sup>23</sup> Aono et al studied 110 boys undergoing circumcision and found out that boys that were anxious preoperatively had a higher incidence of emergence delirium.<sup>24</sup> Studies have centered more on pain as a result of delirium but it's now being seen that anxiety might be another big mitigating factor.

All the probable causes of delirium above can be mitigated by proper planning and assessment of patients.

Out of the 119 patients, 78 (65.5%) required restraining, 66 (55.5%) required additional staff, 13(10.9%) had catheter removals, 23(19.3%) resulted in bleeding and 11(9.2%) resulted in injuries to self (patient).

There was no observed/reported injury to any healthcare provider.

Results shows that the most frequent result of delirium were patients requiring restraining and thus necessitating additional staff. This requires adequate and well trained staff to be able to identify and manage delirium as it occurs. K. Hudek published in the American Organization of Registered Nursing journal an article termed Emergence Delirium: A Nursing Perspective where he cited that early recognition of delirium and adequate staffing enabled centers deal with delirium early thus avoiding prolonged delirium with resultant post operative delirium.<sup>25</sup>

On the length of stay in PACU with/without emergence delirium in adult patients' undergoing surgery at Kenyatta National Hospital, the study found that there was a delay in actual transfer out of PACU whether delirium was present or not. The mean duration of stay

in PACU was 133.75 minutes with a 95% confidence interval of 125.85-141.66. Standard deviation was 73.009. According to resolution of delirium when present and attainment of Alderete score of above 9, all the study participants were fit for discharge after the lapse of 120 minutes. The study however shows that patients actually took more time. There was a patient that spent >360 minutes in PACU. The mean time for staying in PACU (133.75) is actually longer than the time taken for the last patient to be fit for discharge (91-120 minutes). This is a result of multiple factors that are not patient related but are institutional related. The most recurrent factors for prolonged stay in PACU were

- a.** Absence of escorting nurse due to shortage in the wards
- b.** Absence of patient porters
- c.** Handing over in the wards during shift changes thus all nurses were
- d.** Congestion in the lifts during visiting hours

## **6.0 STUDY CONCLUSION AND RECOMMENDATION**

### **6.1 Conclusion**

The study concluded that the incidence of emergence delirium was high in our population 64.5% and that hypoactive delirium was higher at 33.6% than hyperactive delirium at 30.9%. The risk factors for the development of delirium were age above 69 years, ASA grade 1, ENT surgery, surgery lasting 61-120 minutes and those above 360 minutes and use of Cannabis sativa (bhang).

Pain and anxiety are the leading causes of hyperactive delirium. Other causes were presence of tracheal tubes, urinary catheters, nasal packs and drains. Hypoactive delirium was as a result of inadequate emergence.

### **6.2 Study Recommendations**

The study recommends:

- a) Pre-operative assessment of patients should include the risk of development of emergence delirium.
- b) Any predisposing factors to the development of delirium should be communicated to the team that will provide service to the patient.
- c) Patients to be adequately briefed on the procedure to be done, any adjuncts to airway to be used post operatively, any invasive devices to be used or likelihood of them being used to reduce anxiety postoperatively.
- d) Training on recognition and management of delirium as soon as it occurs.
- e) Staffing of PACU to be tailored to anticipated cases being done and risk stratification of patients rather than rigid staff numbers. ( BARNIA Guidelines)
- f) Institutional delays for discharge from PACU to be attended to avoid additional PACU stay with resultant complications and costs.

### **6.3 Recommendations for Further Research**

The study recommends that a study be carried to assess why ASA class 1 was a significant risk factor for development of emergence delirium.

The study also recommends a study to observe analgesic drug administration practices to patients being attended to in KNH.

The study also recommends a study to audit the appropriateness of pre-operative review with the procedure to be done.

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## TIMEFRAME

**Table: Schedule of study activities**

	<b>May/Aug 2 0 1 8</b>	<b>Sept/Oct 2 0 1 8</b>	<b>Nov2018/ Jan 2019</b>	<b>Feb/Apr 2 0 1 9</b>	<b>M a y 2 0 1 9</b>	<b>J u n 2 0 1 9</b>
<b>Proposal development</b>						
<b>Protocol presentation</b>						
<b>Ethical approval</b>						
<b>Data collection</b>						
<b>Data analysis</b>						
<b>Results presentation</b>						

## BUDGET

ITEM	QUANTITY	UNIT COST( Kshs)	TOTAL(Kshs)
Approval costs	One	2000	2000
Research assistants	Two	20,000	40,000
Statistician	One	30,000	30,000
Stationary/Printing			35,000
Contingency			30,000
<b>TOTAL</b>			<b>137,000</b>

## **APPENDICES**

### **Appendix I: Consent Explanation Form**

I am Dr. Edwin WaweruNdung'u, a postgraduate student in the Department of Anaesthesia at the University of Nairobi.

