Comparison Of Airway Management Devices Laryngeal Mask Airway Versus Endotracheal Tube During Respiratory Emergencies and Their Outcome

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By

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Author's Declaration

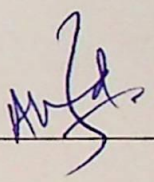
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DEDICATION

This thesis is dedicated to my family for their continuous support, encouragement and sacrifices which has been my strength throughout. The faith they had in me pushed me to do this.

I dedicate this thesis work to my teachers and mentors who's through the years guidance of excellence and dedication has always inspired me. Their priceless lessons have driven me towards excellence. Finally, the above endeavor is for all those whose help and motivation have assisted me in various ways. Your kindness and encouragement contributed to this achievement. Thank you.

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In the name of Allah, the Most Compassionate and Most Merciful. I thank Almighty Allah the one, for giving me strength, power, Sabar and ability to accomplish this work. He has blessed me abundantly at every step of the journey.

I would like to express my sincere appreciation to my respected supervisor for their invaluable guidance, continuous encouragement, and insightful feedback. Their expertise and unwavering support have played a vital role in shaping the direction and quality of this study, for which I am profoundly thankful.

Lastly, I extend my heartfelt gratitude to my family for their unconditional love, support, and motivation. Their patience and belief in my abilities have been a constant source of strength and inspiration, without which this achievement would not have been possible.

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LIST OF ABBREVIATION

ETT	Endotracheal Tube
LMA	Laryngeal Mask Airway
TI	Tracheal Intubation
PE	Pectus Excavatum
PDT	Percutaneous Dilational Tracheostomy
SVCS	Superior Vena Cava Syndrome

ABSTRACT

Prupose: Airway management during respiratory emergenciesis critical to prevent morbidity and mortality. While the endotracheal tube (ETT) remains the gold standard, supraglottic airway devices such as the laryngeal mask airway (LMA) offer less invasive alternatives. However, comparative data regarding device selection, success rates, complications, and operator preferences remain limited in resource-constrained settings.

Objective: This study aimed to compare the efficacy of the laryngeal mask airway and endotracheal tube in maintaining airway patency during respiratory emergencies, while assessing associated complication rates and evaluating patient outcome.

Methods: A cross-sectional study was conducted over six months at Maqsood Medical Complex Hospital, Peshawar, involving 150 adult patients requiring airway management for respiratory emergencies. Data were collected prospectively through structured questionnaires, capturing patient demographics, device types used, operator profiles, insertion attempts, complications, and clinician satisfaction. Statistical analysis was performed using SPSS version 27, employing descriptivestatisticsandchi-squareteststoexploreassociations,withsignificancesetatp<0.05.

Results: Of 150 patients, 55.3% were male, mostly aged 33–50 years. LMA and ETT were used in 50.7% and 49.3% of cases, respectively, with choice influenced by operator preference (46.7%) and device availability (42.7%). First-attempt success was 81.3%, though 26.0% encountered anatomical insertion difficulties. Adequate oxygenation/ventilation was achieved in 72.7%. Complications occurred in 31.3%, primarily hypoxia (16.0%) and aspiration (6.7%). Device replacement was required in 26.0% of cases. The type of device used was significantly associated with complication rates ($\chi^2 = 32.618$, $p < 0.001$). Survival to discharge was 97.3%, and 71.4% of clinicians reported satisfaction with outcomes.

Conclusion: Both LMA and ETT were effective for airway management, though each had distinct complication profiles. Operator expertise, appropriate device selection, and continuous training are essential to improve patient safety in respiratory emergencies.

Keywords: Endotracheal Tube, Laryngeal Mask Airway, Respiratory Emergency, Intubation.

Chapter 1

INTRODUCTION

1.1 Background of Airway Anatomy

The airway comprises the upper and lower respiratory tracts, which facilitate airflow and gas exchange. The upper airway refers to the nasopharynx, oropharynx, hypopharynx, and larynx. These structures are critical for speech, protection, and directing airflow. The larynx is which possesses the vocal cords and the epiglottis; it is often the landmark for endotracheal intubation(1). The trachea, which bifurcates into the main bronchi supported by C-shaped cartilage rings and is wider and more vertical on the right, is where the lower airway begins. The bronchi split into lobar, segmental bronchi, and they further divide into bronchioles and alveoli for gaseous exchange. The linings of the airways help in moistening the air and regularizing the temperature. It plays an immunologic defense role because of the mucosa-associated lymphoid tissue. The bronchial field's diameter is regulated by the parasympathetic (via vagus nerve) and sympathetic innervation via bronchoconstriction and bronchodilation respectively. It is essential to know this anatomy to enable the proper placement of airway devices like laryngeal mask airways (LMA)(2)(3).

1.2 Overview of Respiratory Emergencies

Respiratory emergencies may occur due to conditions affecting airways and blood vessels within the chest or pulmonary parenchyma. In cases of airway obstruction, patients may undergo bronchoscopic treatment with laser ablation, photodynamic therapy, or insertion of airway stents to restore airflow(4). Asthma is a frequently encountered respiratory condition; however, its symptoms can sometimes be mimicked by other serious issues like endobronchial metastasis, where cancer spreads to the airways. Another potentially life-threatening emergency is superior vena cava syndrome (SVCS), which most often results from cancers such as bronchogenic carcinoma or lymphoma. While SVCS may require urgent care, immediate treatment is not always necessary unless there is significant tracheal obstruction that compromises breathing. Pulmonary embolism (PE), a condition caused by a blood clot blocking an artery in the lungs,

can now be quickly and accurately diagnosed using spiral (or helical) computed tomography (CT) scans. Despite this advancement, ventilation-perfusion (V/Q) scans are still widely used as a first-line diagnostic tool in many clinical settings. Lung tissue diseases, or parenchymal lung disorders, are often caused by infections, but cancerous and treatment-related (iatrogenic) causes are also possible. One particular infection, Pneumocystis carinii pneumonia (PCP), is becoming increasingly common among patients with cancer. Fortunately, this serious condition can often be prevented with appropriate prophylactic treatment. Finally, adult respiratory distress syndrome (ARDS) remains a major challenge in critical care. Despite numerous efforts to improve outcomes by targeting the inflammatory pathways involved in ARDS, current treatments have not significantly changed the course of the disease, and its prognosis continues to be poor(5)(6).

1.3 Overview of Respiratory Emergencies

Airway management is the process of ensuring that a patient's airway is open and clear to allow breathing. In emergencies or critical care, maintaining a patent airway is the highest priority because compromised breathing can quickly become life-threatening. A clear airway ensures oxygen delivery and carbon dioxide removal, which are vital for brain perfusion and overall survival. Early assessment, using verbal responses and observation, helps identify airway compromise, allowing timely intervention with oxygen, airway adjuncts, or mechanical ventilation(7). Bag-Valve-Mask Ventilation is often the first-line method in emergencies when spontaneous breathing is inadequate. Anesthesiologist must ensure a tight face-mask seal and proper jaw positioning. A two-person technique is more effective. Factors like facial hair, dentures, or obesity can complicate the seal. Bag-valve-mask (BVM) devices can deliver high oxygen concentrations but are usually for short-term use. ETT is used for prolonged ventilation. It's inserted into the trachea to secure the airway. Ideal placement uses rapid sequence induction (RSI), with cricoids pressure to reduce aspiration risk. Anesthetist must prepare equipment and support positioning(8)(9). ETTs come in various sizes and must be secured properly to prevent displacement. Mechanical ventilators assist or fully control breathing using positive-pressure systems. They reduce the work of breathing and are essential in ICUs. With an ETT in place, suctioning may be necessary to remove secretions, improve oxygenation, and prevent aspiration. Anesthesia practitioners must choose the correct catheter size and perform suctioning carefully,

as patients lack normal reflexes (e.g., gag, cough) while sedated. Regular oral care reduces aspiration pneumonia risk (10).

1.4 Historical Evolution of Airway

During the early to mid-20th century known as the "progressive era", in anesthesia airway management underwent a gradual transformation from rudimentary, manually applied techniques to more systematic and technologically supported practices(11). Initially, airway patency was maintained using basic maneuvers such as head extension and mandibular advancement, often in combination with simple devices like face masks. These were carried over from the 19th century and were largely unrefined but essential. As surgical procedures became more complex, there was an increasing demand for better anesthesia, prompting a shift from spontaneous to intermittent positive pressure ventilation (IPPV). However, opposition arose from complications such as barotrauma and aspiration(12). As the years progressed, the invention of new drugs (thiopental, succinylcholine, etc.) and devices (cuffed endotracheal tube, etc.) made safer and controlled airway management possible. Inventions like The Boyle anesthesia machine, The oropharyngeal airway, and positive pressure ventilation were the milestones of anesthesia. Moreover, experience from war medicine and epidemics (such as polio) pointed out the drawbacks of negative-pressure ventilators (like the iron lung). They also promoted the adoption of IPPV for respiratory failure(13). Peter Safar and James Elam in the 1950s demonstrated the efficacy of mouth-to-mouth ventilation, while the triple airway technique (head tilt, chin lift, jaw thrust) became commonly practiced and endorsed. These techniques pioneered mouth-to-mouth and airway procedures. Even with recent advancements, there remained a failure to advance methods, as many providers continued to rely on outdated practices and inadequate training in airway management contributed to preventable anesthetic deaths that occur. Toward the end of this time period, however, endotracheal intubation and assisted ventilation were becoming more widely accepted and became the basis for modernized airway management(14).

