THE EFFECTIVENESS OF AIRWAY ASSESSMENT TOOLS IN PREDICTING A DIFFICULT AIRWAY BY ANESTHESIOLOGISTS AT KENYATTA NATIONAL HOSPITAL

UNIVERSITY OF NAIROBI

A DISSERTATION PRESENTED IN PART FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF MEDICINE DEGREE IN ANAESTHESIA, UNIVERSITY OF NAIROBI

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DECLARATION

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I hereby declare this to be my original work and that it has not been submitted to any institution for examination or otherwise.

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DEDICATION

I dedicate this thesis to my Family for the affection and the love they have showed me throughout my studies, for choosing to be by my side and their endless encouragement.

To my mother Mrs. Joyce Okiya and Father Mr. Joseph Okiya, my uncle Benon Odiya and Grace Mbera.

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ABSTRACT

Introduction: Airway management is the core responsibility of the anesthesiologist in the operating room. Difficult airway has varied definitions and encompasses difficult bag mask ventilation, difficult supraglottic device placement, difficult laryngoscopy, difficult endotracheal intubation and difficult surgical airway. Different predictor methods have been assessed with varying results.

Objective: the objective of this study is to determine the effectiveness of the commonly used airway assessment tools by anesthesiologists at Kenyatta National Hospital in predicting difficult airway and to establish the incidence of difficult airway among patients undergoing emergency and elective surgery at Kenyatta National Hospital.

Methods: A prospective cross-sectional study at the KNH on 375 patients above 18yrs old undergoing surgery under general anesthesia was done for difficult airway after approval by the research and ethics committee KNH/UON. Upon consenting, the patients' history, assessment for difficult bag mask ventilation, inter-incisor gap, mallampati score, thyromental distance and sternomental distance were filled in a questionnaire by anesthesia care providers during the pre-anesthesia assessment. During conduct of anesthesia, difficult bag mask ventilation, laryngoscopic view and difficulty or ease of endotracheal intubation and supraglottic device placement was filled in the questionnaire by anesthesia care providers.

Results: the incidence of difficult bag mask ventilation, difficult laryngoscopy and difficult intubation were 6.9%, 6.9% and 4.3% respectively. The presence of upper airway mask deformity was a predictor of difficult bag mask ventilation. Interincisor distance less than 3.5cm, mallampati score more than 3, thyromental distance less than 6.5cm were predictors of difficult intubation. The odds of difficult intubation were 2.4 times for every unit increase in Mallampati score.

Conclusion: the difficult airway is a significant problem in KNH. Commonly used tools for prediction are effective. A high index of suspicion is required in patients with obesity.

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LIST OF ABRREVIATIONS

ASA	American society of Anesthesiologists
BMI	Body Mass Index
Cm	Centimeters
ERC	Ethics and Research Committee ETCO2 End tidal carbon dioxide
ETT	Endotracheal tube
Kg	Kilograms
KNH	Kenyatta National Hospital
LMA	Laryngeal mask airway
MMED	Masters of Medicine
UON	University of Nairobi
RCO	Registered clinical officer
SAD	Supraglottic device
SPO2	Peripheral oxygen saturation
SPSS	Statistical Package for Social Sciences.

1.0 Introduction

Airway management is the core responsibility of the anesthesiologist in the operating room. Difficult airway which comprises of difficult bag mask ventilation, laryngoscopy, endotracheal intubation, supraglottic device placement and surgical airway though rare, is encountered in anesthesia care. The choice of predictor tools for airway assessment for difficult airway is at the discretion of the anesthesiologist. In this study, presence of a beard or upper airway mass or deformity, being edentulous, patients' inter-incisor distance, Mallampati score, thyromental distance and sternomental distance are used in predicting difficult or ease of bag mask ventilation, supraglottic device placement, laryngoscopy and endotracheal intubation. Difficult bag mask ventilation, laryngoscopy, endotracheal intubation, and supraglottic device placement as documented by the anesthesia provider were assessed against predictors of difficult airway.

2.0 Literature Review

A Significant number of difficult airways are unanticipated. In a cohort study(1)which was uploaded to the Danish anesthesia Database, 188064 patients were studied; 3391 patients had difficult intubations (1.86%). Of the patients with difficult intubation, 93% had unanticipated difficult intubation. When the provider anticipated difficulty only 25% of the cases actually became difficult. Similarly, 94% of difficult bag mask ventilation was un-anticipated and when difficult bag mask ventilation was anticipated it's the incidence was only 22%.

Failure to predict difficult airway is likely to result in catastrophe and a difficult airway can easily turn fatal if a surgical airway cannot be established immediately. Complications such as hypoxia, pulmonary aspiration, unnoticed esophageal intubation and death do occur with difficult airways as well as easy airways. The "can't intubate can't ventilate" situation contributes to 25% of anesthesia related deaths and leads to surgical airway management in 1 in 50,000 cases annually in the UK. No study has been done in Africa to assess the magnitude of the problem in our population.

A study on difficult mask ventilation in general surgical population(2) found seven main risk factor and predictors of difficult mask ventilation: age above 47yrs, gender, BMI >35kg/M^2 , neck circumference of >40cm, lack of teeth, presence of facial hair and history of difficult intubation.

In a prospective multivariate risk study on the predictive value index for preoperative airway assessment methods(3) 10507 patients' inter-incisor distance, mallampati classification(4), thyromental distance, ability to prognath, neck extension, weight and past difficult intubation were assessed. All factors except history of previous difficult intubation had low positive predictive values (11.8-38.5%). The presence of Mallampati class III, thyromental distance <6 cm, mouth opening <4 cm, and definite history of difficult intubation were the most significant predictors of laryngoscopy Grade IV alone.

An Italian study in 2004 by Cattano et al(5) on risk factor assessment of the difficult airway, mallampati score of III correlated with Cormack Lehane grade II and mallampati 4 with Cormack Lehane grade III. Of the 1956 patients studied 185 had difficult intubation (incidence 0.09%) majority being those with Cormack Lehane grade II (151) and Cormack Lehane grade III (21).

A single blind prospective observational study in India[10] on assessment of difficult airway predictors for difficult laryngoscopy and intubation assessed the ability of mallampati III/IV, inter-incisor gap <3.5, thyromental distance <6.5, ratio of height to thyromental distance, sternomental distance <12.5, neck extension <80%, mandibular length <9cm and mento-hyoid distance <4cm to predict a difficult laryngoscopy and intubation. In this study the ratio of height to thyromental distance was more accurate than thyromental distance in accurately predicting a difficult intubation. Mallampati grade had low sensitivity and specificity in predicting a difficult laryngoscopy and tracheal intubation in many studies.

Zahid Hussain Khan et al in their study on diagnostic value of the upper lip bite test in predicting difficulty in intubation with head and neck landmarks obtained from lateral neck x rays(6) measured the effective mandibular length, atlanto-occipital gap (between the occiput and the superiors surface of the posterior tubercle of atlas). In this study there was no significant difference in atlanto-occipital gap between patients. Thus, radiological assessment is not recommended in routine airway assessment owing to the risk of radiation exposure, time and cost implications. They are useful in selected cases with suspected difficulties in laryngoscopy and intubation. Secondly there is no critical atlanto-occipital gap value that predicts difficult laryngoscopy and intubation.

Airway assessment indices and measurement techniques applied includes use of measuring tape or calipers. A study done by Davide Cattano et al(7) on external neck landmark identification and measurement correlation in a normal weight cohort showed there is statistically significant difference in measuring by tape versus by caliper but no clinical significance. It also showed there is a correlation between measures such as the thyromental distance and patient height if the patients are of the same weight. Use of BMI and ratio of thyromental distance to height as measurements that predict difficulties in airway management is applicable in any population despite of their average height.

The incidence of difficult airway shows variability as reported by anesthesiologists and in many studies. A study by Olivier Langeron et al(8) showed an incidence of difficult intubation of 6.1% that is an occurrence of 101 difficult intubations among 1665 patients. To determine the sample size, calculation was done with anticipation of about 100 events. Another study by Celebi N et al(9) on inter-observer difference in difficult airway found an incidence of 4.9% of the 384 patients studied.

Various tools have been studied in different populations and showed variability in predicting difficult airway. The predictor tools have low sensitivity and positive predictive values. Both single and combined factors for airway assessment show variation in predicting airway difficulties. The anesthesiologist should thus be aware that difficult intubation may occur in patients otherwise not expected to have difficult airway.

El Ganzouri et al(3) excluded patients with obvious airway abnormalities scheduled for awake fibre optic intubation while Srinivasa(10) et al excluded edentulous patients as factors not accounted for by the assessment tools.

2.1 Airway Anatomy And Manipulation

It is paramount for anesthesiologists to know the functional anatomy of the airway and to understand the principles applied to maintain the airway patent.

The airway(11)(12) consists of the air passages from the nasal passages, oral cavity, the pharynx the larynx, trachea, main bronchi and bronchioles. The nasal cavity is bound by the septum medially, the turbinates and air sinuses laterally, the cribriform plate superiorly and nasopharynx posteriorly. The oral cavity is bound by the alveolar arch (hard palate, soft palate) and teeth superiorly the tongue with the mandible and teeth inferiorly and the oropharynx posteriorly. The pharynx is a fibromuscular tube extending from the base of the skull to the cricoid cartilage and consists of the nasopharynx, oropharynx and hypopharynx. The larynx extends from the epiglottis to the lower end of the cricoid cartilage. The laryngeal opening consists of the true vocal cords bound by the arytenoids laterally and the anterior and posterior commissure anteriorly and posteriorly respectively. Visualization of the laryngeal opening during laryngoscopy allows for tracheal intubation. The larynx has evolved in humans to be an organ for phonation. The lower airway consists of the bronchi, bronchioles and alveoli. The gaseous exchange surfaces depend on the patency of airway and the ventilator power of respiratory muscles to drive oxygen and carbon dioxide into and out of the lungs respectively.