I would like to invite you to participate in a study that I am conducting on the incidence of emergence delirium in patients operated at KNH. The study is being done under the supervision of Prof. Ngumi Z.N. and Dr. Nyamai Kituu.

This informed consent form has two parts:

- Information sheet(to give information on the research)
- Certificate of Consent(for signatures if you agree to take part)

### **Study Background**

Emergence delirium is temporary condition that manifests itself upon emergence of anaesthesia in that the patient is not in full awareness of him/herself and may result in harm to the patients and the staff attending to them. It occurs due to many reasons including pain, poor reversal, and presence of invasives or even the drugs used during anaesthesia.

### **Broad Objective**

The aim of this study is to determine the prevalence of emergence delirium in adult surgical patients undergoing in the post anaesthesia care unit at Kenyatta National Hospital.

### **Voluntariness of Participation**

Your participation in this study is voluntary and there is no compensation for participating. Refusal to participate will not impact on the medical management you are already receiving or you are to receive. If you accept to participate in the study, you will be required to answer few questions about yourself and your medical condition, and then you will be observed in PACU after the operation.

There is no additional treatment or drugs that will be given to you and there are also no additional costs that you will incur due to your participation in the study.

### **Confidentiality**

All information collected from you will be kept confidential. Any publications arising from this study will not identify you in person.

### **Benefits**

Information collected from the study will be used to possibly formulate guidelines for the management of emergence delirium. This will be of benefit to all future patients as the care given to them will be enhanced to cover this possible complication.

### **Risks**

The study does not involve any additional drugs or treatment as its an observational study and thus poses no risk to you as a participant.

### **Right to Withdrawal**

You have the right to withdraw from the study at any stage. Withdrawing from the study will not affect the type and quality of treatment that you were to receive.

Do you have any questions or concerns about the study, please feel free to ask.

If you have understood the information I have given you and you are willing to participate in this study, I will require you to sign a form indicating your willingness to participate.

## Appendix II: Consent Form

I ..... do confirm that I have read/ been explained to the above study, understood the information presented to me and have had the opportunity to ask questions. I understand that my participation is voluntary and that I am free to withdraw from this study at any time without giving reason.

I agree to take part out of my own free will and no coercion or incentive has been offered.

Signature of participant..... Date: .....

Signature of investigator ..... Date: .....

### Who to contact

If you have any questions you may ask them now or later and any time even after the study has begun. If you wish to ask questions later, you may contact any of the following:

Name: Dr. Waweru Edwin Ndung'u (Primary Investigator)  
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College of Health Sciences  
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### **Kitambulisho III: Idhini Ya Kushiriki**

Jinalanguni Daktari Edwin Ndung'u Waweru, ninafanya utafiti washahadaya juu katika anesthesia kwenye Chuo Kikuu cha Nairobi.

Kama sehemu yamasomo yangu nahitaji kufanya utafiti wa hospitalini, nautafiti wangu ni juu ya:

**Matukio ya Kuweweseka baada ya kuibuka kutoka Anesthesia katika chumba cha ahueni-Hospitali Kuuya Kenyatta.**

#### **Maelezo**

Kuweweseka baada ya kuibuka ni hali ambayomtuha jielewiba adaya anesthesia nahali hii yawezakusababisha majeraha kwa mgonjwa na wauguzi wake.

Utafiti huu utasaidia wauuguzi kuboresha huduma wa wagonjwa wanapata katika vyumba vya ahueni.

Utafiti huu siku ulizwamaswali kadhaa kabla ya upasuaji kasha unapokuwa katika chumba cha ahueni, muuguzi atakutizama kuajaza fomu.

#### **Nia**

Nia yangu ni kuweza kutathmini idadi ya wagonjwa wanao pata hali ya kuweweseka baada ya kufanyiwa upasuaji.