1.5 Endotracheal Tube: Applications

The endotracheal tube (ETT) is a device with which the airway may be secured and mechanical ventilation achieved first reliably used in the early 20th century. The endotracheal tube, which is usually made of polyvinyl chloride (PVC), is introduced through the vocal cords into the trachea

to deliver oxygen and anesthetics gases to the lungs while protecting the airway from the aspiration of gastric contents, blood etc(15)(16). Over the years, the ETT has changed along with new anesthesia and surgical techniques. Today's modern designs may prevent aspiration, allow for lung isolation, allow for the administration of medication, and prevent airway fire in surgery(17). Despite these improvements, challenges remain. Ventilator-associated pneumonia (VAP) is a serious and commonly occurring infection associated with prolonged ETT use. Researchers are focused on optimizing ETT design and use to limit such complications. ETTs are selected in pediatric practice for premature babies to full adult-size tubes for teens on age and size. Pediatric ETTs in the past were uncuffed to prevent injury from pressure to the narrowest part of the pediatric airway: the cricoid cartilage just below the vocal cords. Cuffed ETTs are now believed to be preferable to uncuffed ETTs when it comes to children. Their ability to create a better seal at lower pressures means improved ventilation. In addition to this, cuffed ETTs also have a reduced risk of aspiration. In adults, on the other hand, the vocal cords are the narrowest part of the airway, and cuffed tubes are used. There are many well-established clinical guidelines to help clinicians choose the correct ETT size for safe airway management(18).The primary purpose for which endotracheal tube (ETT) is used is to create a definitive airway. A definitive airway is one in which the ETT is placed in the trachea, with cuff blown up just below the vocal cords so that no air can leak1. When an airway is unable to be maintained, there is a risk of aspiration, or when a patient fails to ventilate or oxygenate, a definitive airway is usually required(19).

In addition, a definitive airway is needed in a situation where a high risk is reported for clinical deterioration to respiratory failure. The endotracheal intubation or ETT placement procedure is a life-saving, emergency skill every healthcare staff working in critical care settings must learn. Medical professionals who work in emergency departments, operating rooms, per operative sectors, and intensive care units, where patients might need intubation(20)(21). It is important that these professionals have a good handle on the principles and techniques of endotracheal intubation. This is essential for airway management, but also for choosing ventilator settings and providing adequate care to the critically ill patients(18)(6).

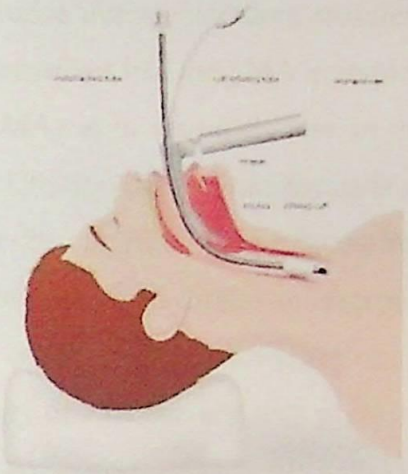


Figure 1: Endotracheal Intubation

1.6 Laryngeal Mask Airway: Evolution and Benefits

The rapid evolution of airway management technology has brought forth a host of novel devices, a surfeit of which remain unknown to practicing anaesthetists. Supraglottic airway devices are gaining attention for being easier to use and less invasive compared to endotracheal intubation.These devices, designed to sit above the vocal cords, help avoid some of the complications associated with tracheal intubation, such as trauma, sore throat, or more serious airway injuries(22). The laryngeal mask airway (LMA), first introduced by British anesthesiologist Dr. Archie Brain in 1987, marked a breakthrough in this field and has since become widely used in both routine and emergency airway management. It bridges the gap between face masks and endotracheal tubes in terms of anatomical placement and invasiveness, providing a hands-free, effective way to maintain an open airway. Numerous articles and letters about the device have been published in the last decade, but few large, controlled trials have been performed. Despite widespread use, the definitive role of the laryngeal mask has yet to be established. LMAs are especially useful in emergencies or in patients with difficult airways where intubation or ventilation is challenging (7). The American Society of Anesthesiologists even recommends the use of such devices in unanticipated difficult airway situations, particularly in the critical "cannot ventilate, cannot intubate" scenario. While endotracheal intubation remains the gold standard for securing the airway and preventing aspiration, it is not

without risk complications may arise during insertion, maintenance, or removal of the tube, highlighting the importance of alternatives like the LMA in modern anesthetic practice (23)(24). The Laryngeal Mask Airway (LMA) is in vogue for use in various clinical scenarios in the elective and emergency domains. Usually, General anesthesia is used for short elective surgeries, with airway pressure kept under 20 cm H2O. It is "hands-free" hence useful for outpatient procedures(25). An important tool in difficult airway management, especially for patients with limited mouth opening, obesity, cervical spine instability, etc. The difficult airway algorithm developed by the American Society of Anesthesiologists plays a very important role in elective and emergency situations(26). In emergencies like pre-hospital care, surgery or CPR, the LMA or Laryngeal Mask Airway provides a quick means to airway access, especially under adverse conditions when the patient is unable to move, such as during a helicopter transfer or in tight spaces. The LMA is also used in specific types of surgeries, such as ENT surgeries like adenotonsillectomy or middle ear surgery, and other general surgeries like anorectal or abdominal surgeries(27)(11).



Figure 2: Laryngeal mask airway insertion

The ProSeal LMA can generate positive pressure inside the lungs, and allows for a safeguard against aspiration. In addition, it has applications in patient transport in special scenarios especially during emergencies where ease of insertion and high success are important. In space missions, where intubating a patient is impossible due to floating body and microgravity environment, the LMA allows effective airway management without body restraints. (28). In the

Intensive Care Unit, LMA is used to provide short-term ventilation or airway rescue while performing tracheostomy or cricothyrotomy. It helps monitor the respiratory and cardiovascular systems and measure end-tidal CO2 and pharyngeal pulse oximetry. The LMA is used as an airway device in CPR (cardiopulmonary resuscitation) of adults and children in whom intubation may not be feasible. Economically, the LMA is cost-effective due to its ability to improve case turnover, reduce the need for anesthetic agents, and lower the risk of complications in difficult airway situations, becoming more cost-effective than tracheal tubes when used extensively (29)(30).

1.7importance of timely Airway Securing In Emergencies

Ensuring a secure and well-monitored airway is one of the most critical priorities in managing emergency patients. Failure to do so can lead to a rapid deterioration in the patient's condition, significantly increasing both morbidity and mortality in just a matter of seconds. In fact, the time window for successfully securing the airway in such situations without allowing for intermediate ventilation or oxygenation is extremely limited, often restricted to just 30 to 40 seconds. In high-pressure emergency settings, having both a deep understanding of airway management and immediate access to alternative techniques is absolutely vital(31)(32). Given the wide array of tools and methods now available, it's essential to implement a structured, well-thought-out approach that follows a clear algorithm. Such an algorithm serves multiple purposes such as streamlining the setup of necessary equipment, enhancing staff training, and most importantly, supports quick and effective decision-making when every second counts(33)(21). Notably, many anesthesia-related deaths have been linked to hypoxemia resulting from difficulties in securing the airway an issue particularly prominent during obstetric emergencies such as the induction of anesthesia for cesarean deliveries. Among the most common critical respiratory events are failed intubation, unrecognized esophageal intubation, and the inability to ventilate. These complications highlight the necessity for every anesthesiologist, especially those working in labor and delivery units, to be thoroughly familiar with and confident in the use of the failed intubation management algorithm(34).

Crucially, the emergency airway management algorithm must be tailored to match the specific

resources, protocols, and expertise available within each institution. Customizing this sequence of procedures ensures that teams are not only prepared but also capable of delivering the highest standard of care under the most demanding circumstances. (35).



Figure 3: ***Emergency Intubation***

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1.8 Comparative Clinical Outcomes of LMA and ETT

When comparing the efficiency of insertion, a randomized clinical trial involving patients undergoing elective orthopedic surgery demonstrated that the LMA group had significantly lower peak airway pressures and higher dynamic lung compliance compared to the ETT group. This indicates that LMA may offer better respiratory mechanics during surgery(9).Postoperative complications also differ between the two devices. A study assessing pharyngolaryngeal morbidity found that patients intubated with ETT experienced higher rates of hoarseness and pain during speech compared to those managed with LMA. These symptoms persisted up to 36 hours postoperatively, highlighting the potential for increased patient discomfort with ETT .In pediatric populations, the choice between LMA and ETT is particularly important due to anatomical and physiological considerations(36). A systematic review concluded that LMA use in pediatric anesthesia resulted in fewer hemodynamic changes and postoperative respiratory complications, such as laryngospasm and sore throat, compared to ETT(10).

1.9 Hemodynamic Considerations in Airway Device Use

Hemodynamic instability has become a significant and often dangerous challenge for critically ill patients undergoing intubation, particularly in emergency departments (ED) or intensive care units (ICU). The INTUBE study, conducted across 29 countries, revealed that nearly half of critically ill patients developed hemodynamic instability following intubation, even though fewer than 10% of these patients were intubated specifically due to hemodynamic concerns. This phenomenon is particularly concerning as peri-intubation hypotension has been identified as an independent predictor of mortality, with one in three patients experiencing cardiovascular collapse and one in 30 suffering a cardiac arrest(16). These figures highlight the critical need for careful peri-intubation management of hemodynamics, as cardiovascular collapse remains a significant risk throughout multiple intubation attempts, unlike other complications that increase with successive tries. Ensuring adequate oxygenation during the apnea period is essential, but equally important is the pre-intubation management of hemodynamics to support a smooth transition to life support(11). Unfortunately, the management of hemodynamic disturbances during intubation is complex, with limited standardized guidelines and a lack of universally accepted definitions of vital sign thresholds or the exact time frame for the peri-intubation period. Despite these gaps, observational data suggest that certain factors, such as pre-intubation shock index (a ratio of heart rate to systolic blood pressure), older age, hypotension, shock, and a higher severity of illness (e.g., APACHE score), increase the likelihood of post-intubation cardiovascular collapse. Hemodynamic instability is multifactorial and varies between patients, as the underlying causes of hypotension differ. For example, patients with severe viral pneumonia (e.g., COVID-19, influenza) face challenges due to impaired gas exchange and increased pulmonary vascular resistance, which further strain the right ventricle during intubation. Similarly, patients with massive pulmonary embolism or pulmonary arterial hypertension may experience similar challenges during intubation(37). Each patient's unique physiology must be considered to avoid harm. For instance, septic patients may experience a wide range of responses, from vasodilation with high cardiac output to high systemic vascular resistance with myocardial depression, while patients with heart failure may suffer from pulmonary edema due to either high left ventricular filling pressures (in preserved ejection fraction) or poor contractility (in reduced ejection fraction). These variations mean that treatment must be individualized to address the specific hemodynamic weakness of each patient. The clinical picture becomes complicated due to many factors like vasoplegia, induction agents, and

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Chapter 2

LITERATURE REVIEW

Malekshoar *e.t al.,* (2024) conducted a randomized double-blinded clinical trial to evaluate airway management during general anesthesia, an important component to maintain the airway for optimal respiratory function of a patient undergoing any surgery. This study aimed to compare the commonly used methods of establishing an airway endotracheal intubation and laryngeal mask airway with respect to their effect on respiratory parameters and intraoperative events. The results indicated that, in comparison to the other groups, the values of peak airway pressure (P peak) and plateau pressure (P plateau) significantly increased in the endotracheal tube (ETT) group at all analyzed time points. On the contrary dynamic lung compliance was significantly greater in LMA group there was only significant upward trend noticed in this group. Nevertheless, arterial oxygen saturation and end-tidal carbon dioxide levels did not differ between the two groups, suggesting that both methods maintain adequate oxygenation and ventilation. Results indicate that LMA may offer benefits over ETT, dynamic lung compliance and lower airway pressures with stable oxygenation levels suggesting it may be an effective alternative for airway management in general anesthesia for orthopedic surgeries (4).