The head tilt, chin lift or jaw thrust maneuver has been used to align the pharyngeal and laryngeal axes to allow for endotracheal intubation. The scissors maneuver is useful in opening the mouth for placement of oropharyngeal airway, supraglottic devices and for direct laryngoscopy and involves rotational and sliding movements of the temporal-mandibular joint. A jaw thrust involves sliding movement of the temporal-mandibular joint and is useful in airway manipulation of patients with cervical spine instability.

2.2 Definitions Of Difficult Airway

The difficult airway(13) is the clinical situation in which a conventionally trained anesthesiologist experiences difficulty with bag mask ventilation, supraglottic device placement, difficult laryngoscopy, difficult tracheal intubation, difficult surgical access or all.

Difficult bag mask ventilation is the inability of an unassisted anesthesiologist to maintain oxygen saturation 92%, to prevent or reverse signs of inadequate ventilation during positive pressure mask ventilation under general anesthesia. [2] Some sources consider need by the anesthesiologist to be assisted with bag mask ventilation as difficult mask ventilation.

Difficulty laryngoscopy is when it is not possible to visualize any portion of the vocal cords with conventional laryngoscope use,[9] typically laryngoscopic grades III and IV.

Difficult endotracheal intubation is when proper insertion of the tracheal tube with conventional laryngoscopy requires more than three attempts or more than 10minutes

2.3 Causes of Difficult Airway

Difficult airway can be attributed to anesthesiologist-based factors, equipment factors and patient factors.

The level of experience of the anesthesiologist determines difficulty in airway management such that the experienced anesthesiologist is more likely to optimize conditions for airway manipulation. Depending on preference and practice some anesthesiologists will try alternative methods after the first attempt faced with difficulty whereas some may use adjuncts such as the gum elastic bougie or stylet as the first option when difficult of laryngoscopy is anticipated.

Malfunctioning or wrongly selected instruments may make an otherwise easy intubation difficult. Examples include failure of the laryngoscope light system or use of inappropriately sized

laryngoscope blade. It is the responsibility of the anesthesiologist to confirm the equipment function before attempts at laryngoscopy and endotracheal intubation.

Patient factors[15] are either congenital or acquired. Congenital anomalies such as Pierre Robinson syndrome, down syndrome in which patients have macroglosia, micrognathia, cervical instability, chin protrusion, excessive maxillary length and reduced pharyngeal space cause difficulties in mask ventilation, laryngoscopy and intubation. Acquired factors are the majority of causes of difficult intubation and include joints and tissues inflexibility as occurs in arthritis of the spine or temporal mandibular joint, fibrosis and scaring due to burns, radiotherapy, obesity, fractures of the facial bones, head and neck masses, laryngeal edema from sepsis or burns.

2.4 Airway Assessment

Patients' history, examination as well as a number of measured indices are used in airway assessment.

Mouth opening is assessed by inter-incisor gap and view of oropharyngeal structures (mallampati score). Inter-incisor distance is the distance between lower and upper incisors. Normal value is more than or equal to 4.6cm, inter-incisor distance of less than 3.8cm predicts difficult airway. The oropharyngeal structures seen are graded using modified Mallampati score(4) as follows:

Mallampati 1: Soft palate, uvula, fauces and pharyngeal pillars visible.

Mallampati II: soft palate, fauces and uvular visible

Mallampati III: soft palate and base of uvula visible

Mallampati IV: soft palate not visible

Thyromental distance is the distance from the mentum of the mandible to the thyroid notch while the patient's neck is fully extended. The normal value is more than or equal to 6.5cm. A distance of less than 6cm predicts difficulty in aligning pharyngeal and laryngeal axes.

Sternomental distance is the distance between the bony prominences of the mentum to the manubrium sternum. A distance of less than 12.5cm predicts difficult intubation.

Head and neck extension is measured using atlanto occipital gap measured radiographically as the distance between the first cervical vertebra and the occiput. It can also be measured as the angle between maxillary occlusion surface and the horizontal: angles less than 20 degrees predict difficulty.

Difficult laryngoscopy is assessed by the Cormack Lehane grades(14) which assess visibility of the laryngeal structures during direct laryngoscopy as follows:

Grade I: full view of the glottis

Grade II: partial view of the glottis (posterior portion)

Grade III: only epiglottis visible, none of glottis seen

Grade IV: neither epiglottis nor glottis seen.

2.5 Difficult Airway Algorithm

The difficult airway society has created an algorithm for approach and management of a difficult airway with sequential options as follows(15);

Plan A is facemask ventilation, laryngoscopy and intubation. If intubation fails, you go to plan B.

Plan B is to maintain oxygenation. This is achieved through supraglottic airway device placement. If successful the options include waking the patient, intubation via the supraglottic device, proceeding without intubation or tracheostomy or cricothyroidotomy.

Plan C applies when plan B fails and includes final attempt at mask ventilation. If successful, the patient can be woken up. If not, go to plan D.

Plan D involves emergency surgical neck access by cricothyroidotomy.

3.0 Justification

There is no specific protocol for airway assessment at Kenyatta National Hospital which is the main training institution for anesthesiologists in Kenya. Establishing the effectiveness of airway assessment tools used will be useful in generating airway assessment protocols applicable to our population.

By establishing the incidence and thus the magnitude of difficult airway, we will justify procurement of equipment such stylets, gum elastic bougies, video laryngoscopes and Awake-fibre optic intubation which are not readily available in KNH theatres.

There is paucity of local data on incidence of difficult airway. This study will generate knowledge on the incidence of difficult airway, create awareness and thus establish the magnitude of the problem in the Kenyan population.

4.0 Study Question

What is the effectiveness of airway assessment tools used by anesthesiologists at KNH in predicting difficult airway?

5.0 Study Objectives

5.1 Broad Objective

To determine the effectiveness of Mallampati score, inter-incisor distance, thyro-mental distance, sterno-mental distance in predicting difficult airway and the correlation of Comark Lehane laryngoscopic view and difficult airway as assessed by anesthesiologists in Kenyatta National Hospital.

5.2 Specific Objectives.

To determine the effectiveness of Mallampati score, interincisor distance, thyromental distance, sternomental distance predicting difficult intubation at KNH.

To determine the incidence of difficult airway among patients undergoing emergency and elective surgery in KNH theatre.

3.0 Methods

After seeking approval from the Ethics and Research Committee KNH/UON, consenting patients scheduled for surgery in KNH theatres who meet the inclusion criteria were assessed for presence of a beard, being edentulous, airway deformity or masses, mallampati score, inter-incisor distance, thyromental distance, sternomental distance by anesthesia providers prior to induction. Once the airway was secured, the presence of difficult bag mask ventilation, laryngoscopy, intubation and supraglottic device placement was recorded. The data obtained was filled in the provided questionnaire. The anesthesia providers involved in the study included consultant anesthesiologists, registrars in anesthesia and RCO anesthetists. A difficult airway algorithm and pictorial representation of Cormack Lehane laryngoscopy grades were provided to the anesthesia care provider.

4. 0 Patient Recruitment

4.1 Inclusion Criteria

Consenting patients

Male and female patients above 18yrs

Patients scheduled for elective or emergency surgery in KNH theatres to be done under general anesthesia

Patients in the ASA class I-III

4.2 Exclusion Criteria

Patients below the age of 18yrs

Patients who cannot consent

Unconscious and uncooperative patients whose airway cannot be assessed by the above methods.

5.0 Study Design and Population

A prospective cross-sectional study was done at KNH theatres over a period of 6months. In the year 2016 there was an estimated 500 adult patients undergoing tracheal intubation in KNH theatres monthly. This study was done over a period of 6 months hence the accessible population during the period was approximately 3,000 patients. A representative sample was drawn from this fixed population and the sample size calculation obtained using a formula for finite population

(less than 10,000). One stage cluster sampling was used to account for the different surgical patients in KNH theatres. The calculation is as follows(16)(17):

$$n' = \frac{NZ^2P(1-P)}{d^2(N-1) + Z^2P(1-P)}$$

Where

n' = sample size with finite population correction,

N = size of the target population = 3000

Z = Z statistic for 95% level of confidence = 1.96

P = Estimated proportion of patients with difficult airway = 11.3%

d = margin of error = 3%

$$= \frac{3000 \times 1.96^2 \times 0.113 \times 0.887}{0.03^2 (3000-1) + 1.96^2 \times 0.113 \times 0.887}$$

n = **375**

A minimum of 375 patients were sampled to estimate the prevalence of difficult airway within 3% level of precision.

6.1 Data Management and Analysis

The questionnaires data was coded, entered and managed in Microsoft Access 2013 database designed for the study. Data cleaning was performed continuously in the course of data entry and the cleaned data exported to SPSS version 21.0 for statistical analysis. Descriptive data that including demographic variables of the patients were summarized into means and percentages for continuous and categorical data respectively. The inter-incisor, thyromental and sternomental distances were presented as means with 95% confidence interval. In addition, Mallampati score and Cormack Lehane grades were presented as percentage of patients with I, II, III and IV scores. The incidence of Difficult airway was determined and presented as a percentage with 95% confidence interval. Effectiveness of airway assessment tools in predicting difficult airway were tested using Student's t test to compare means and Chi square test to test the relationship with categorical variables. Multiple logistic regression analysis was used to determine independent

predictors of difficult intubation. All statistical tests were performed at 5% level of significance (p value less or equal to 0.05)

7.0 Ethical Consideration

The researcher sought ethical approval from the Ethics and Research Committee KNH/UON and Informed consent was obtained from patients who met the inclusion criteria. Preanesthetic assessment was conducted by the anesthesia provider and consenting patients' biodata and airway assessment filled in the questionnaire. All anesthesia providers were provided with the difficult airway algorithm provided by the difficult airway society and advised to seek help from senior specialists in case of difficulty. A difficult airway trolley was readily available for use by the anesthesia provider. All anesthesia providers were recommended to confirm that equipment for airway management were readily available and in working condition. Patient information was kept confidential. Data collected was saved in a password protected computer and backed up in a securely preserved flash disk. Data collected was analyzed and results presented to The KNH and UON departments of anesthesia.