#### **Hatari**

Utafiti huu hauhusishi kuongezewa madawa yeyote au upasuaji mwingine isipokuwa ule ulikuwa unahitaji. Hii inafanya kusikuwa na hatari yoyote kwa mgonjwa anaposhiriki utafiti huu.

#### **Faida ya Utafiti**

Matokeo ya utafiti huu utasaidia kuboresha huduma za afya wa wagonjwa wapewa wakiwa katika vyumba vya ahueni.

#### **Kushiriki**

Kushiriki utafiti huu ni kwa hali ya kujitolea. Hakuna malipo kushiriki wala fidia yoyote utakayo pata kwa Kushiriki utafiti. Kutokubali kushiriki hakuta kuwa na madhara yoyote kwa matibabu yako. Matibabu yata endelea kama vile yalikuwa yamepangiwa. Uko na ruhusa ya kutoka katika utafiti huu wakati wowote bila kukatiza matibabu yako.

## **Usiri**

Baadayenitafanyauchambuziwatakwimunataarifahiiitachapishwakatikakitabuambachokitaku wachiniyamamlakaya Chuo Kikuu cha Nairobi. Taarifazotezitatawekwakwausiri.

Naomba kukupa fursa yakuulizamaswaliyoyoteyanayohusiananautafitihuu.

Ikiwaumekubalikushiriki,tafadthalitia Sahihi kwenyefasiiliyotolewa.

Asante

## **Kitambulisho IV: Shahada yaIdhini**

Mimi.....naitikiyakwambanimesomananimeelezewakuh  
usuutafitihuunanimeelewa.Nimepatanafasiyakuulizamaaswaliniliyokuwanayo.Naelewakushir  
ikinikwahariyanganikonaruhusa  
yakusimamishakushirikikwanguwakatiwowoteulebilamadtharakwangu.Nimeelewapiyahakuna  
malipo au fidiakushirikiutafitihuu.

Sahihiyamgonjwa.....Tarehe.....

Sahihiya mtafiti.....Tarehe.....

Kwa maelezo zaidi hata baada ya utafiti huu una uhuru wakuwasiliana na watu wafuatao  
kupitiaanwani na nambari za simu zilizo andikwa hapa chini wakati wowote,

Jina: Dkt. Waweru Edwin Ndung'u (Mpelelezi Mkuu)

Namba ya simu: 0721235650/0731235650

Barua pepe: edwindosh@gmail.com

Jina: Profesa Ngumi Z. N.

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**Appendix V: Study Questionnaire**

**TOPIC: PREVALENCE OF EMERGENCE DELIRIUM IN POST ANAESTHESIA CARE UNIT IN PATIENTS UNDERGOING SURGERY IN KENYATTA NATIONAL HOSPITAL.**

**Serial no.....**

**SECTION A1: DEMOGRAPHIC CHARACTERISTICS**

1. Age (years): .....

2. Gender:     Male                       Female

3.0 Smoker     Yes                       No

3.1 If Yes, how many pack years [    ]

4.0 Alcohol     Yes                       No

4.1 If Yes, how often .....

4.2 Number of bottles taken.....

5. Co-morbidities (any medical conditions the patient may have)

.....  
.....  
.....

6. Current drug use: Type and dosages

.....  
.....

7. Recreational drug use    Yes                        No

7.1 If Yes, which type and quantities.....

.....  
.....



**SECTION A2:**

- 1. Umri( Miaka)
- 2. Jinsia [ ] Kiume [ ] Kike
- 3.0 Mvutaji sigara [ ] Ndio [ ] La
- 3.1 Kama ni ndio,kwa miaka ya pakiti mingapi [ ]
- 4.0 Pombe [ ] Ndio [ ] La
- 4.1 Kama ni Ndio, mara ngapi.....
- 4.2 Nambari ya chupa unazokunywa.....
- 5.0 Magonjwa mengine yeyote unayo uugua  
.....  
.....  
.....
- 6.0 Dawa zozote unazotumia. Aina na viwango  
.....  
.....  
.....
- 7.0 Madawa ya kulevya [ ] Ndio [ ] La
- 7.1 Kama ni Ndio,Aina na viwango.....  
.....  
.....