Benger *et. al.,* (2018) investigated the best approach to airway management during out-of-hospital cardiac arrest, an important clinical question with no consensus on optimal practice, he conducted a multicenter, cluster randomized clinical trial. The participants of the study were paramedics from four ambulance services serving a population of about 21 million. The study included adults aged over 18 years with non-traumatic out-of-hospital cardiac arrest. Paramedics were randomly assigned to use tracheal intubation (TI) or supraglottic airway device (SGA) as the initial advanced airway management. The trial results showed that 6.4% of the SGA group and 6.8% of the TI group achieved a good functional outcome, defined as a modified Rankin Scale score of 0 to 3 at hospital discharge or 30 days after the arrest, with no significant difference between the groups. SGA group had greater success with initial ventilation compared with TI group. Rates of regurgitation and aspiration were similar between the two groups. A supraglottic airway device is an advanced airway intervention that is known to achieve higher success for ventilation compared to tracheal intubation (5).

Mao *et. al.,* (2018) assessed and compared the feasibility, and safety of laryngeal mask airway (LMA) and endotracheal intubation (ETT) for general anesthesia in adult patients undergoing thoracoscopic surgery for pectus excavatum (PE) between September 2016 and March 2017. A total of sixty adult patients who were scheduled for the surgery using NUSS procedure (VATS-NUSS) were randomized into two groups LMA or ETT. "Physiological parameters collected before, during and after surgery were analyzed using SPSS software". The two groups were similar in terms of baseline clinical characteristics, and there were no differences in anesthesia time, surgical time, peak $PetCO_2$ during operation, anesthetic satisfaction, blood loss and inpatient recovery time. Patients in the LMA group had greater stability in relevant inflammatory and hemodynamic markers WBC, NEU%, ΔHR, and ΔMAP compared to the ETT group. 7. The LMA group also had faster recovery of consciousness and earlier resumption of food and water intake. Crucially, patients managed with LMA experienced significantly lower incidences of postoperative side effect – gastrointestinal, throat pain, and hoarseness. They stated that using LMA during general anaesthesia may be superior to ETT in terms of airway management in patients undergoing the VATS-NUSS procedure (6).

In a recent prospective cohort study, the use of laryngeal mask airway (LMA) and endotracheal tube (ETT) during percutaneous dilatational tracheostomy (PDT), guided by ultrasonography (US) or bronchoscopy, was compared and executed by the Critical Care Department, KasrAlainy Hospital and Damanhur Medical National Institute, March 2020 to November 2021. The study enrolled 120 critically ill patients requiring prolonged mechanical ventilation and was randomized into LMA and ETT groups. Both groups are further subdivided into LMA-US, LMA-Bronch, ETT-US, and ETT-Bronch groups based on guidance methods. Analysis was done about hemodynamic parameters, arterial blood gases, procedure duration and complications. The heart rate remained comparable across all groups and timepoints, while the mean arterial pressure (MAP) was significantly higher during and after the procedure in the ETT group. No significant differences were found in oxygen saturation or PaO_2 levels across groups. However, during the procedure, $PaCO_2$ was notably higher in the ETT and ETT-Bronch subgroups. Although the number of punctures did not vary significantly, procedure duration was shortest in the LMA group, particularly in the LMA-Bronch subgroup, and longest in the ETT-Bronch

subgroup. Complication rates were similar across groups, except for aerophagia, which was more frequently observed in the LMA group. These findings suggest that LMA, when used with US or bronchoscopy guidance, may offer a shorter procedural time for PDT with comparable safety outcomes to ETT, though with a slightly higher risk of aerophagia(7).

Zhou *et. al.,* (2022) carried out a study on the subject of airway interventional therapy using a multifunctional laryngeal mask. He focused on evaluating the safety and efficacy of multifunctional intubation laryngeal masks used in conjunction with normal frequency jet ventilation in airway interventional therapy. In airway interventional therapy, he focused on assessing the effectiveness and safety of multifunctional intubation laryngeal masks in conjunction with normal frequency jet ventilation. The medical team at our institution split 200 patients undergoing airway interventional therapy into two groups (group M and group P) in order to evaluate the differing effects of various laryngeal masks. Group P used multifunctional intubation masks and a jet ventilator for conventional frequency jet ventilation, while Group M used standard laryngeal masks and an anesthesia machine for positive pressure ventilation. The two groups were systematically compared in terms of positive pressure ventilation As a result, there was no statistically significant difference in operation duration, patient satisfaction indices, or recovery metrics between the two groups ($P>.05$). Nonetheless, a statistically significant difference ($P<.05$) was seen between the physicians' satisfaction indices in cohorts P and M (8).

Cecelia *et. al.,* (2021) carried out a review of the existing literature and a case-control matching analysis on the subject of laryngeal mask versus endotracheal tube for airway management in tracheal surgery. They performed a study, and 184 patients with idiopathic stenosis, post-intubation, and post-tracheostomy diagnoses who had tracheal or laryngotracheal resections and cervicotomy reconstructions were included retrospectively in this single-center study. A laryngeal mask airway (LMA) was used to aid airway management in 29 of these patients during the tracheal surgical operation, whereas endotracheal tube (ETT) insertion was used in 155 of these patients. In order to create a cohort of 22 patients managed with LMA (LMA group) and 22 patients managed with ETT (ETT group), a case-control matching analysis was performed at a 1:1 ratio, accounting for variables such as age, gender, body mass index, etiology, and the length of stenosis (ranging from 1 to 4 cm). The 30-day mortality rate, surgical length of stay, and reintubation rate did not differ significantly. The ETT group's operating time was 96.23 ± 34.72

min, while the LMA groups was 76.14 ± 26.94 min; P = 0.043. Patients with LMA had shorter operating times (9).

Varunjikar *et.al.,* (2024) conducted a study on subject of Endotracheal Tube vs. Laryngeal Mask Airway Comparison in Short Duration Surgery: A Randomized Controlled Study, two hundred individuals receiving short-duration, elective operations classified as ASA I or II were part of the randomized controlled experiment. Patients were assigned at random to receive ETT or LMA. In terms of insertion success rates, time for successful placement, intraoperative problems, and postoperative outcomes, such as recovery durations and patient satisfaction, we evaluated the safety and effectiveness of both devices. With an LMA of 97% and an ETT of 95%, both devices had great success rates; however, this difference was not statistically significant (P=0.45) (20).

Chapter 3

METHODOLOGY

3.1. Research Design:

This study was conducted using a cross-sectional study design.

3.2. Clinical Settings:

The research was conducted at Maqsood Medical Complex Hospital, Peshawar.

3.3. Sample Size:

To find the sample size by Cochran's formula, the formula is:

$$n0 = \frac{z^2 . p . (1-p)}{e^2}$$

Where:

n = required sample size

e: desired level of precision, the margin of error.

z: the z-value, taken from a z-table

p: the proportion of the population.

Calculation Assumptions

- Prevalence (p): prevalence of adults, ranges between 10% and 12 %, (23).
- Confidence level: 95% (Z = 1.96)
- Margin of error (d): 0.05

The sample size will be consisting of 150 participants.

3.4. Sampling Technique:

A convenient sampling method was employed.

3.5. Duration of Study:

The study was conducted for a period of six months after the synopsis approval.

3.6. Selection Criteria:

3.6.1 Inclusion Criteria:

- Adults who required airway management in respiratory emergencies (≥18 years old)
- Situations appropriate for ETT or LMA
- Patients with ASA physical status IIEto IVE

3.6.2 Exclusion Criteria

- Obstruction of the upper airway that precluded the use of LMA
- Cases where ETT was required or rapid sequence intubation was indicated
- Device placement complicated by craniofacial abnormalities
- A history of severe allergies to parts of the device
- Positioning of the airway device prior to data collection
- Moribund patients anticipated to pass away within a day

3.7 Ethical Consideration:

A) Informed Consent:

Participants were clearly informed about the study's objectives, benefits and their right to withdraw from the study at any point. The informed consent document was clear and explained participants' questions clearly.

B) Confidentiality and Privacy:

Data was anonymized and securely stored to guarantee participant confidentiality.

C) Ethical Approval:

The Institutional Review Board (IRB) of Superior University provided ethical approval before starting the study. The Institutional Review Board (IRB) reviewed the research proposal to ensure that it was ethical and did not violate the rights of the participants.

3.8 Data Collection Procedure:

The research proposal was approved before the data was collected for the study over four months' period. A questionnaire was drafted for this purpose based on the literature and consultation with the expert in the area. The questionnaire contained sections regarding patient demographics, clinical features of the respiratory emergency, type of airway device used,

professional role of operator, number of attempts made to insert the airway, any difficulties encountered during insertion and type, success of ventilation and oxygenation after insertion, any complications encountered, and satisfaction of the provider with respect to the airway management process.