8.0 Study Limitations

Inter-observer variability of predictors of difficult airway. Anesthesia care givers were given pictorial depiction of laryngoscopy grades to limit bias.

There is high variability in anesthesia practice among anesthesia care givers.

This being an observational study, the researcher could not control for variation in airway management techniques.

9.0: Results

10.1 Introduction

The findings of the study are presented in this chapter. The main objective of the study was to determine the effectiveness of mallampati score, inter-incisor distance, thyromental distance, sternomental distance in predicting difficult intubation and the correlation of Comark Lehane laryngoscopic view and difficult intubation as assessed by anesthesiologists in Kenyatta National Hospital. The specific objectives were to determine the effectiveness of mallampati score,

thyromental distance, sternomental distance predicting difficult intubation at KNH and to determine the proportion of difficult airway among patients undergoing emergency and elective surgery in KNH theatre. A total of 375 patients who met the inclusion criteria for the study and undergoing general anesthesia in KNH over a period of 3 months were assessed between May 2017 and July 2017.

11.1 Demographic Information

This section presents the socio-demographic information of the patients.

Table 1: Demographic Characteristics

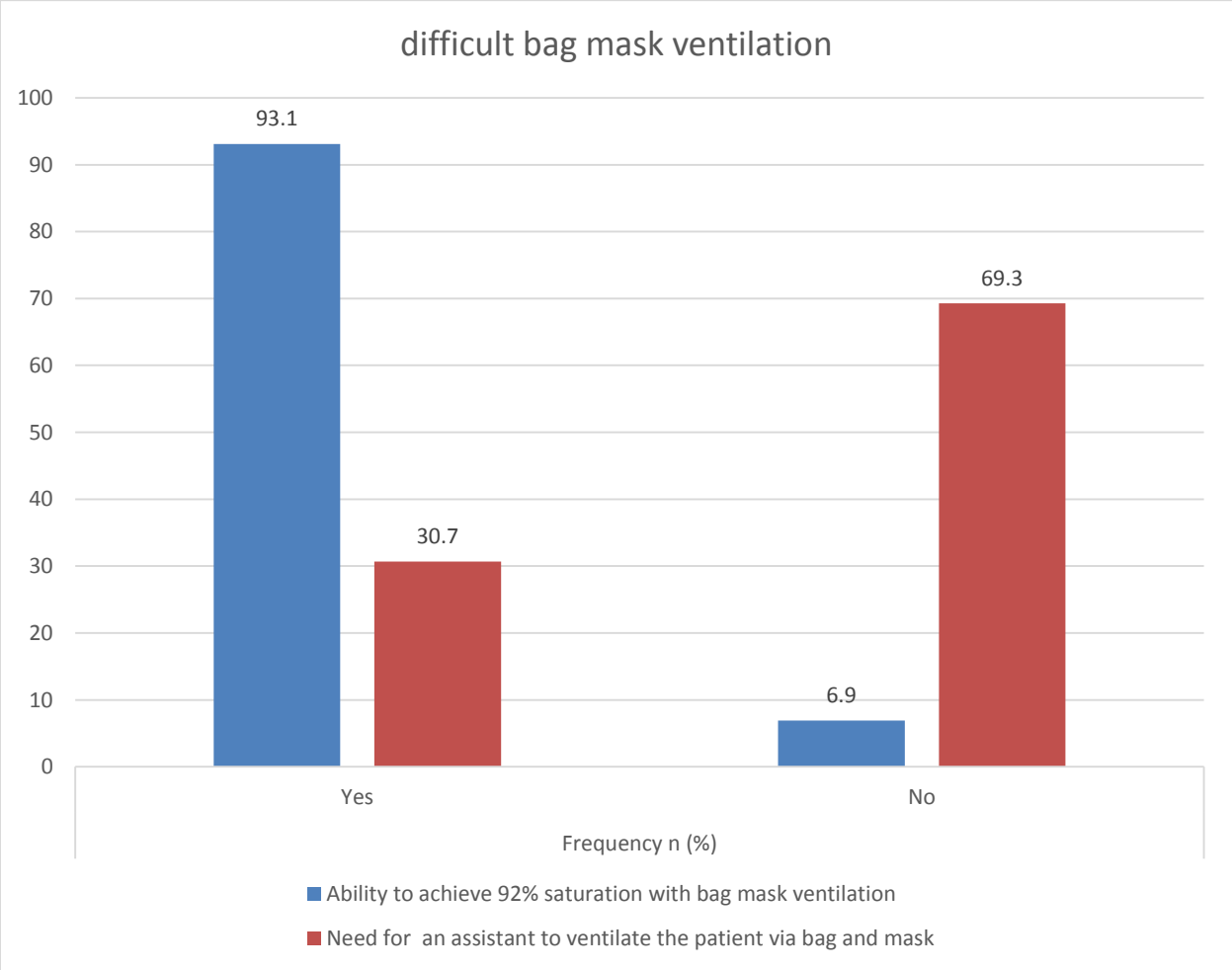
	Frequency n (%)
Gender	
Male	201 (53.6)
Female	174 (46.4)
Age	
18 – 25	41 (10.9)
26 – 35	117 (31.2)
36 – 45	100 (26.7)
46 – 55	67 (17.9)
56 – 65	27 (7.2)
66 – 75	18 (4.8)
76 – 85	5 (1.3)
BMI	
Underweight (Less than 18.5)	25 (6.7)
Healthy weight (18.5 - 24.9)	180 (48.0)
Overweight (25 - 30)	107 (28.5)
Obese (30 and above)	63 (16.8)

Of the 375 patients, there were 201 (53.6%) male patients, and 174 (46.4%) female patients. The largest age group was the 26 to 35 years old which had 117 (31.2%) patients. The mean age was 40.66 ± 1

3.38 years with a median age of 39 years. The female patients had a mean age of 42.43 ± 13.01 years, while the male patients had a mean age of 39.13 ± 13.54 years.

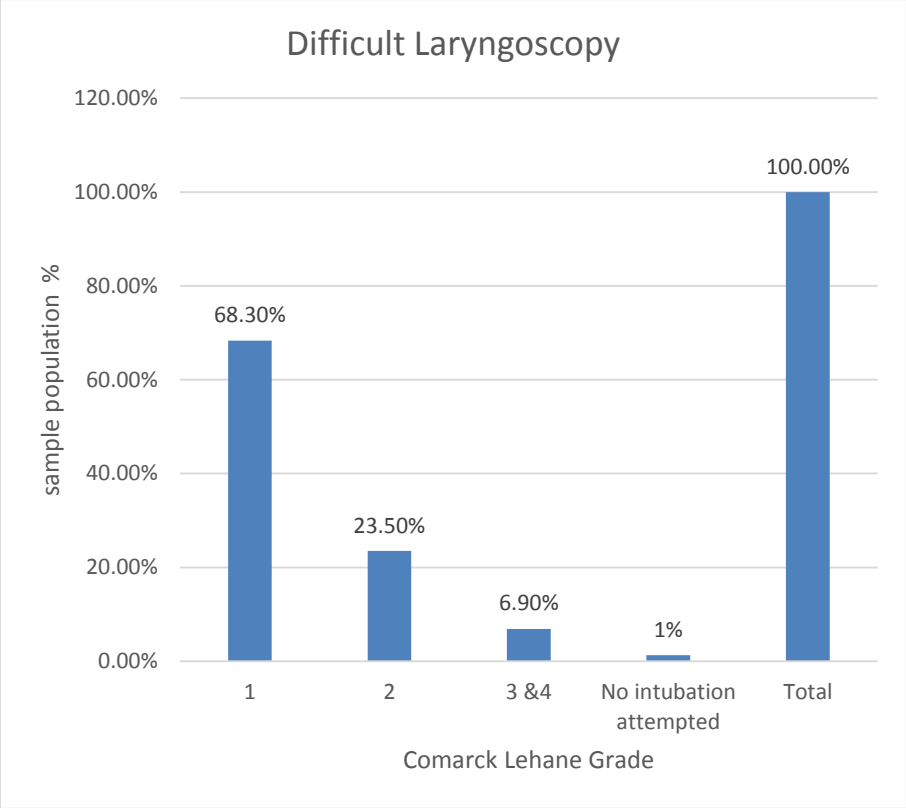
11.2 Incidence of Difficult Airway

Figure 1: Incidence of Difficult Bag Mask Ventilation



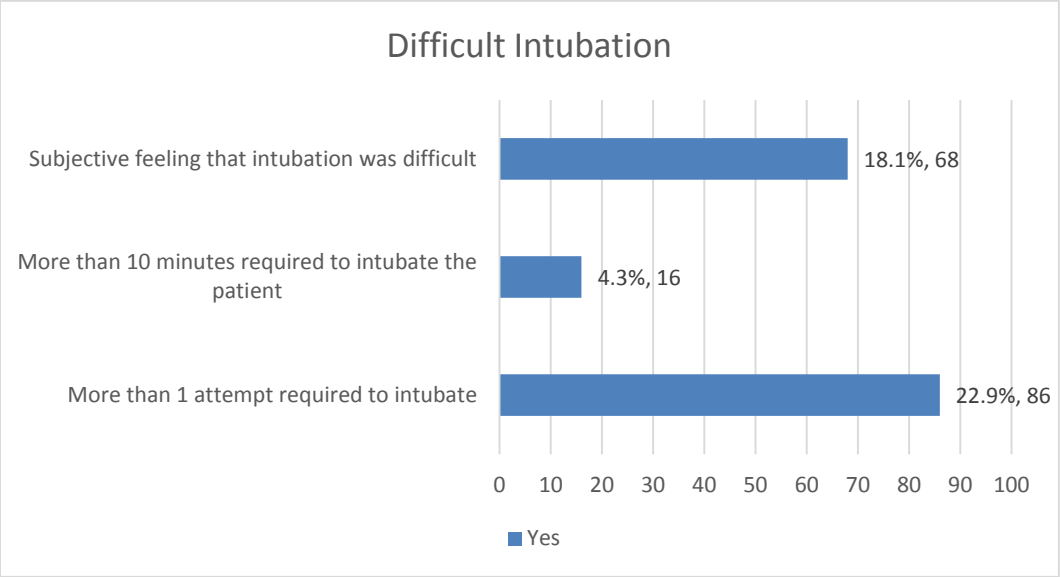
Based on the definition by the difficult airway society 2015 guidelines, inability to achieve more than 92% saturation by bag mask ventilation, incidence of difficult bag mask ventilation was 6.9%.

