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Effective Airway Management: A Key to Successful Postoperative Care Outcomes

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Abstract:

Effective airway management is a critical determinant of postoperative patient outcomes, yet evidence suggests persistent gaps in nurses' competence in emergency airway assessment and intervention. The aim of this narrative review is to explore the basic principles of postoperative airway management, the recent trends on the technology and the major challenges that confront the nurses in the resource-poor clinical environment with a special reference to Nigeria. Peer-reviewed articles and clinical guidelines were systematically searched in three databases: MEDLINE, CINAHL, and Google Scholar, and included articles from 2015 to 2025. Findings were organised using the technique of thematic synthesis around key domains: airway obstruction and recognition, airway adjuncts and oxygenation devices, equipment and teamwork, emerging technologies and challenges to effective management. The results suggest that time pressure and suboptimal team availability and expertise, care delivery in non-theatre settings, inadequate airway triage, and equipment limitations are the biggest challenges to effective postoperative airway management. The review also focuses on new technologies such as airway triage applications, point-of-care ultrasound, video laryngoscopy, and artificial intelligence and their potential to revolutionize risk stratification and clinical decision-making. These challenges will need significant investment in structured training programmes for nurses focused on core airway skills, cost-effective and long-life airway devices and in institutionalizing the protocols of multidisciplinary teamwork. These are essential measures to prevent postoperative patients from having preventable airway emergencies and the sequelae.

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Introduction

Airway management is considered to be the foundation of treatment for postoperative patients, the critically ill and those who have an acute respiratory emergency (Turner et al., 2020). Airway assessment and airway maintenance (including basic airway manoeuvres and working in collaboration during advanced airway interventions) are essential in the clinical practice of nurses working with postoperative and acutely unwell patients (Nigatu et al., 2022). The locations in which postoperative airway emergencies occur go beyond the controlled environment of the operating theatre to the post-anaesthetic care units, general wards and other in-hospital locations all with their own specific challenges and limitations of resources.

Airway emergencies that occur after surgery are always complicated. They require rapid and high-stakes decision making, the patient is often stressed, there is often some degree of clinical uncertainty, and they often occur in patients with low cardiorespiratory reserve or large amounts of metabolic dysfunction (Burtenshaw et al., 2015). This group of patients is physiologically unstable and in addition to their technical competence, the nurse must also possess sound clinical judgement to decide when and how each intervention is appropriate, and how much human, as well as material, resources are necessary (Burtenshaw et al., 2015). Most importantly, the management of a postoperative airway emergency is a shared responsibility, as the nurses need to work within the scope of their personal skills, and in conjunction with the anaesthetists, surgeons, physicians and other members who make up the multidisciplinary team.

Although it is recognized that airway management skills are valuable, anecdotal and empirical evidence suggests that a substantial number of nurses are not confident and competent in their airway management skills, especially in an environment where formal education is less available (Nigatu et al., 2022; Elhabashy & Moawad, 2024). The structural constraints such as lack of equipment, power supply and lack of advanced training programmes further exacerbate the challenge in low and middle-income countries like Nigeria (Olatunji et al., 2024). These gaps have important implications for patient safety and outcomes of care.

In this context, the present narrative review has four aims: (a) to outline the basic principles of postoperative airway management; (b) to review the current evidence base for the use of airway adjuncts and oxygenation systems, and nursing care; (c) to discuss emerging technological trends that may lead to improved postoperative airway management; and (d) to describe the key issues in the delivery of effective postoperative airway management and make evidence-based recommendations. This review was designed to help synthesize the literature to guide nursing practice, education and policy in Nigeria and similar resource-limited settings.

Method

This narrative review was conducted in accordance with established methodological principles for narrative synthesis in health sciences (Scott et al., 2020). A systematic search of MEDLINE, CINAHL, and Google Scholar was performed using the following search terms in combination: airway management, postoperative airway, airway obstruction, nursing competence, oxygenation, airway adjuncts, airway triage, and emergency airway. The search was restricted to English-language peer-reviewed articles, clinical guidelines, and authoritative manuals published between 2015 and 2025. Reference lists of retrieved articles were hand-searched to identify additional relevant sources. Articles were included if they addressed airway assessment, airway management techniques, nursing roles, equipment,

teamwork, or emerging technologies in the context of postoperative or emergency care. Studies were excluded if they focused exclusively on paediatric or neonatal populations or were not available in full text. Thematic synthesis was applied to organise retrieved evidence into coherent analytical domains corresponding to the review objectives.

Airway Obstruction: Causes and Recognition

In the postoperative patient, the most common cause of respiratory insufficiency is airway obstruction (partial or complete) at any level of the respiratory tract from oropharynx to carina and main bronchi (Day, 2022). Pharangeal obstruction is the most common site of obstruction in unconscious and semiconscious patients (including those recovering from general anaesthesia). Here, it is most commonly the posterior displacement of the tongue secondary to decreased muscle tone in the posterior pharynx that is the main mechanism and the tongue touches the posterior pharyngeal wall, thus obstructing airflow (Day, 2022). Early detection and correction of this type of obstruction is essential, since total obstruction for a few minutes will result in hypoxic brain damage.