Patients requiring airway management during respiratory emergencies and fulfilling the inclusion criteria were identified in the emergency department or critical care areas of Maqsood Medical Complex Hospital, Peshawar. Before participation, written informed consent was obtained from either the patient (if conscious and stable) or a legally authorized representative. The research team ensured that consent was obtained in accordance with ethical standards and those participants or their representatives were informed of their rights, including the right to withdraw at any time without affecting their medical care.The data collection was performed by trained research assistants, who recorded information immediately after the airway management procedure to minimize recall bias. Where necessary, additional details were extracted from patient medical records, including clinical diagnoses and procedural notes, ensuring data accuracy and completeness. To maintain confidentiality, each participant was assigned a unique study identification code, and no personally identifying information was entered into the study database.

3.9 Data Analysis:

Data was analyzed using IBM SPSS Statistics Version 27. Descriptive statistics summarized demographic and clinical variables as frequencies, percentages, means, and standard deviations. The Chi-square test was applied to examine associations between categorical variables. A p-value < 0.05 was considered statistically significant

Chapter 4

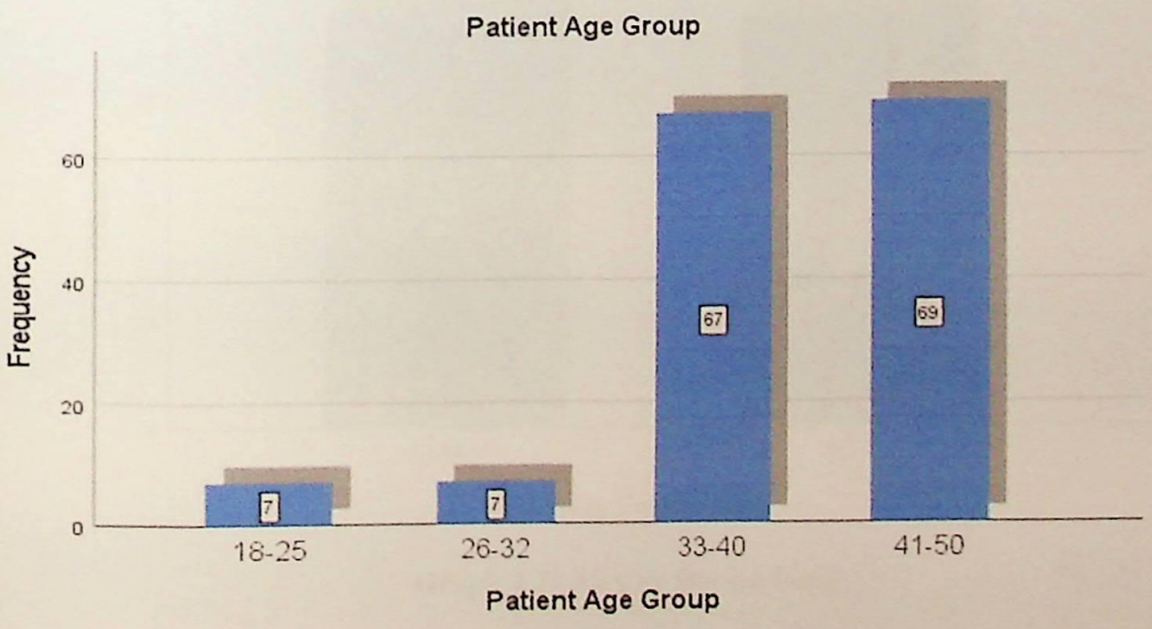
RESULTS

4.1. Age Categories and Its Frequency Distribution:

The majority of participants were around 45 years old. This demographic provide an overview of study population undergoing airway management during respiratory emergencies. The spread of ages indicates it can occur across different age groups.

Table 4.1: Frequency of Age Distribution

Age Categories	Frequency	Percent
18-25	7	4.7
26-32	7	4.7
33-40	67	44.6
41-50	69	46
Total	150	100.0



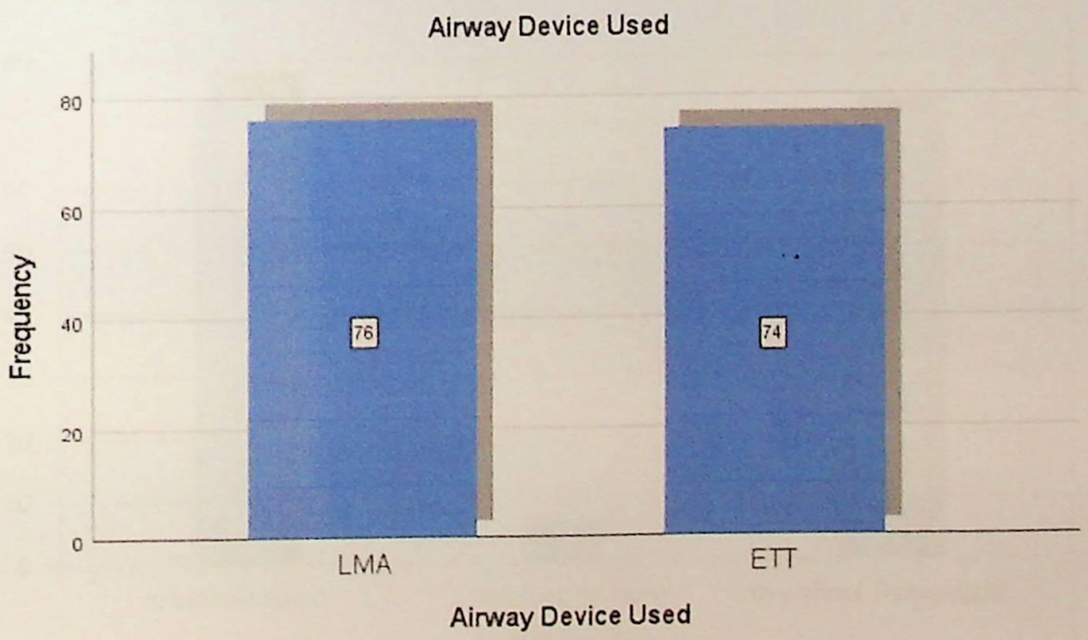
Graph 4.1: Frequency of Age Distribution

4.2. Frequency of Airway Device:

Of the 150 patients analyzed, nearly equal proportions underwent airway management using either a Laryngeal Mask Airway (LMA) or an Endotracheal Tube (ETT). Specifically, the LMA was utilized in 50.60% of cases (n = 76), while the ETT was employed in 49.40% of patients (n = 74). This balanced distribution reflects comparable use of both devices during respiratory emergencies.

Table 4.2: Frequency of Airway Devices

Airway Device	Frequency	Percent
LMA	76	50.60
ETT	74	49.40
Total	150	100.00



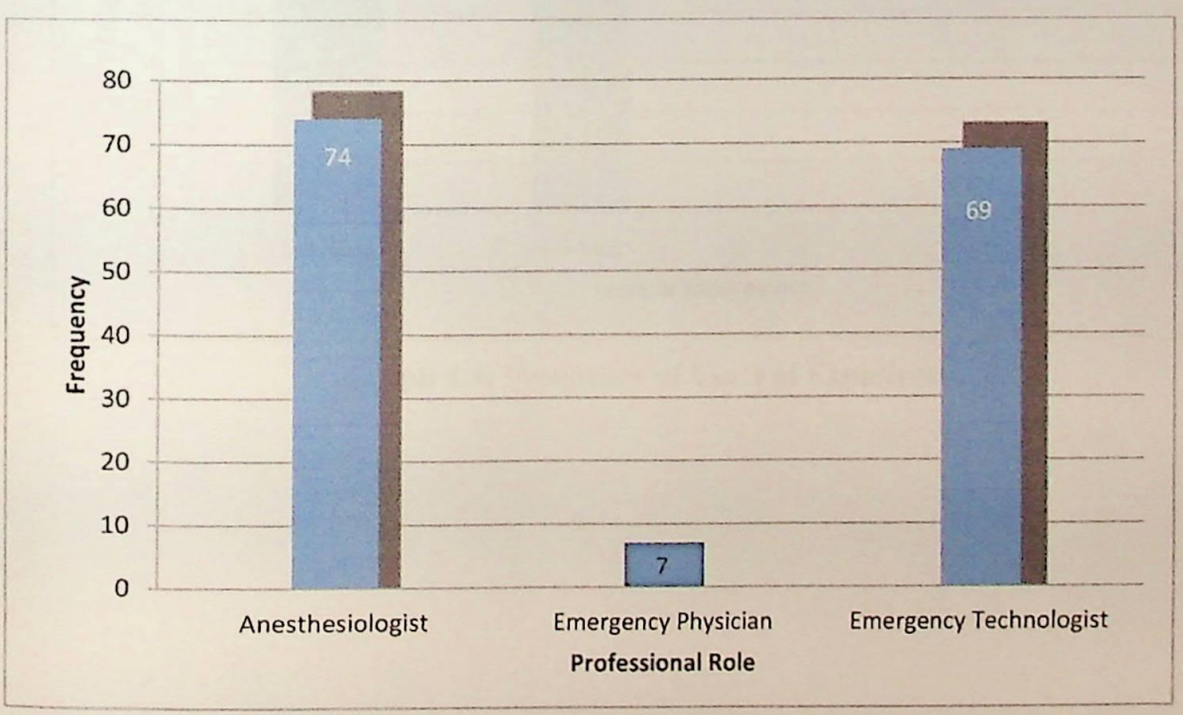
Graph 4.2: Airway Device Used

4.3. Distribution of Professional Roles Involved in Airway Management

Among the professionals performing airway management during respiratory emergencies, anesthesiologists accounted for the largest proportion, comprising 49.3% of cases (n = 74). Emergency technologists were involved in 46.0% of procedures (n = 69), while emergency physicians participated in a smaller proportion, representing 4.7% of cases (n = 7). This distribution underscores the significant roles of both anesthesiologists and emergency technologists in airway management within the study setting.