Figure 2: Incidence of Difficult Laryngoscopy



Only 370 (98.6%) patients had laryngoscopy for intubation. Twenty-six (6.9%) of the patients had difficult laryngoscopy that is they had grades III and IV laryngoscopy grades. Majority (91.8%) of patients had Cormack Lehane grades I and II.

Figure 3: Incidence of Difficult Intubation



The incidence of difficult intubation defined as more than 10minutes to intubate was 4.3%. Eighty-six (22.9%) of the patients required more than 1 attempt to intubate. However, the anesthesia care providers had a subjective feeling of difficult intubation for only 18.1% of the cases.

Table 2: Difficult Supraglottic Device Placement

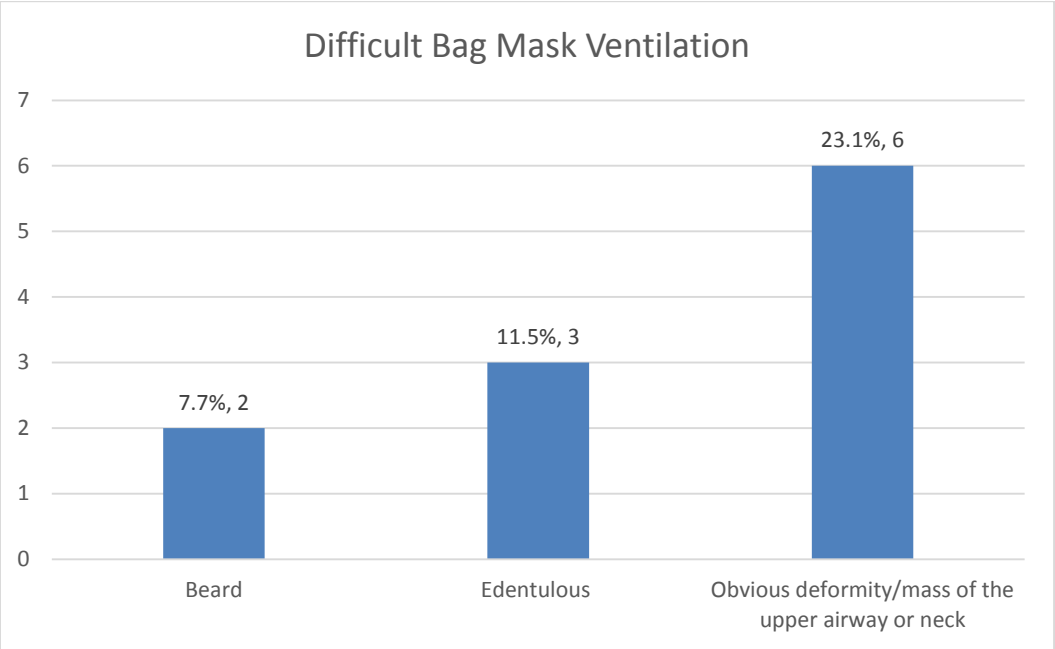
	Frequency n (%)
Yes	4 (1.1)
No	7 (1.9)
Supraglottic device placement not attempted	364 (97.1)
Total	**375 (100.0)**

Of the 11 patients that had supraglottic device used for airway management, 4 had difficult supraglottic device placement. Supraglottic airway use is not commonly used for surgery for in adult patients in our hospital.

11.3 Effectiveness of Airway Assessment Tools

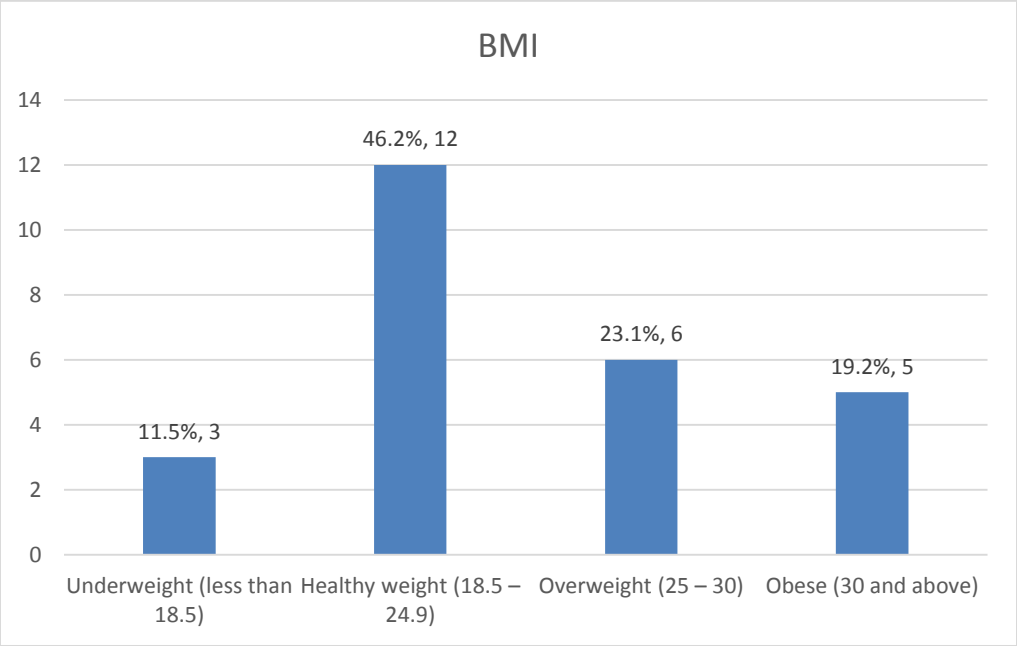
11.4 Difficult Bag Mask Ventilation

Figure 4: Predictors of Difficult Mask Ventilation



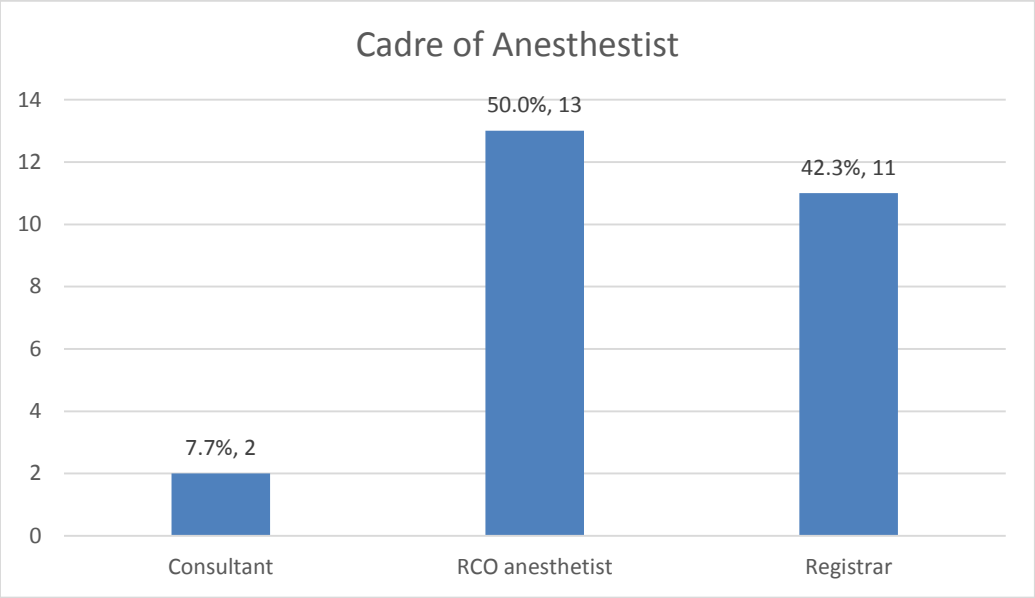
Of the patients with difficult bag mask ventilation 23.1% had obvious deformity or mass of the upper airway,11.5% were edentulous and 7.7% had a beard. A chi-square test for association was conducted between those able to and unable to maintain saturation at more than 92% with bag mask ventilation without being assisted. There was a statistically significant difference in the two groups with respect to deformity ($\chi 2$ (1) = 4.515, p = 0.034), but there were no statistically significant differences with respect to patients with a beard ($\chi 2$ (1) = 1.222, p = 0.269), and edentulous patients ($\chi 2$ (1) = 0.670, p = 0.413).