**SECTION B:**

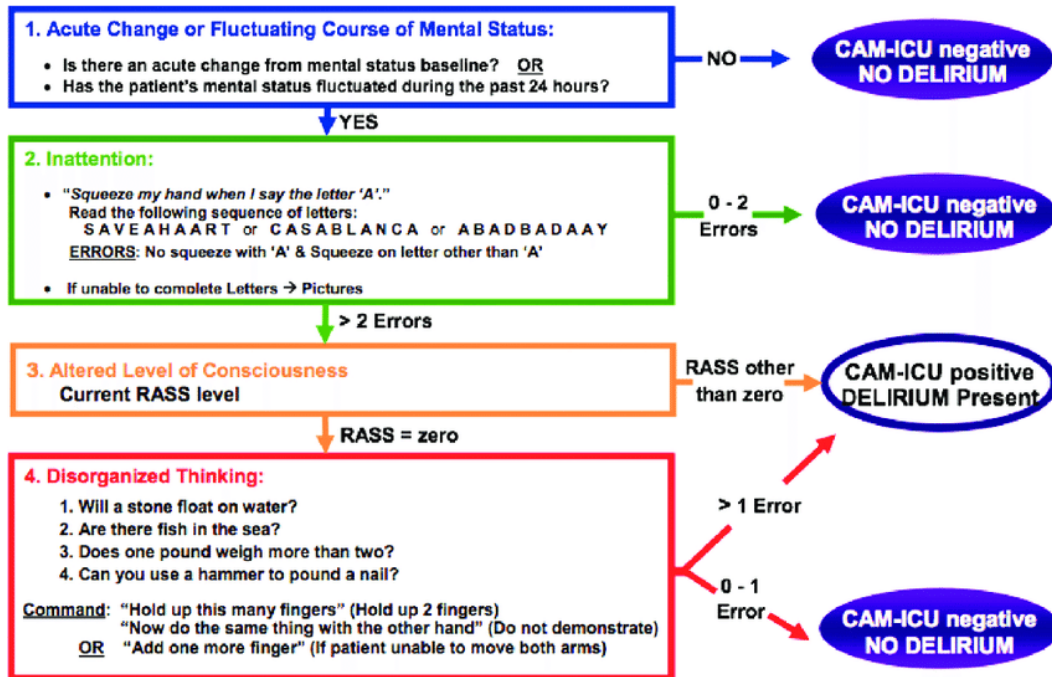
- 1. **ASA classification 1 [ ] 2 [ ]**
- 2. **Type of surgery**  
.....  
.....  
.....
- 3. **Induction time .....**
- 4. **Induction drugs and dosages**  
.....  
.....
- 5. **Maintenance drugs and dosages**  
.....

- .....
- .....
- 6. Analgesia, type, dosages, time given**
- .....
- .....
- .....
- .....
- 7. Reversal time .....**
- 8. Total surgery time.....**

**SECTION C**

- 1. Time of arrival in PACU .....**
- 2. Level of ED observed in PACU as per CAM-ICU Flowsheet**

## Confusion Assessment Method for the ICU (CAM-ICU) Flowsheet



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### RICHMOND AGITATION SEDATION SCALE (RASS)

Scale	Term	Description
+4	<b>Combative</b>	Overtly combative, violent, immediate danger to staff.
+3	<b>Very agitated</b>	Pulls or removes tube(s) or catheter(s), aggressive.
+2	<b>Agitated</b>	Frequent non-purposeful movement, fights ventilator.
+1	<b>Restless</b>	Anxious but movements not aggressively vigorous.
0	<b>Alert and calm</b>	
-1	<b>Drowsy</b>	Not fully alert but has sustained awakening (eye opening to voice (>10seconds))
-2	<b>Light sedation</b>	briefly awakens to <i>voice</i> with eye contact (<10seconds)
-3	<b>Moderate sedation</b>	Movement or eye opening to <i>voice</i> (but no eye contact).
-4	<b>Deep sedation</b>	No response to <i>voice</i> but movement or eye opening to <i>physical</i> stimulation.
-5	<b>Unarousable</b>	No response to <i>voice</i> or <i>physical</i> stimulation.

(Eye opening

Verbal Stimul

Physical Stimulat



7. Measures taken to alleviate delirium.....

.....  
.....  
.....

8. Outcomes of measures taken in 6. Above

- i. Delirium resolved [ ]
- ii. Delirium persistent [ ]

9. Time of discharge from Pacu .....

10. Total time spent in Pacu.....