Table 4.3: Distribution of Professional Roles Involved in Airway Management

Professional Role	Frequency	Percent
Anesthesiologist	74	49.30
Emergency Physician	7	4.70
Emergency Technologist	69	46.00
Total	**150**	**100.00**



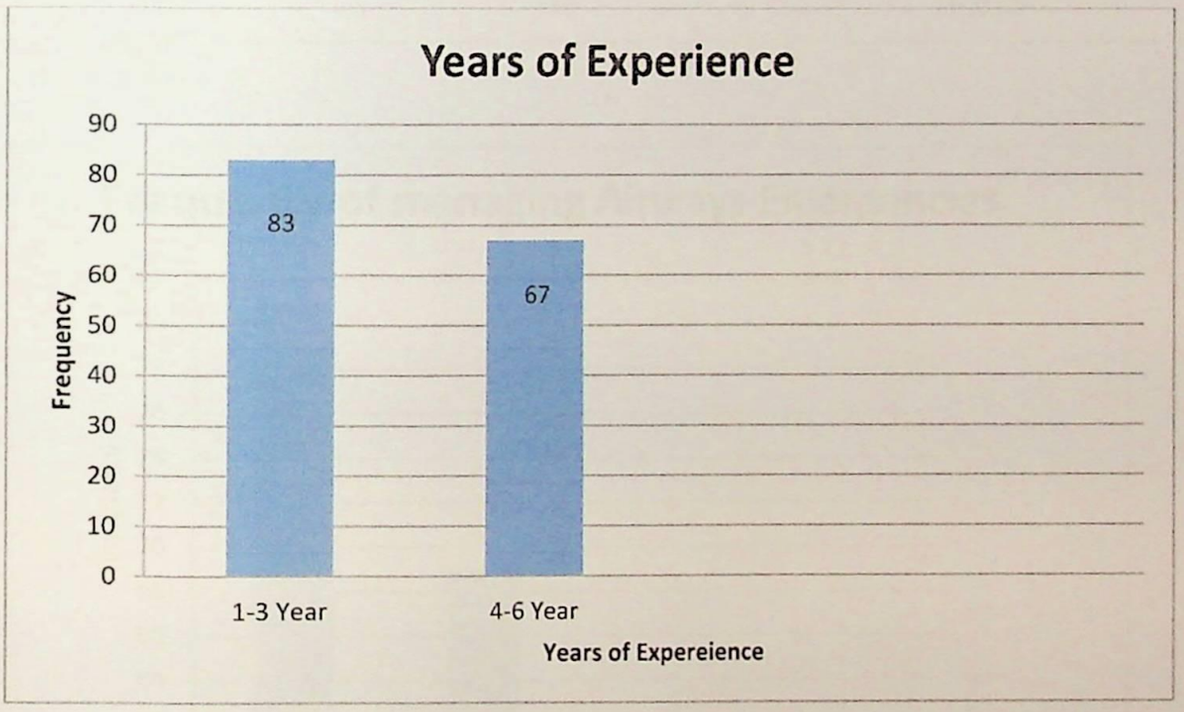
Graph4.3: Distribution of Professional Roles Involved in Airway Management

4.4. Experience in managing Airway Emergencies:

Regarding clinical experience, 55.3% of participants (n = 83) reported having between one and three years of experience in airway management, while 44.7% (n = 67) had four to six years of experience

Table 4.4: Frequency of Years of Experience

Years	Frequency	Percent
1–3 years	83	55.3%
4–6 years	67	44.7%



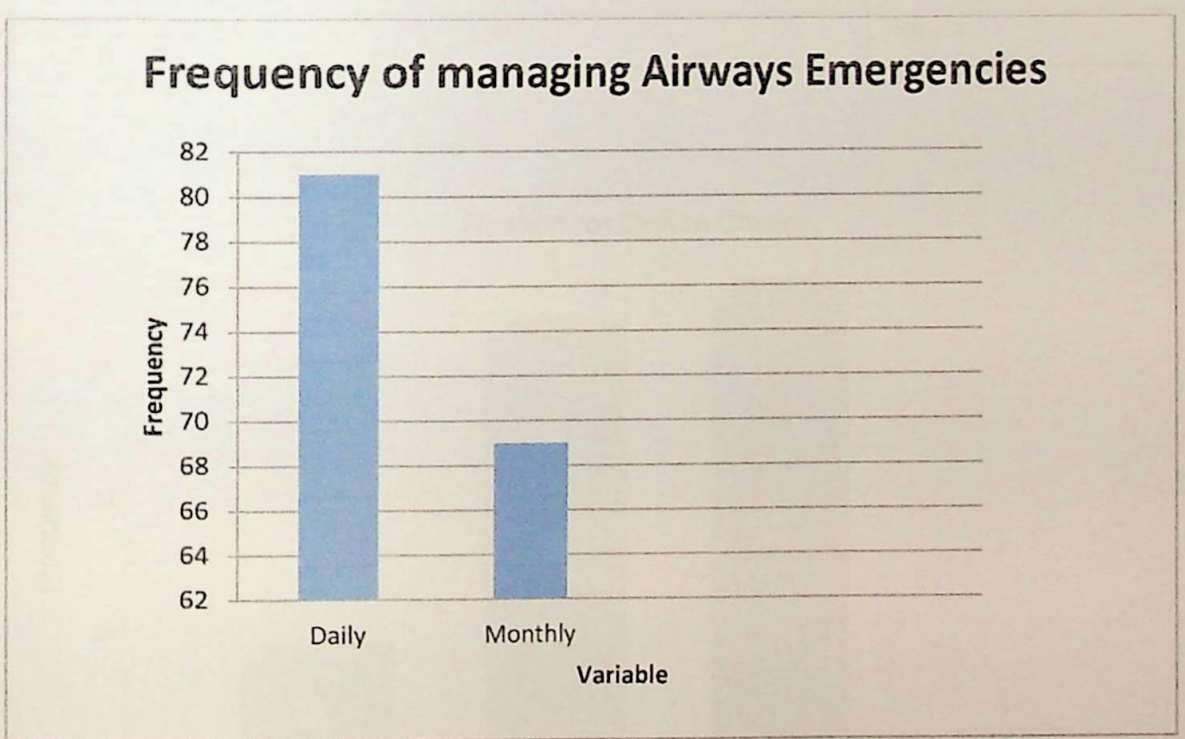
Graph 4.4: Frequency of Years of Experience

4.5. Frequency of managing airways emergencies:

In terms of practice frequency, more than half of the professionals (54.0%, n = 81) indicated managing airway emergencies on a daily basis, whereas 46.0% (n = 69) reported encountering such situations on a monthly basis. These findings highlight that a significant portion of the study cohort possessed moderate experience and were regularly involved in airway management during emergencies.

Table 4.5 Frequency of managing Airway Emergencies

Variable	Frequency	Percent
Daily	81	54.00
Monthly	69	46.00
Total	150	100.00



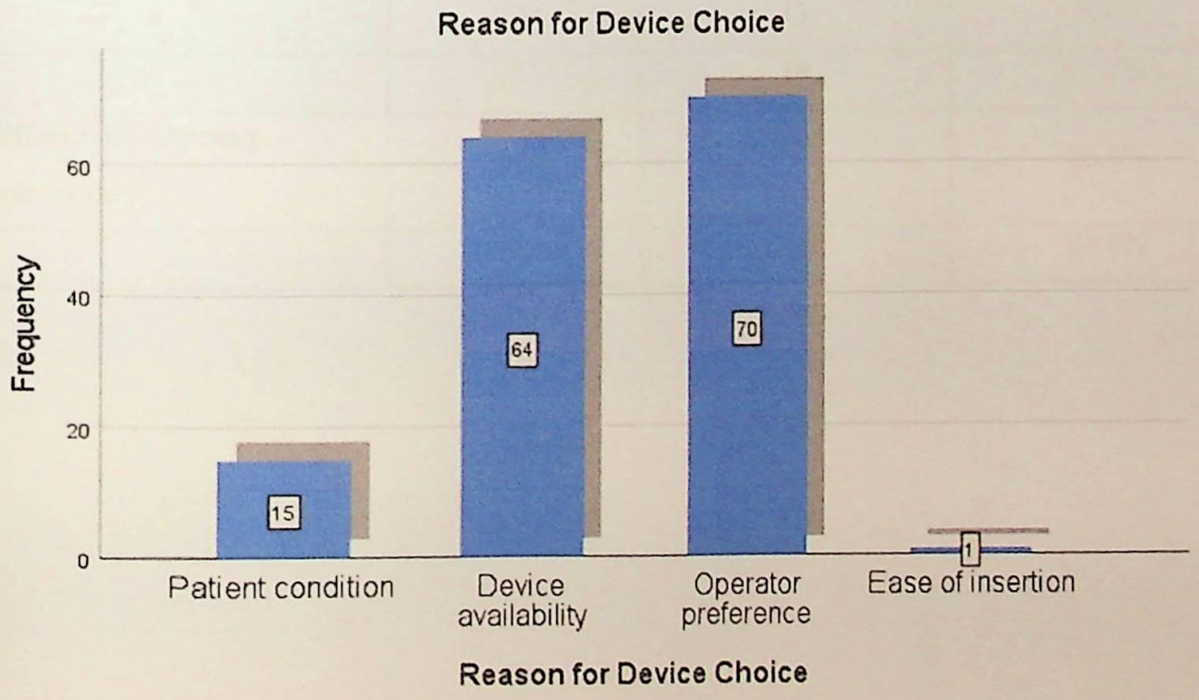
Graph 4.5: Frequency of managing Airway Emergencies

4.6. Selecting Airways Devices:

Regarding the rationale for selecting airway devices during respiratory emergencies, operator preference emerged as the most common factor, cited in 46.7% of cases (n = 70). Device availability was the reason for choice in 42.7% of procedures (n = 64), while patient condition influenced device selection in 10.0% of instances (n = 15). Ease of insertion was reported as the determining factor in only 0.7% of cases (n = 1). These results suggest that individual clinician preference and logistical factors played prominent roles in airway device selection.