Figure 5: Bmi Versus Difficult Bag Mask Ventilation



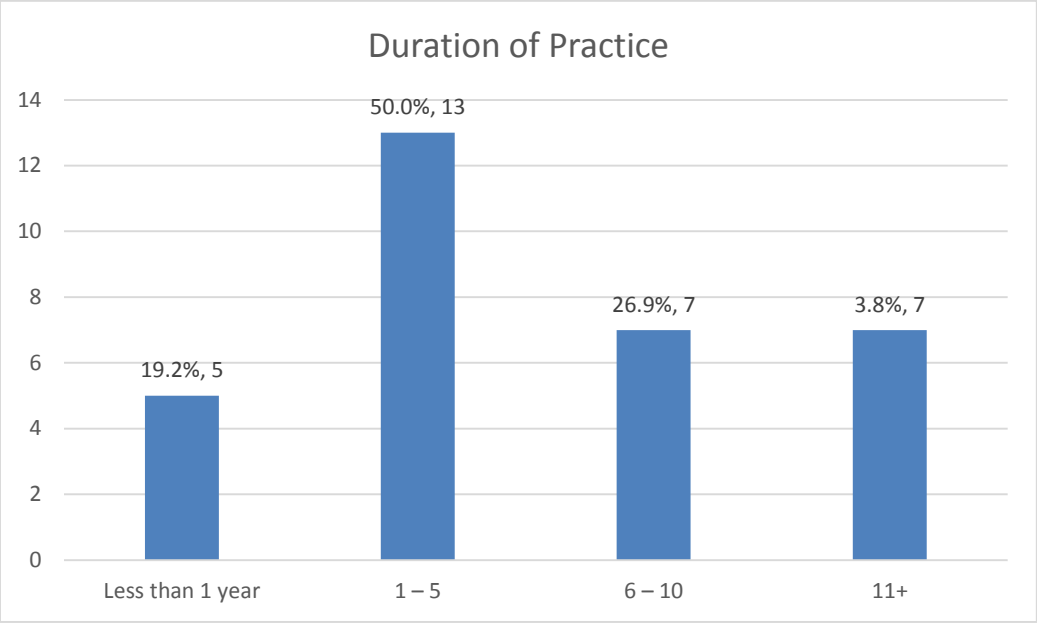
The incidence of difficult bag mask ventilation was not affected by the patients' BMI. A chi-square test for association was conducted between those able to, and those unable to maintain saturation at more than 92% with mask ventilation. There were no statistically significant differences in the groups with respect to BMI ($\chi 2$ (3) = 1.404, p = 0.705).

Figure 6: Cadre of Anesthetist versus Difficult Bag Mask Ventilation



Majority of patients had anesthesia care primarily provided by registered clinical officer anesthetist and registrars of anesthesia. A chi-square test for association was conducted between those able to, and those unable to maintain saturation at more than 92% with mask ventilation. There were no statistically significant differences in the groups with respect to cadre of anesthetist ($\chi 2$ (2) = 0.087, p = 0.957).

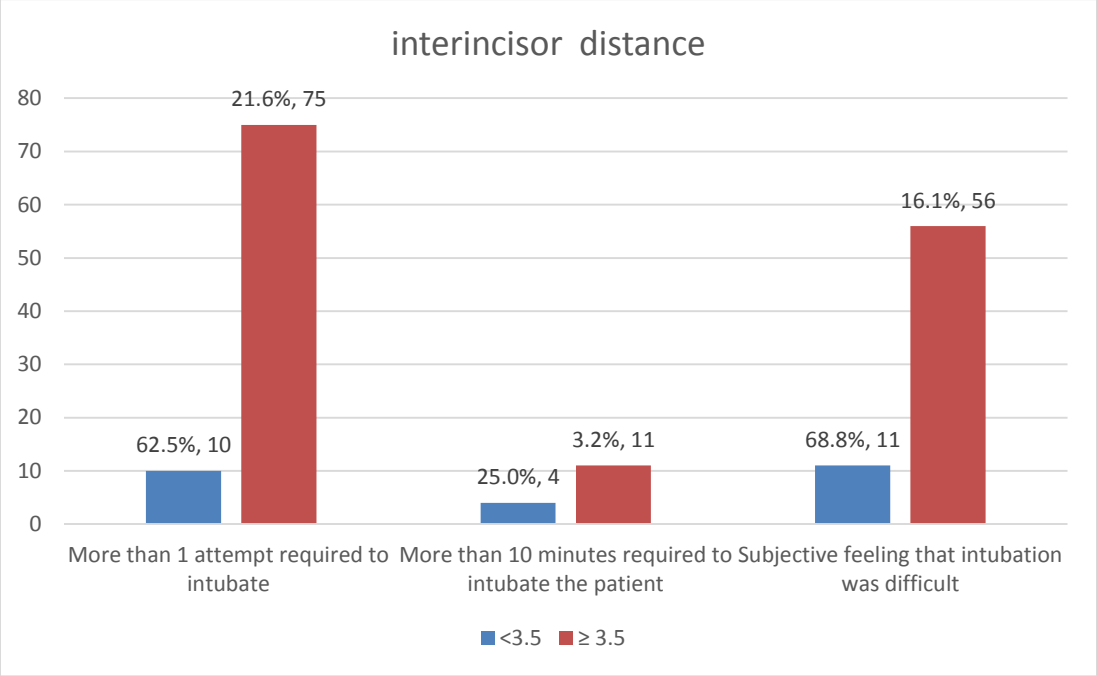
Figure 7: Duration of Practice versus Difficult Bag Mask Ventilation.



Majority of patients had anesthesia provided by anesthetist with 1-5yr duration of practice. A chi-square test for association was conducted between those able to, and those unable to maintain saturation at more than 92% with mask ventilation. There were no statistically significant differences in the groups with respect to duration of practice ($\chi 2$ (3) = 4.588, p = 0.205).

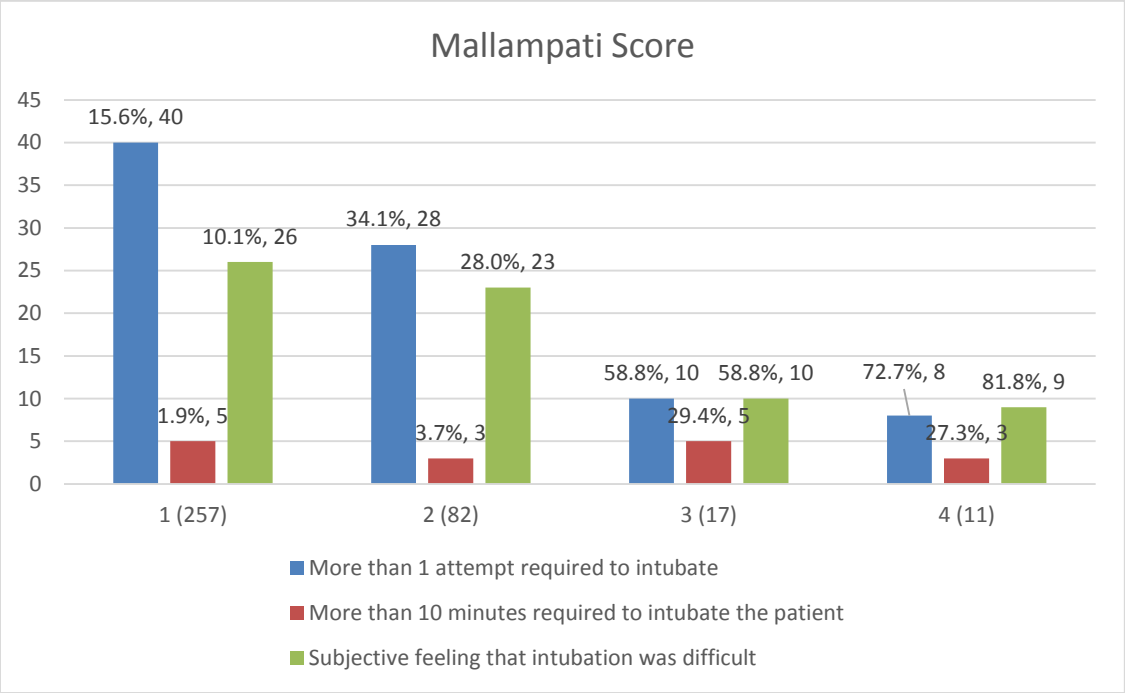
11.5 Predictors of Difficult Intubation

Figure 8: Inter-Incisor Distance



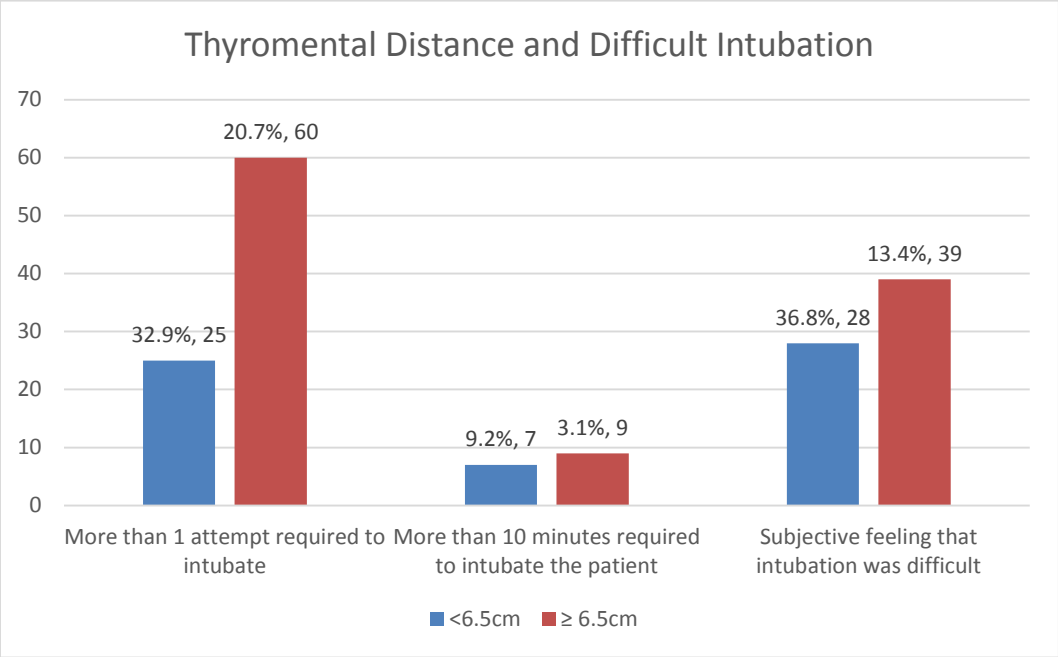
Most patients (n 347) had interincisor distance of more than 3.5cm. 12 patients' interincisor distance were not measured due to being edentulous. A Fisher's exact test was conducted between those that had inter-incisor distance of < 3.5 and those ≥ 3.5. There was statistically significant difference between those that had inter-incisor distance of < 3.5 and those ≥ 3.5 with respect to more than 1 attempt required to intubate ($p = 0.001$), more than 10 minutes required to intubate the patient ($p = 0.003$), and subjective feeling that intubation was difficult ($p < 0.001$).