Table 4.6: Frequency of Selecting Airways Devices

Selecting Devices	Frequency	Percent
Patient Condition	15	10.00
Device Availabilty	64	42.67
Operator Preference	70	46.67
Ease of insertion	1	0.66
Total	150	100.00



Graph No 4.6: Frequency of Selecting Airways Devices

O f the 150 airway procedures analyzed, successful insertion on the first attempt was achieved in 81.3% of cases (n = 122), while 18.7% (n = 28) required additional attempts. Regarding the total number of attempts, 78.7% of cases (n = 118) were completed in a single attempt, whereas 8.7% (n = 13) required two attempts and 12.7% (n = 19) required three attempts to secure the airway. Difficulties during insertion were reported in 26.0% of cases (n = 39), while the majority of insertions (74.0%, n = 111) were performed without notable challenges. These results indicate a high overall success rate for first-attempt insertions, although a significant minority experienced technical difficulties requiring multiple attempts.(Table 4.4)

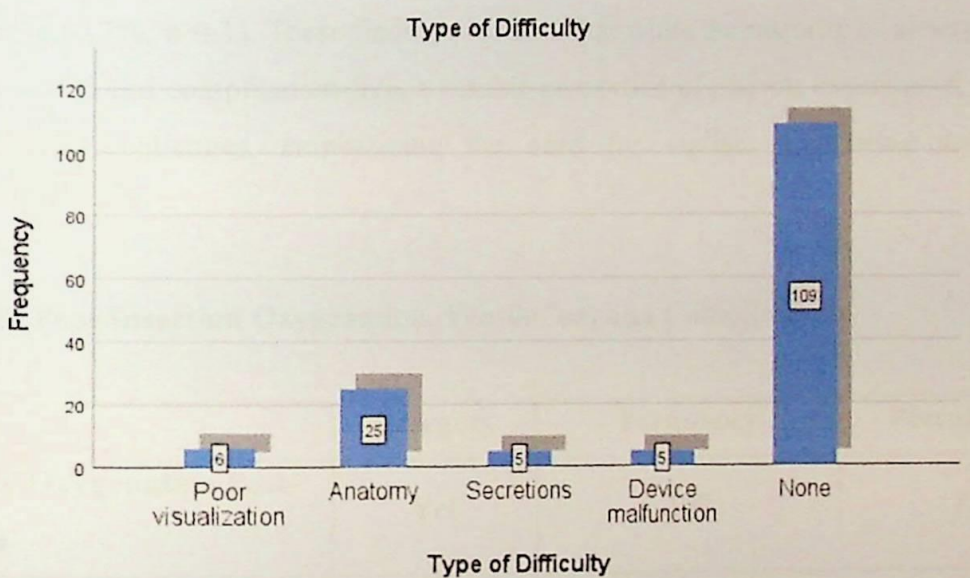
Table 4.7: Airway Insertion Success, Number of Attempts, and Difficulties During Insertion

Variable	Category	Frequency	Percent
Inserted Successfully on First Attempt	Yes	122	81.3%
	No	28	18.7%
Number of Attempts	1	118	78.7%
	2	13	8.7%
	3	19	12.7%
Difficulties During Insertion	Yes	39	26.0%
	No	111	74.0%

4.7. Challenges during Insertion:

Among the procedures analyzed, the majority of airway device insertions (72.7%, n = 109) were performed without any reported difficulties. However, 27.3% of cases encountered specific challenges during insertion. Anatomical factors were the most commonly cited difficulty, reported in 16.7% of cases (n = 25). Other issues included poor visualization of airway structures (4.0%, n = 6), the presence of excessive secretions (3.3%, n = 5), and device malfunction (3.3%, n = 5).

Figure



Graph No 4.7: Type of Difficulty

4.8. Oxygenation and ventilation Challenges:

Following airway device placement, adequate oxygenation was achieved in 72.7% of cases (n = 109), while 27.3% (n = 41) experienced inadequate oxygenation. Similarly, effective ventilation was confirmed in 72.7% of patients (n = 109), whereas 27.3% (n = 41) had difficulties maintaining ventilation post-insertion. Regarding complications, 68.7% of procedures (n = 103) were completed without adverse events. Among the observed complications, hypoxia was the most frequent, occurring in 16.0% of cases (n = 24), followed by aspiration in 6.7% (n = 10), airway trauma in 4.0% (n = 6), and dislodgement in 4.0% (n = 6). Cardiac arrest was reported in a single case (0.7%, n = 1). These findings indicate that while the majority of airway placements were successful and complication-free, a notable proportion of patients experienced oxygenation or ventilation challenges, emphasizing the need for vigilant monitoring during airway management.

Table 4.8: Post-Insertion Oxygenation, Ventilation, and Complications

Variable	Category	Frequency	Percent (Valid)
Adequate Oxygenation Post-Insertion	Yes	109	72.7%
	No	41	27.3%
Effective Ventilation Post-Insertion	Yes	109	72.7%
	No	41	27.3%
Complications Occurred	Aspiration	10	6.7%
	Hypoxia	24	16.0%
	Airway trauma	6	4.0%
	Dislodgement	6	4.0%
	Cardiac arrest	1	0.7%
	None	103	68.7%

4.9. Airway Device Replacement:

Device replacement was necessary in 26.0% of cases (n = 39), while in the remaining 74.0% (n = 111), the initially selected airway device remained in place throughout the procedure. Among those requiring device replacement, the primary reason cited was failed ventilation, accounting for 44.7% of replacements (n = 17). Other reasons included complications associated with the initial device in 39.5% of cases (n = 15), and dislodgement in 15.8% of cases (n = 6).

Table 4.9: Frequency and Reasons for Airway Device Replacement

Variable	Category	Frequency	Percent (Valid)
Device Replaced	Yes	39	26.0%
	No	111	74.0%
Reason for Replacement	Failed ventilation	17	44.7%
	Dislodgement	6	15.8%
	Complications	15	39.5%

4.10. Outcomes after the Use of Airway Devices:

At discharge, 97.3% of patients (n = 146) were alive, while 2.7% (n = 4) had succumbed despite airway management interventions. Regarding satisfaction, 40.7% of respondents (n = 61) reported being very satisfied with the airway management process, and 30.7% (n = 46) were satisfied. Conversely, 18.0% (n = 27) expressed dissatisfaction, and 10.7% (n = 16) were very dissatisfied. When asked whether they would choose to use the same airway device again, 72.0% of participants (n = 108) indicated willingness to reuse it, whereas 28.0% (n = 42) preferred not to. These results suggest that overall outcomes were favorable, with high survival rates and predominantly positive satisfaction levels, although a notable proportion of respondents expressed reservations about reusing the same airway device.

Table 4.10: Patient Status, Satisfaction, and Willingness to Reuse Airway Device

Variable	Category	Frequency	Percent
Patient Status at Discharge	Alive	146	97.3%
	Deceased	4	2.7%
Overall Satisfaction	Very satisfied	61	40.7%
	Satisfied	46	30.7%
	Dissatisfied	27	18.0%
	Very dissatisfied	16	10.7%
Would Use Device Again	Yes	108	72.0%
	No	42	28.0%
Total Participants		**150**	**100.0%**

4.11. Association between Airway Device and Difficulty encountered:

An association was tested between the type of airway device used and the specific difficulties encountered during insertion, as shown in Table X. The most common problem was related to patient anatomy, especially among those managed with the LMA. Although differences were observed between devices, the Pearson chi-square test did not show a statistically significant association overall, with $\chi^2(4) = 7.925$ and $p = 0.094$. However, there was a possible trend suggesting some link between device type and difficulties, indicated by a significant linear-by-linear association ($p = 0.044$). (Table 4.8)

Table 4.11: Airway Device Used vs. Type of Difficulty Encountered

Type of Difficulty	**LMA**	**ETT**	**Total**
Poor visualization	3	3	6
Anatomy	18	7	25
Secretions	2	3	5
Device malfunction	4	1	5
	49	60	109
Total	76	74	150
Pearson Chi-Square (p-value)	-	-	**p=0.094**

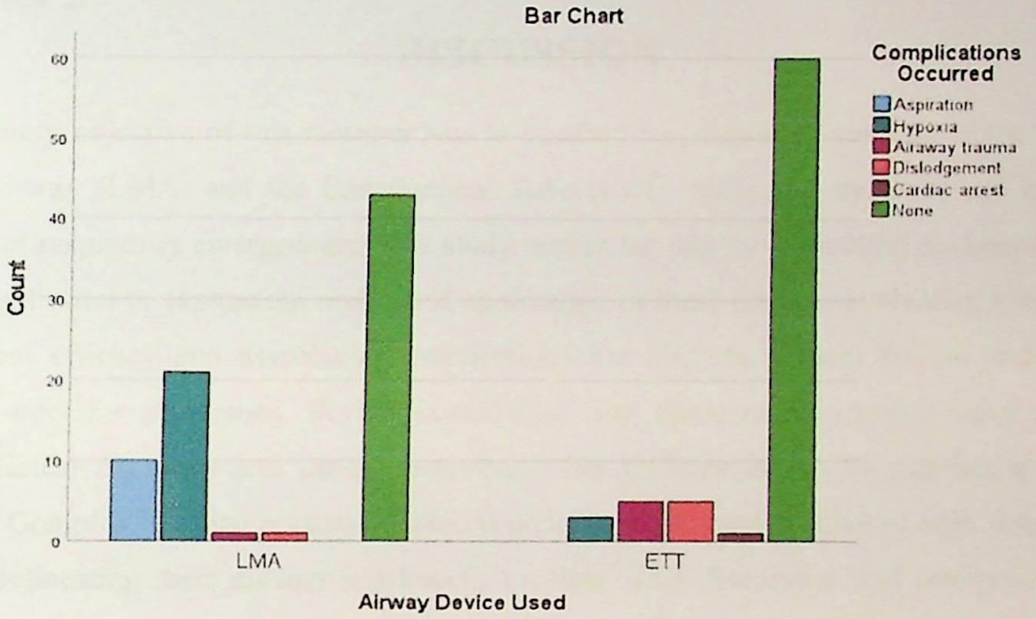
4.12. Association between Type of Device and complication:

Table 4.12 summarizes the relationship between the type of airway device used and the complications that occurred during airway management. Among patients managed with an LMA, hypoxia was the most frequent complication (n = 21), followed by aspiration (n = 10). In contrast, airway trauma and dislodgement were more commonly associated with the ETT, each occurring in five cases. Most patients experienced no complications, with 43 cases in the LMA group and 60 in the ETT group.

Table 4.12: Airway Device Used vs. Complications Occurred

Complication Type	**LMA**	**ETT**	**Total**
Aspiration	10	0	10
Hypoxia	21	3	24
Airway trauma	1	5	6
Dislodgement	1	5	6
Cardiac arrest	0	1	1
None	43	60	103
Total	76	74	150
Pearson Chi-Square (p-value)	-	-	**$p < 0.001$**

The Pearson chi-square test indicated a statistically significant association between the airway device used and the type of complications observed, $\chi^2(5) = 32.618$, $p < 0.001$. These findings suggest that the choice of airway device may influence the likelihood and type of complications encountered during airway management.(Figure 4.4)



Graph No 4.8: Airway Device Used vs. Complications Occurred

Chapter 5

DISCUSSION

The primary objective of this research was to conduct a comparative analysis of the Laryngeal Mask Airway (LMA) and the Endotracheal Tube (ETT) within the dynamic and high-stakes context of respiratory emergencies. This study moves beyond the controlled environment of the operating theater to capture the real-world application of these devices, evaluating not only their procedural efficacy and associated complications but also the critical human and logistical factors—operator preference, device availability, and clinician satisfaction—that ultimately shape clinical decisions and patient outcomes. The findings from 150 patients at Maqsood Medical Complex Hospital present a nuanced picture, affirming the value of both devices while clearly delineating their distinct risk-benefit profiles. This discussion will interpret these key findings, situate them within the broader scientific discourse, and explore their profound implications for clinical practice and future research.

A cornerstone finding of this study is the high first-attempt success rate of 81.3% for airway device insertion. This is a commendable achievement, reflecting significant skill and preparedness among the healthcare providers involved. It aligns favorably with literature from elective settings; for instance, Asai et al. (1994) reported that over 80% of novice users could successfully insert an LMA on their first attempt in controlled surgical patients. However, the context of our study—the respiratory emergency—is fundamentally different. It is characterized by physiological instability, time pressure, and often suboptimal patient positioning. Achieving such a high success rate in this challenging environment underscores a robust level of proficiency and effective teamwork within the clinical setting.

Nevertheless, this success should not obscure the significant challenges encountered. In over a quarter of the procedures (26.0%), clinicians reported difficulties during insertion, with anatomical factors being the predominant issue (16.7% of all cases). This finding resonates strongly with major national audits. The Fourth National Audit Project (NAP4) of the Royal College of Anaesthetists in the UK identified patient anatomy as a leading contributor to major airway complications, highlighting that even experienced providers can be thwarted by

unexpected anatomical challenges (Cook et al., 2011). In an emergency, factors such as obesity, short neck, airway edema, blood, or vomitus can dramatically alter the difficulty of both laryngoscopy for ETT placement and achieving a proper seal with an LMA. This recurrent theme in airway management literature underscores a non-negotiable principle: proficiency must extend beyond routine insertion to include the management of the difficult airway. Our results reinforce the critical need for continuous training in advanced airway techniques, the pre-procedural identification of potential difficulties (when possible), and the mandatory presence of a pre-formulated and practiced backup plan, or "Plan B," for every emergency airway encounter (44).

Perhaps the most illuminating finding of this study is the starkly different complication profiles associated with the LMA and ETT, a relationship that was statistically robust ($\chi^2 = 32.618$, $p < 0.001$). This divergence is not merely a statistical artifact but reflects the fundamental anatomical and physiological differences in how these devices manage the airway.

The LMA was significantly associated with a higher incidence of hypoxia (16.0%) and aspiration (6.7%). This pattern is mechanistically explicable. The LMA is a supraglottic device, meaning it sits above the glottic opening and does not provide a sealed, definitive airway within the trachea. While modern designs like the ProSeal LMA offer improved seals and drainage channels, the fundamental risk remains. In the emergency setting, patients are rarely fasted and may have delayed gastric emptying, creating a high-risk environment for regurgitation and aspiration of gastric contents. The LMA's design does not reliably protect against this eventuality. Furthermore, an inadequate seal between the LMA cuff and the pharyngeal mucosa can lead to significant air leakage, especially if high ventilation pressures are required. This results in inadequate ventilation and subsequent hypoxia, a finding supported by other studies in critical care settings (Elnafad et al., 2024). A meta-analysis by Li et al. (2013) corroborates this, indicating an increased relative risk of aspiration when LMAs are used in contexts where the risk of regurgitation is elevated.

Conversely, the ETT was more frequently linked to airway trauma and device dislodgement (4.0% each). The process of endotracheal intubation is inherently traumatic. Direct laryngoscopy requires the application of force to align the oral, pharyngeal, and laryngeal axes, which can lead to dental damage, soft tissue lacerations, and vocal cord injury. The act of passing a rigid tube

through the sensitive glottic structures can cause further trauma. Moreover, securing an ETT is more complex than securing an LMA. In an agitated patient, during patient transfer, or with excessive movement, the ETT is prone to dislodgement, either partially (leading to ventilation failure or aspiration) or completely. This aligns with the known challenges of ETT management in the ICU and during transport, where dislodgement is a recognized and serious complication (Mosier & Brown, 2024). The ETT, while providing the "gold standard" in airway protection, demands a higher level of ongoing vigilance to maintain its position and prevent iatrogenic injury.

This clear dichotomy forces a paradigm of calculated compromise. The choice is not between a "good" and a "bad" device, but between a device that minimizes insertion trauma and simplifies the procedure (LMA) at the cost of reduced airway protection, and a device that maximizes airway security and protection (ETT) at the cost of a more difficult and traumatic insertion and greater maintenance challenges (45).

A revealing aspect of our study lies in the rationale behind device selection. The decision was predominantly driven by operator preference (46.7%) and device availability (42.7%), with patient condition being the primary factor in only 10.0% of cases. This finding offers a critical insight into the realities of emergency medicine. Clinician comfort and familiarity with a device are undeniably crucial for procedural success; a provider is more likely to succeed with a tool they use confidently. Similarly, the stark reality of resource constraints is evident, where the "best" device may not be the one that is immediately available.

However, this heavy reliance on preference and logistics presents a potential pitfall. As Hohlrieder et al. (2007) argued, optimal patient outcomes are achieved when device selection is guided by a careful assessment of patient-specific risk factors, such as aspiration risk, the presence of a full stomach, the anticipated difficulty of bag-mask ventilation, and the potential for a difficult intubation. When preference overrides patient physiology, the risk of encountering a device-specific complication may increase. For example, using an LMA for a patient with a high aspiration risk due to its ease of insertion could predispose that patient to the very complication the device is ill-equipped to prevent. This highlights a significant opportunity for quality improvement through the implementation and strict adherence to structured, evidence-

based airway algorithms in the emergency department and ICUs. These algorithms can help objectify the decision-making process, ensuring that patient safety remains the paramount concern.

The data on clinician satisfaction further enriches this narrative. The high overall satisfaction (71.4% satisfied or very satisfied) indicates that providers generally felt competent and effective in their airway management. Yet, the fact that over a quarter (28.0%) were unwilling to reuse the same device reveals a more complex, experience-based judgment. This discrepancy likely reflects the lasting impact of complications. A clinician who successfully secured an airway with an LMA but then struggled with persistent hypoxia or witnessed aspiration may develop a strong aversion to its use in future, similar emergencies. Conversely, a provider who caused significant airway trauma with an ETT may become more hesitant to perform intubation. This feedback is a powerful, albeit informal, form of continuous learning and risk assessment, underscoring that lived experience with complications profoundly shapes future clinical behavior.

The operational finding that device replacement was necessary in 26.0% of cases is a critical metric for system performance. This high rate underscores the iterative and often unpredictable nature of emergency airway management. Failed ventilation was the most common reason for replacement (44.7%), which could stem from an inadequately sized LMA, poor positioning, or severe bronchospasm making any form of ventilation difficult. The NAP4 audit similarly found that the failure to transition promptly to a rescue strategy was a common theme in cases with poor outcomes (Cook et al., 2011). Our data reinforces the "first attempt" as not always the "only attempt." Clinical teams must be mentally and materially prepared for this eventuality, with a designated "difficult airway cart" and clear protocols for escalating to alternative devices like video laryngoscopes or ultimately performing a surgical airway.

Despite these procedural challenges, the ultimate patient outcomes were remarkably positive. The achievement of adequate oxygenation and ventilation in 72.7% of cases and a survival-to-discharge rate of 97.3% are the most important endpoints. This demonstrates that despite the high rate of difficulties and complications, the system of care was ultimately resilient. Clinicians were able to navigate challenges, replace devices when needed, and stabilize the majority of patients. This aligns with the assertion by Mort (2004) that both the LMA and ETT are life-saving tools, and when used by skilled clinicians within a supportive framework, they can lead to

excellent outcomes even in dire circumstances (47).

The interpretation of our findings must be tempered by an acknowledgment of the study's limitations. As a single-center study utilizing a convenient sampling method, the generalizability of our results may be limited. The practices, expertise, and resource availability at Maqsood Medical Complex Hospital may not be representative of other settings in Pakistan or internationally. The cross-sectional nature of the study provides a snapshot in time and cannot establish causal relationships or evaluate long-term outcomes beyond hospital discharge. Furthermore, we did not capture granular data on the specific etiologies of respiratory failure (e.g., COPD exacerbation vs. pulmonary edema vs. pneumonia), which could influence both device selection and subsequent complications.

Despite these limitations, the study possesses significant strengths. Its prospective design and consecutive enrollment of emergency cases provide a realistic "real-world" perspective that is often missing from randomized controlled trials conducted in controlled elective settings. The comprehensive data collection, capturing not just clinical outcomes but also operator-related factors and satisfaction, offers a holistic view of the airway management process.