Figure 9: Mallampati Score



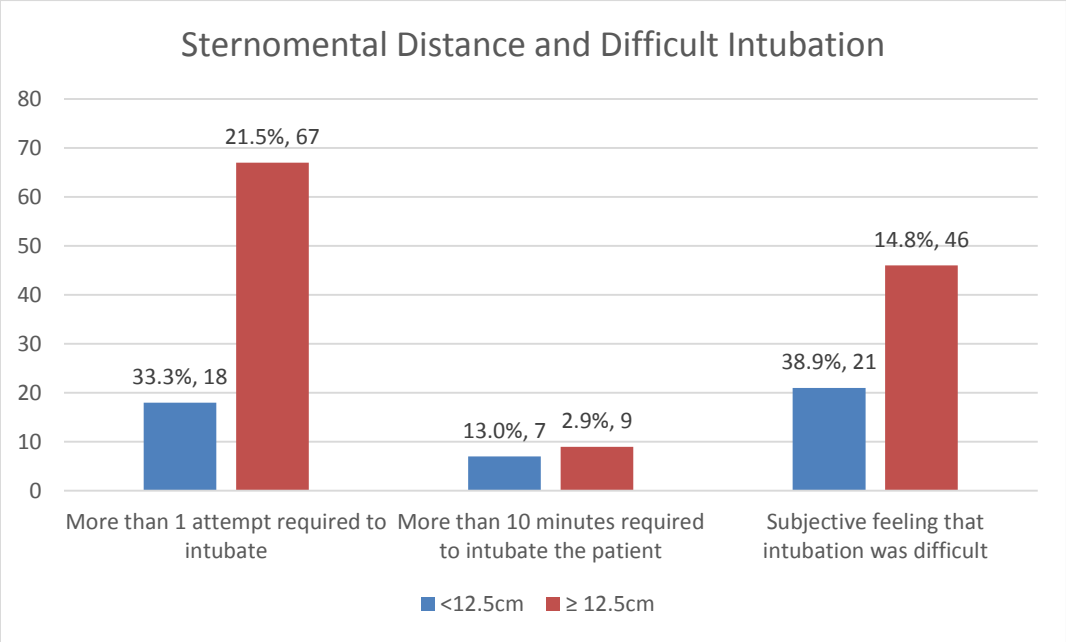
Majority of patients (92.4%) had mallampati scores I and II (n 257 and 82 respectively). Only 4.6 % had mallampati III and 3% had mallampati IV scores. 29.3% of patients with mallampati III and 27.3 % of patients with mallampati IV had difficult intubation, versus 1.9% and 3.7% with mallampati I and II respectively (p=0.001).

Figure 20 : Thyromental Distance



A chi-square test for association was conducted between those that had thyromental distance < 6.5 and those ≥ 6.5. There was statistically significant difference between those that had thyromental distance < 6.5 and those ≥ 6.5 with respect to more than 1 attempt required to intubate ($\chi 2$ (1) = 5.031, p = 0.025), more than 10 minutes required to intubate the patient ($\chi 2$ (1) = 5.372, p = 0.020), and subjective feeling that intubation was difficult ($\chi 2$ (1) = 22.037, p < 0.001).

Figure 31: Sternomental Distance



A chi-square test for association was conducted between those that had sternomental distance < 12.5 and those ≥ 12.5. There was statistically significant difference between those that had sternomental distance < 12.5 and those ≥ 12.5 with respect to more than 10 minutes required to intubate the patient ($\chi 2$ (1) = 11.130, p = 0.001), subjective feeling that intubation was difficult ($\chi 2$ (1) = 17.828, p < 0.001), but there was no statistically significant difference with respect to more than 1 attempt required to intubate ($\chi 2$ (1) = 3.580, p = 0.058).

Figure 42: cadre of anesthetist versus difficult intubation

Cadre of Anesthetist	**Frequency n (%)**		**Total n (%)**	**P value**
	Yes	**No**		
Consultant	4 (5.9)	24 (8.0)	28 (7.6)	0.826
RCO anesthetist	33 (48.5)	139 (46.5)	172 (46.9)	
Registrar	31 (45.6)	136 (45.5)	167 (45.5)	
Total	**68 (100.0)**	**299 (100.0)**	**367 (100.0)**	

There is no statistically significant difference between the anesthesia care givers cadres with respect to subjective feeling of difficult intubation. (p 0.826)

Figure 5: duration of practice versus subjective feeling of difficult intubation

Duration of practice	Frequency n (%)		Total n (%)	P value
	Yes	No		
Less than 1 year	13 (19.1)	73 (24.4)	86 (23.4)	0.375
1 – 5	34 (50.0)	162 (54.2)	196 (53.4)	
6 – 10	12 (17.6)	39 (13.0)	51 (13.9)	
11 +	9 (13.2)	25 (8.4)	34 (9.3)	
Total	**68 (100.0)**	**299 (100.0)**	**367 (100.0)**	

Duration of practice did not show statistical significance with respect to subjective feeling of difficult intubation.

11.2.1 Regression Analysis

This section presents the findings of the secondary objective which was to ascertain the effects of mallampati score, thyromental distance, sternomental distance, patient able to protrude the lower jaw beyond the incisors and the BMI on the likelihood that participants required more than 1 attempt. The results of the regression analysis are as shown on Table 16.

Table 3: Logistic Regression Prediction Likelihood of Difficult Intubation.

	p values	Odds Ratio
Mallampati score	0.019	2.430
Inter Incisor distance	0.277	0.734
Sternomental distance	0.150	0.807
Thyromental distance	0.285	1.387
Protrude lower jaw	0.635	1.459
BMI	0.361	1.039

The odds of having difficult intubation was 2.43 times for each 1 unit increase in the mallampati score, which was found to be statistically significant (p=0.019). The odds of difficult intubation were 1.039 for each unit increase of the BMI score, 1.387 for thyromental distance, and 1.459 for ability of the patient to protrude the lower jaw beyond the incisors but were found not to be statistically significant (p 0.361, p 0.285, and p 0.635 respectively)

12.0 Discussion

Airway management is core to anesthesia practice. The American Society for Anesthesiologists recommends airway assessment prior to anesthesia for safety reasons. Difficult airway, though uncommon, is associated with complications and airway related litigation in anesthesia.

The male to female ratio of the participants was 1:1, which is similar to the national ratio (Kenya bureau of statistics) which is lower than the global ratio of 1016 males to 1000 females. Majority of patients were in the productive age group of 18yrs to 55yrs (86.7%). Although obesity is an emerging problem in anesthesia care in the world, most patients (48%) in this study had healthy weight as measured using BMI, minority were underweight (6.7%) and only 16.8% of the patients were obese.

The incidence of difficult bag mask ventilation, difficult laryngoscopy and difficult intubation was assessed.

Based on the definition of a difficult mask ventilation by the difficult airway society 2015 guidelines the incidence of difficult bag mask ventilation was 6.9%. This proportion is 3 times that of the study by Cattano et al (2.4%).

Twenty-six patients (6.9%) had difficult laryngoscopy that is they had grades III and IV Cormack Lehane laryngoscopy grades. This is falls within the range of 1.5-13% as quoted by various studies. This is probably due to less variability in assessment of the laryngoscopic grades by Cormack Lehane. This study provided for accurate assessment of the laryngoscopy grades as the care givers were provides with a grading score in the assessment tool and eliminated recall bias.

The incidence of difficult intubation (4.3%) is almost similar to the study by Celebi et al (4.9%). Celebi et al included patients who required more than 3 attempts to intubate and those who required more than 10minutes to intubate. It is slightly less than that of the study by Langeron et al. (6.1%) who included patients who required more than 2 attempts in their definition of difficult tracheal intubation. The anesthesia care providers had a subjective feeling of difficult intubation for only 18.1% of the cases. Further analysis did not show a statistically difference in the cadres and duration of practice with respect to subjective feeling of difficult intubation and more than 10minutes to intubate with respect with duration of practice (p 0.826, p 0.436, p 0.198 and p 0.375

respectively). This contrasts the study done by langeron et al in which there was statistically significant difference in occurrence of difficult intubation with respect with cadre (p 0.005)

The patients BMI, being edentulous, having a beard or the presence of a deformity or mass of the upper airway were assessed for effectiveness in predicting a difficult mask ventilation. The presence of a deformity or a mass of the upper airway or the neck positively correlated with occurrence of a difficult mask ventilation. However, patients having a beard did not show statistical significance in predicting difficult mask ventilation. There was no statistically significant correlation between occurrence of difficult mask ventilation and the patients BMI. This contrasts the study by Cattano et al who found that a BMI of $35kg/M^2$ and facial hair to be significant predictors of difficult ventilation (p 0.0001 and 0.001 respectively). Being edentulous was not a predictor of difficult mask ventilation, similar to the study by Cattano et al on predictors and risk for difficult mask ventilation. In the presence of upper airway mass or deformity, the anesthesia care provider needed assistance with bag mask ventilation. Other factors such as presence of a beard, patient being edentulous, BMI, cadre and duration of practice did not correlate with anesthesia care giver need for assistance with bag mask ventilation.

The patients' BMI and clinical significance with respect to difficult intubation, odds of 1.039 for every unit increase in BMI but not statistically significant (p 0.361).

The anesthesia care providers in the KNH belong to 3main cadres: consultant anesthesiologists, residents pursuing masters of medicine in anesthesia (medical doctors) and registered clinical officer anesthetists. In rural Kenya anesthesia care is also provided by nurse anesthetists. This mirrors the global scene where anesthesia is provided by physician and non-physician anesthesiologists(18). In the united states of America anesthesia care is provided by nurse anesthetists who work under supervision of physician anesthesiologists. A comparison of the cadres and duration of practice showed no statistical significance with respect to occurrence of difficult mask ventilation.

The tools commonly used for prediction of difficult intubation; prognathic ability, mallampati score, inter-incisor distance, thyromental and sternomental distance were assessed for effectiveness in correctly predicting difficult intubation.

There was statistically significant difference between interincisor distance below and above 3.5cm, thyromental distance below and above 6.5 and sternomental distance below and above 12.5. in predicting difficult intubation. However, on logistic regression analysis the odds of difficult intubation were 1.387, and 1.459 for every unit change in thyromental distance and change in prognathic ability respectively ($p= 0.285$ and $p=0.635$ respectively).

Increasing mallampati score is associated with increasing incidence of difficult intubation. Logistic regression analysis showed that the odds of occurrence of difficult intubation was 2.4 per unit increase in mallampati score.

The 'Cannot intubate cannot ventilate', a dreaded complication of difficult airway, occurred in a 43yr old Male patient with upper airway mass scheduled for excision with neck dissection. The patient had mallampati score of IV with inter incisor gap of 4cm, inability to prognath, thyromental distance of 5cm and sternomental distance of 12cm. Bag mask ventilation was difficult and the anesthesia team were unable to intubate the patient. A tracheostomy was done by the otorhinolaryngology surgeons scheduled to do the surgery to rescue the airway. No other adverse effect was reported. A difficult airway had been anticipated and a decision to get front of neck access was made as soon as attempts at intubation and bag mask ventilation failed.

Supraglottic devices are hardly used in airway management in adult patients in our institution. Of the 11 patients had supraglottic devise used for airway management, 4 had difficult supraglottic device placement. The number of patients who had supraglottic device used for airway management is very low. A follow up multicenter study would give a good picture of prevalence of difficult supraglottic device placement.

13.0 Conclusion

The difficult airway is significant problem in KNH. The incidence of difficult mask ventilation, laryngoscopy and intubation of 6.9%, 6.9% and 4.3% respectively is comparable to other parts of the world.

Commonly used assessment tools such as Mallampati score, interincisor, thyromental and sternomental distances as well as prognathic ability are effective predictors of difficult intubation in our population.

Presence of a mass or deformity in the airway and upper neck was a significant predictor of difficult mask ventilation whereas BMI, being edentulous and presence of a beard were not.

Finally, a high index of suspicion for anticipated difficult intubation is required whenever a patient with obesity is scheduled for surgery since the odds of difficult intubation is 1.039.

14.0 Recommendations

I hereby recommend that:

1. A difficult airway cart be available for every operating room and remote locations where anesthesia is provided to cater for both anticipated and unanticipated difficult airway.
2. Symposia on difficult airway assessment and management are consistently organized for all cadres of anesthesia providers to sensitize them on the incidence, predictors and management of difficult airway.
3. Awake fibre optic intubation bronchoscope and video laryngoscopes for specific cases of anticipated difficult airway be available and training opportunities offered to anesthesia care providers.
4. A standard operating procedure in airway assessment and management is tailored for KNH based on the study results.
5. A multicenter study with higher power be done on difficult airway assessment and management in Kenya.

REFERENCES

1. Nørskov AK, Rosenstock C V., Wetterslev J, Astrup G, Afshari A, Lundstrøm LH. Diagnostic accuracy of anaesthesiologists' prediction of difficult airway management in daily clinical practice: A cohort study of 188 064 patients registered in the Danish Anaesthesia Database. Anaesthesia. 2015;
2. Cattano D, Killoran P V., Cai C, Katsiampoura AD, Corso RM, Hagberg CA. Difficult mask ventilation in general surgical population: observation of risk factors and predictors. F1000Research [Internet]. 2014;3:204. Available from: http://www.ncbi.nlm.nih.gov/pubmed/25485097
3. Kluwer W, Logo H, Searches S, Searches R, Search A, Issue C, et al. Anesthesia & Analgesia Preoperative Airway Assessment : Predictive Value of a Multivariate Risk Index.
4. Mallampati SR, Gatt SP, Gugino LD, Desai SP, Waraksa B, Freiberger D, et al. A clinical sign to predict difficult tracheal intubation; a prospective study. Can Anaesth Soc J. 1985;32(4):429–34.
5. Cattano D, Panicucci E, Paolicchi A, Forfori F, Giunta F, Hagberg C. Risk factors assessment of the difficult airway: An Italian survey of 1956 patients. Anesthesia and Analgesia. 2004.
6. Khan ZH, Arbabi S. Diagnostic value of the upper lip bite test in predicting difficulty in intubation with head and neck landmarks obtained from lateral neck X-ray. Indian J Anaesth. 2013;57(4):381–6.
7. Cattano D, Wojtczak JA, Callender R, Cai C, Tezino T, van Zundert TCR V, et al. External neck landmark identification and measurement correlation in a normal weight cohort. J Anesthesiol Clin Sci [Internet]. 2014;3(1):7. Available from: http://www.hoajonline.com/jacs/2049-9752/3/7
8. Langeron O, Cuvillon P, Ibanez-Esteve C, Lenfant F, Riou B, Le Manach Y. Prediction of difficult tracheal intubation: time for a paradigm change. Anesthesiology [Internet]. 2012;117(6):1223–33. Available from: http://www.ncbi.nlm.nih.gov/pubmed/23880997%5Cnhttp://www.ncbi.nlm.nih.gov/pubmed/23135259
9. Celebi N, Canbay O, Cil H, Disli ZK, Karagoz AH. Interobserver variability for non-invasive prediction of difficult intubation in different years of anesthesiology residency. Middle East J Anesthesiol. 2012;21(6):823–8.
10. Salgar ST. Stress in first year medical students. Int J Biomed Adv Res [Internet]. 2014;05(01):79–80. Available from: http://ijbar.ssjournals.com/index.php/journal/article/view/580/1035
11. Larson CP. Miller's Anesthesia, 7th ed. Vol. 110, Anesthesia and analgesia. 2010. p. 263–5.
12. Paul B. Clinical Anesthesia (Barash, 6th Ed. 2009.
13. Anesthesiologists A society of. Practice Guidelines for Management of the Difficult Airway. Anesthesiology [Internet]. 2013;118(2):251–70. Available from: http://anesthesiology.pubs.asahq.org/article.aspx?articleid=1918684
14. CORMACK RS, LEHANE J. Difficult tracheal intubation in obstetrics. Anaesthesia. 1984;

15. Frerk C, Mitchell VS, McNarry AF, Mendonca C, Bhagrath R, Patel A, et al. Difficult Airway Society 2015 guidelines for management of unanticipated difficult intubation in adults. Vol. 115, British Journal of Anaesthesia. 2015. p. 827–48.
16. De Jong A, Molinari N, Terzi N, Mongardon N, Arnal JM, Guitton C, et al. Early identification of patients at risk for difficult intubation in the intensive care unit: Development and validation of the MACOCHA score in a multicenter cohort study. Am J Respir Crit Care Med. 2013;187(8):832–9.
17. Daniel W. Biostatistics: A Foundation for Analysis in the Health Sciences (7th edition) [Internet]. Vol. 30, Technometrics. 1999. p. 161-210,214-279. Available from: http://www.jstor.org/stable/1270189?origin=crossref
18. Ashengo T, Skeels A, Hurwitz EJH, Thuo E, Sanghvi H. Bridging the human resource gap in surgical and anesthesia care in low-resource countries: A review of the task sharing literature. Human Resources for Health. 2017.

APPENDICES

APPENDIX I: QUESTIONNAIRE

SECTION A: PATIENT BIODATA

Serial number Age (years)

sex

☐ M

☐ F

weight (kg)

height (cm)

SECTION B: ANESTHESIA PROVIDER BIODATA

1 What is the Aneesthesia providers' cadre? Tick as appropriate

☐ Consultant

☐ RCO anesthetist

☐ Registrar

2 What is the duration of your practice in anesthesia. (months/years)

SECTION C: PATIENT FACTORS

3. Does the patient have predictors of difficult mask ventilation? Tick as appropriate.

☐ beard

☐ edentulous

☐ obvious deformity/mass of the upper airway or neck

4a. Does the patient have previous history of difficult airway?