In conclusion, this study paints a detailed picture of emergency airway management, affirming that both the LMA and ETT are vital, effective, yet imperfect tools. The LMA offers speed and less invasiveness but trades off security against aspiration and hypoxia. The ETT offers a definitive, protected airway but demands greater skill to insert and maintain, carrying risks of trauma and dislodgement. The high first-attempt success rate is a testament to clinical skill, but the frequent need for device replacement and the distinct complication profiles highlight the inherent volatility of the emergency airway.

The path forward is clear. First, training must evolve beyond simple device insertion to emphasize the management of difficult scenarios, including the decision-making process for device selection and rescue techniques. Second, institutional protocols must be strengthened to guide device choice based on objective patient risk factors rather than habit or convenience alone. Finally, future research should focus on prospective, multi-center trials that can control for confounding variables and further elucidate which patients are most likely to benefit from one device over the other, ultimately moving the field towards more personalized and safer emergency airway management.

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CONCLUSION

According to the study, LMA and ETT were used with equivalent frequency and are nearly equally effective for respiratory emergency management. While airway insertion was often successful on the first try, some cases had technical or anatomical issues that sometimes necessitated a repeated attempt or replacement of the device. The study showed that there are differences in complications between LMA and ETT. LMA more often was linked with issues of hypoxia and aspiration. On the other hand, the ETT was connected with airway trauma and device dislodgement more often. This highlights the importance of carefully selecting a device depending on the patient and the procedure. Most patients received sufficient oxygen and ventilation, and most clinical outcomes were favorable, indicating that competent staff can manage emergencies involving either apparatus. The choice of device was found to be significantly influenced by operator preference and availability of equipment, indicating that even in difficult situations, the clinical practice was determined by what was available. Despite being highly satisfied with airway management overall, most practitioners would not use the same device again in future emergencies, suggesting continuing concerns about performance and safety. Ongoing training and understanding of device-specific risks, along with defined processes to make decisions around airway management, are important, as substantiated by these results. In summary, the LMA and the ETT are still important tools for emergency airway management. All of these have their own pros and cons, and each mustpatient details, operator experience, and complexity of procedure, be balanced in order to use them effectively.

Based on the study findings, it is recommended to enhance training for healthcare providers in managing anatomical airway challenges, particularly with LMA use. Protocols should be developed to guide device selection according to patient risk factors to reduce complications. Continuous monitoring and documentation of airway management outcomes are essential for quality improvement. Availability of both LMA and ETT devices must be ensured in all emergency settings. Future research should explore patient-specific predictors of airway management success and complications.

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48.

APPENDICES
APPENDIX-1

CONSENTFORM

The study you are about to participate is a randomized control trial survey titled as;

"Comparison of Airway Management Devices Laryngeal Mask Airway Versus Endotracheal Tube During Respiratory Emergencies and Their Outcome"

The study has no potential harm to participants. All data collected from you will be coded in order to protect your identity, and should not be disclosed to anyone. Following the study there will be no way to connect your name with your data. Your answers to the questions will not affect the quality of education given to you. Any additional information about the study results will be provided to you at its conclusion, upon your request.

You are free to withdraw from the study at any time. You agree to participate, indicating that you have read and understood the nature of the study, and that all your inquiries concerning the activities have been answered to your satisfaction.

NAME _____

SIGNATURE_____

DATE_____

APPENDIX-2

URDU CONSENT FORM

میں_____ تصدیق کرتا/ کرتی ہوں کہ**محترم**)عابد عل(نے اپنی اس تحقیق

"سانس کی ایمرجنسیز کے دوران ایئر وے مینجمنٹ ڈیوائسز کا موازنہ :لاریجل ماسک ایئر وے بمقابلہ اینڈوٹراکیئل ٹیوب اور ان کے نتائج

.زیرنگرانی)ق تہمینہ طار(کے متعلق بتا دیا ہے۔ مجھے اس تحقیق کی نوعیت، مقاصد، احداف، توقعات، فوائد اور خطرات کے متعلق ، ساری معلومات فراہم کر دی گئی ہیں

اس تحقیق کے دوران ساری معلومات صیغۃ راز میں رہیں گی اور مریض کا نام اور دیگر معلومات صرف تحقیق کے لیے استعمال ہوں گی۔مجھے یہ بھی بتا دیا گیا ہے کہ میں اس تحقیق سے متعلقہ ہر قسم کے سوال پوچھنے کا مجاز ہوں اور یہ تحقیق صرف ایک شخص ک مفاد میں نہیں ہے بلکہ بحسثیت مجموعی انسانیت کا مفاد اس سے وابسطہ ہے۔ تمام تفصیلات جاننے کے بعد یس تحقیق میں شامل ہونے یا نہ ہونے پر کسی کا قائل نہیں ہوں۔ اس تحقیق سے کسی بھی وقت علیحدہ ہونے پر مجھ پر کوئی پابندی نہیں ہو گی۔ میں بذاتِ خود بقائمی حوش و حواس اور رضا مندی سے اس تحقیقاتی عمل میں شامل ہوتی/ ہوتا ہوں.

دستخط محقق ----------

دستخط شرکت کار ----------

تاریخ ----------

APPENDIX-3

QUESTIONNAIRE

Patient Demographics

1. Age (in years):

☐ 18-30

☐ 31-45

☐ 46-60

☐>60

2. Gender:

☐ Male

☐ Female

☐ Other

3. ASA Physical Status:

☐ I (Healthy)

☐ II (Mild Systemic Disease)

☐ III (Severe Systemic Disease)

4. Underlying Conditions (Select all that apply)

- ☐Hypertension
- ☐ Diabetes
- ☐ COPD
- ☐ Asthma
- ☐ None
- ☐ Other: _____
-

Clinical Presentation & Airway Indication:

1. **Reason for Airway Management:**
   - ☐ Respiratory Failure
   - ☐ Cardiac Arrest
   - ☐ Trauma
   - ☐ Elective Surgery
   - ☐ Other: _____
2. **Glasgow Coma Scale (GCS) Score:**
   - ☐ 3-8 (Severe)
   - ☐ 9-12 (Moderate)
   - ☐ 13-15 (Mild)
3. **Oxygen Saturation (SpO_2) Before Device Placement:**
   - ☐<85%

☐ 85-90%

☐ 91-95%

☐>95%

4. **Heart Rate Before Device Placement (bpm):**

☐<60

☐ 60-100

☐>100

5. **Blood Pressure Before Device Placement (mmHg):**

☐<90/60

☐ 90/60 - 140/90

☐>140/90

Airway Device Used & Procedural Details:

1. **Airway Device Used:**

☐ Laryngeal Mask Airway (LMA)

☐ Endotracheal Tube (ETT)

2. **Size of Device Used:**

☐<3.5

☐ 3.5 - 5.0

☐>5.0

3. **Number of Attempts Required for Successful Placement:**

☐ 1

☐ 2

☐>2

4. **Total Time for Successful Placement:**

☐<30 sec

☐ 30-60 sec

☐>60 sec

5. **Provider Experience Level:**

☐ Junior Doctor

☐ Senior Doctor

☐Anesthetist

☐ Paramedic

6. **Was an Additional Airway Maneuver Used?**

☐ Yes

☐ No

7. **If Yes, Which Maneuver Was Used?**

☐ Head Tilt-Chin Lift

☐ Jaw Thrust

☐ Cricoid Pressure

☐ Other: _____

Hemodynamic & Oxygenation Changes

1. **Oxygen Saturation (SpO_2) Levels:**

Time Interval	<85%	85-90%	91-95%	>95%
1 Min After Placement	☐	☐	☐	☐
5 Min After Placement	☐	☐	☐	☐
10 Min After Placement	☐	☐	☐	☐

2. Heart Rate (bpm):

Time Interval	<60	60-100	>100
1 Min After Placement	☐	☐	☐
5 Min After Placement	☐	☐	☐
10 Min After Placement	☐	☐	☐

Blood Pressure (mmHg):

Time Interval	<90/60	90/60 - 140/90	>140/90
1 Min After Placement	☐	☐	☐
5 Min After Placement	☐	☐	☐
10 Min After Placement	☐	☐	☐

Complications & Outcomes:

1. **Was There Difficulty in Placement?**
   - ☐ Yes
   - ☐ No
2. **Any Complications Observed? (Select all that apply)**
   - ☐ None
   - ☐ Hypoxia
   - ☐ Aspiration
   - ☐ Airway Trauma
   - ☐ Laryngospasm
   - ☐ Other: _____
3. **Did the Patient Require a Device Change?**
   - ☐ Yes
   - ☐ No

4. **Post-Procedure Oxygen Saturation (SpO_2):**
   - ☐<85%
   - ☐ 85-90%
   - ☐ 91-95%
   - ☐>95%
5. **Patient Outcome:**
   - ☐ Stable
   - ☐ Required Additional Airway Support
   - ☐ Deteriorated
   - ☐ Death

Ref.: IRB /FAHS/Allied/04/25/MS/AHS-3732

Date: 18th March 2025

Program: MS Allied Health Sciences

Name: Abid Ali

Registration: SU91-MSAHW-F23-051

Subject: Ethical Approval Letter

The Research Ethical Committee convened on Dated: **17th March, 2025** to discuss your protocol titled "**Comparison Of Airway Management Devices Laryngeal Mask Airway Versus Endotracheal Tube During Respiratory Emergencies and Their Outcome**"

No further corrections and recommendations were suggested. The above-mentioned protocol has been approved after considering various research issues including ethical concerns with condition that the researcher will submit completion report at the end of his/her research.

Prof. Dr. Muhammad Naveed Babur
Dean/Convener REC
Faculty of Allied Health Sciences
Superior University, Lahore

PLAGIARISM CERTIFICATE

For MPhil and PhD

This is certified that the thesis entitled:**Comparison Of Airway Management Devices Laryngeal Mask Airway Versus Endotracheal Tube During Respiratory Emergencies And Their Outcome.**

Student Name:Abid Ali

Reg /Roll No:SU91-MSAHW-F23-051

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