☐ Yes ☐ No

4b if yes tick as appropriate

☐ difficult bag mask ventilation

☐ difficult supraglottic device placement

☐ difficult laryngoscopy

☐ difficult intubation

5. What was the patient's Inter-incisor distance (cm)?

6. What is the patient's Mallampati score?

7. What is the patients thyromental distance (cm)?

8. What is the patients sternomental distance (cm)?

9. Is the patient able to protrude the lower jaw beyond the upper incisors?

☐ Yes

☐ NO

SECTION D: PATIENT OUTCOMES

10. Does the patient have difficult mask ventilation? Tick as appropriate if any of this is present.

Are you able to maintain saturation at more than 92% with mask ventilation without being assisted?

☐ Yes

☐ No

Did you need an assistant to ventilate the patient via bag and mask?

☐ Yes

☐ No

11. What is the patient's Cormack Lehane laryngoscopic view score? Tick as appropriate the structures visualized at laryngoscopy.

☐ Full view of the glottis

☐ Partial view of the glottis

☐ Only the epiglottis viewed

☐ Neither the glottis nor the epiglottis visualized

12. Was intubation difficult? Tick as appropriate

More than 1 attempt required to intubate

☐ Yes

☐ No

More than 10minutes required to intubate the patient

☐ Yes

☐ No

Subjective feeling that intubation was difficult

☐ Yes

☐ No

13. Was placement of supraglottic device difficult?

☐ Yes

☐ No

APPENDIX II: CONSENT FORM.

You are being asked to participate in a research study on the effectiveness of airway assessment methods for predicting difficult airway management used by anesthesiologists at Kenyatta national hospital. Please carefully read this form and ask any questions you may have before participation in the study. This study will be carried on all consenting adult patients undergoing surgery under general anesthesia.

There are assessments for difficult airway that will be done prior to and after induction of anesthesia. These assessments are routine. In case of difficulty in airway management there are alternatives to ensure your safety.

Your assessment will be confidential as the records of this study will be kept private in a locked file. When the information is made public, there will be no information that makes it possible to identifying you. You are free to withdraw from the study any time and it will not affect your anesthesia management.

The researcher is Dr. Sarah Ushindi Okiya and you are free to contact her at any time via mobile number +25427466053 or email: sarahokiya@yahoo.com in case concerns or questions. You can also talk to the lead supervisor Dr. Julius Muriithi whose contacts information is as follows: mobile number 0722850375, email address, muriithi.julius@yahoo.com or the KNH/UoN ERC secretariat NAIROBI Tel 254 (020) 27263009 Ext 44355, Email: uonknh_erc@uonbi.ac.ke, Website: www.erc.uonbi.ac.ke

Having read the information given, explained and understood I consent to participate in the study.

Signed Date

Patient's serial no

Signed Date

Researcher's Name

This consent form will be kept by the researcher for at least 3 years after the study

ITHINI YA KUSHIRIKI KATIKA UTAFITI

Unaulizwa kushiriki katika utafiti wa mbinu zinazotumika kutabiri uwezekano wa ugumu katika kuweka mpira wa kupumua wakati wa operesheni katika hospitali Kuu ya Kenyatta. Tafadhali uliza maswali ukiwa na utata wowote kabla ya kushiriki katika utafiti huu. Ugumu wa kuweka mpira wa kupumua utapimwa kabla na baada ya kupewa dawa ya kulala. Vipimo hivi vinatumiwa kawaida kabla ya kupewa dawa ya kulala kuhakikisha usalama wako. Ugumu unapotokea madkatari wana mbinu tofauti tofauti ya kuimudu hali hiyo kuhakikisha usalama wako.

Majibu ya utafiti huu unahifadhiwa kuhakikisha hakuna jinsi mtu mwingine yeyote anaweza kukutambua au kupata majibu haya pasipo ithini. Una uhuru wa kujiondoa kwenye utafiti huu wakati wowote bila ya kupata madhara yoyote unapofanyiwa operesheni.

Ukiwa na swali lolote mwulize Dr. Sarah Ushindi Okiya, nambari ya simu +254727466053, barua ya pepe sarahokiya@yahoo.com. Pia unaweza zungumza na Dr. Julius Muriithi nambari ya simu +254722850375, barua ya pepe muriithi.julius@yahoo.com na KNH/UoN ERC secretariat NAIROBI nambari ya simu 254 (020) 27263009 Ext 44355, barua ya pepe : uonknh_erc@uonbi.ac.ke, Website: www.erc.uonbi.ac.ke

Sahihi Tarehe

nambari ya mgonjwa

Sahihi Tarehe

Jina la Daktari.

APPENDIX III: INFORMATION/EXPLANATION OF THE CONSENT FORM

TITLE: THE EFFECTIVENESS OF AIRWAY ASSESSMENT TOOLS IN PREDICTING A DIFFICULT AIRWAY BY ANAESTHESIOLOGISTS AT KNH

STUDY SITE: KNH Theatres

BACKGROUND: When a patient undergoes surgery under general anesthesia the provider ensures safety by placing a breathing tube to keep the airway open. A number of methods are used to assess for possibility of difficult airway to ensure the anesthesia provider is prepared to handle emerging cases. These are done to ensure your safety. The anesthesia providers use different methods in different combinations.

PURPOSE OF STUDY: We want to establish how effectively the methods anesthesia providers use at KNH correctly identify a difficult airway. With this information we will be able to establish protocols to improve safety of anesthesia.

PARTICIPATION: Your participation in this study is voluntary and are free to withdraw from the study at any point and still have safe anesthesia.

RISKS: there is a small chance that you may have a difficult airway, the anesthesia are however qualified to handle such cases to ensure safety.

BENEFITS: information obtained from this study will enable anesthesiologists to improve and provide safe anesthesia that is personalized to our communities. Please note that KNH is one of the major teaching centres for anesthesia care providers in this country in conjunction with teaching institutions such as the UoN and Kenya Medical Training College.

RESULTS: The results of this study will be shared at the KNH/UoN anesthesia department with experts and through publications. Your information will be kept confidential. Information from this study will be stored for at least three years.

COST AND COMPENSATION: You will not incur extra cost from participation in this study. You will not get monetary benefit since the study is done to better anesthesia provision.

ETHICS AND RESEARCH COMMITTEE CONTACTS:

In case of concerns about this study you can contact the KNH/UoN Ethics and Research committee though the following contacts:

KNH-UoN Secretariat

KNH/UoN ERC

College of Health Sciences
P.O BOX 19676-00202
NAIROBI
Tel 254 (020) 27263009 Ext 44355
Email: uonknh_erc@uonbi.ac.ke
Website: www.erc.uonbi.ac.ke.

MAELEZO YA ITHINI

Utafiti huu utafanyika katika thiata za Hospitali kuu ya Kenyatta.

Wakati mgonjwa wanafanyiwa upasuaji chini ya anesthesia ujumla muhudumu wa anesthesia huhakikisha usalama kwa kuweka mpira wa njia ya hewa. Idadi ya njia zinatumika kutathmini uwezekano wa ugumu huo kuhakikisha mtoa anesthesia yu tayari kushughulikia kesi zinavyojitokeza. Utathmini huu hufanyika ili kuhakikisha usalama wako. Watoa anesthesia hutumia mbinu mbali mbali katika michanganyiko tofauti.

Tunataka kutathmini iwapo mbinu zinazotumiwa kutabiri ugumu wa kuweka mipira ya njia ya hewa zinatabiri kwa usahihi.

habari hii itatuwezesha kuwa na itifaki ili kuboresha usalama wa anesthesia.

ushiriki wako katika utafiti huu ni wa hiari na u huru kuondoka kutoka utafiti katika hatua yoyote na uwe na anesthesia salama.

kuna nafasi ndogo ya ugumu kuweka mpira wa hewa, wahudumu wa anesthesia wana sifa ya kushughulikia kesi hiyo ili kuhakikisha usalama.

Habari zitakazopatikana kutokana na utafiti huu utawezesha wahudumu wa anesthesia kuboresha na kutoa anesthesia salama kwamba ni Msako kwa jamii zetu. Tafadhali kumbuka kuwa KNH ni moja ya vituo kubwa ya kufundisha kwa wahudumu wa anesthesia katika nchi hii kwa kushirikiana na vyuo vya ualimu kama vile UON na Kenya Medical Training College.

matokeo ya utafiti huu yatahifadhiwa katika idara anesthesia KNH / UON na wataalamu na kupitia machapisho. Maelezo yako yatakuwa siri. Taarifa kutoka utafiti huu utahifadhiwa kwa angalau miaka mitatu.

Hautagharamika ziada kutokana na ushiriki katika utafiti huu. Huwezi kupata faida ya fedha kwani utafiti unafanywa kwa kuboresha utoaji anesthesia.

Ukiwa na utata wowote kuhusu utafiti huu unaweza kuwasiliana na KNH / UON ERC kupitia nambari ya simu na barua pepe vifwatavyo:

KNH-UoN Secretariat
KNH/UoN ERC
College of Health Sciences
P.O BOX 19676-00202
NAIROBI
Tel 254 (020) 27263009 Ext 44355
Email: uonknh_erc@uonbi.ac.ke
Website: www.erc.uonbi.ac.ke

APPENDIX IV: CONTENTS OFF DIFFICULT AIRWAY CART.

Laryngoscope with millers' blades 3 and 4.

Two face masks Two nasopharyngeal airways Two guedel's airways

One in intubating laryngeal mask airway, two classic laryngeal mask airways.

Two Magil's forceps

Endotracheal tubes sizes 6.0, 6.5, 7.0, 7.5.

stylets

Two 10ml syringes

Two gum elastic bougies

Cricothyrodotomy set; two 16 gauge cannulas, two 2ml syringes

Tracheostomy set: tracheostomy tubes sizes 6.0, 6.5, 7.0, 7.5

Drugs: propofol, fentanyl, suxamethonium, atropine, adrenaline, 2% lidocaine for local infiltration