In addition to tongue displacement, airway obstruction can be caused by vomiting or blood from regurgitation of gastro-oesophageal contents or trauma, laryngeal oedema due to anaphylaxis or inflammation, laryngospasm from stimulation of the upper airways during the peri-anaesthetic period and subglottic obstruction from excess bronchial secretions, bronchospasm, pulmonary oedema and gastro-oesophageal aspiration (Burtenshaw et al., 2015; Disque, 2023). With patients with tracheostomies, obstruction can be at the tube or stoma requiring special assessment and management.

The clinical recognition of airway obstruction relies on a systematic look–listen–feel assessment: observing the chest and abdomen for the presence and symmetry of respiratory movement, listening for abnormal breath sounds, and feeling for airflow at the mouth and nose (Resuscitation Council UK, 2021). Partial obstruction is characterised by reduced and noisy air entry, with specific sounds reflecting the anatomical level of impairment: inspiratory stridor indicates obstruction at or above the larynx; expiratory wheeze suggests lower airway obstruction; gurgling is associated with semisolid material in the upper airway; snoring reflects partial pharyngeal occlusion by the tongue; and crowing or stridor denotes laryngeal spasm (Lloyd, 2020). Complete obstruction, by contrast, manifests as paradoxical see-saw chest and abdominal movements, recruitment of accessory respiratory muscles, and ultimately silent apnoea, a clinical emergency requiring immediate intervention (Lloyd, 2020; Disque, 2023).

Airway Assessment

A systematic approach to assessment of the airways allows clinician to assess for patency and assess patient's ability to manage their airways in the postoperative period via appropriate cough and gag reflexes (Resuscitation Council UK, 2021). The main components of assessment are visual assessment of the rise and fall of the chest wall and for signs and symptoms of respiratory distress, auscultation of bilateral air entry and adventitious sounds, and tactile assessment of airflow from the nose and mouth.

Objective physiology monitoring offers extra and essential assessment data. Pulse oximetry is a quick, easily-placed, and non-invasive method of measuring the oxygen saturation level in the arteries (SpO_2) in peripheral tissues, usually in the fingertip, by transmitting light of certain wavelengths through them (Wang, 2023). Although useful, there are a variety of factors that the nurse needs to be aware of that can reduce the ability of the machine to detect the signal or give false reassuring readings: bright light directly impinging on the probe, peripheral vasoconstriction (seen in hypovolaemia or hypothermia), cardiac

arrhythmias, carboxyhaemoglobinaemia and nail polish (World Health Organization, 2011). Therefore, careful monitoring of the probe insertion site and reading the probes in the context of the entire clinical picture are important.

Physiological parameters that indicate the need for active airway management in the postoperative patient are as follows: SpO_2 < 90%, partial pressure of arterial oxygen (PaO_2) < 60 mmHg (on 40% inspired oxygen), respiratory rate > 35 breaths per minute, partial pressure of arterial carbon dioxide ($PaCO_2$) > 55 mmHg, and vital capacity < 15 mL/kg (Resuscitation Council UK, 2021). If these levels are reached or are closing in, stoke volume should be immediately increased and senior clinical assistance should be requested immediately.

Basic Airway Management: Positioning and Adjuncts

Patient Positioning

The first and most basic measure of postoperative airway management is appropriate positioning of the patient. A conscious, spontaneously breathing patient who is suspected of having an oral or upper airway obstruction is put in the recovery position to minimise the risk of aspiration and the removal of oral secretions is commenced promptly (Lloyd, 2020). The triple airway manoeuvre (head tilt, chin lift and jaw thrust) is useful for unconscious or apnoeic patients to realign the pharyngeal and laryngeal axes to remove the obstruction and to provide adequate access for mask ventilation and insertion of airway adjuncts. At the same time, high concentration oxygen is provided through a non-rebreathing mask to reduce hypoxia and minimise the risk of irreversible damage to the brain (anoxic brain injury) (Lloyd, 2020).

Oropharyngeal and Nasopharyngeal Airways

Airway adjuncts are mechanical devices used to provide a patent airway until more advanced airway management can be provided (if indicated). A rigid curved plastic tube used to keep the tongue in a forward position, and prevent its contact with the posterior pharyngeal wall, inserted orally. It should only be used if the patient is unconscious and has a reduced or absent gag reflex and pharyngeal reflex as using it in a patient with an intact reflex could lead to vomiting or laryngospasm (Dleoy, 2021). Other problems with the OPA are the trauma to the soft tissues caused by inserting the OPA and the potential for biting into the appliance and damaging the teeth.

The nasopharyngeal airway (NPA) is a soft, flexible rubber or plastic tube that is inserted (after lubricating the tube) into the naris that rests with the distal end just above the epiglottis at the posterior pharynx (Dleoy, 2021). The NPA is much better tolerated than the OPA in patients who are conscious, and is especially useful in drowsy patients that have copious amounts of upper airway secretions and need deep suctioning. It is a great help in the mouth which is difficult to open, as in active seizures. It is contraindicated in patients with facial fractures, head injury, basal skull fracture, nasal haemorrhage is its major complication and it is relatively contraindicated in patients with coagulopathy and nasal sepsis (Dleoy, 2021).

Supraglottic Airway Devices

Supraglottic airway devices (SADs) are a mid-level level of airway maintenance in between basic airway adjuncts and endotracheal intubation when basic airway adjuncts are not effective. The laryngeal mask airway (LMA) is a wide-bore tube with an elliptical inflatable cuff that is meant to seal around the laryngeal inlet. The LMA is reliable, easily inserted with a short learning curve and, when correctly inserted with inflation pressures kept below 20 cm H_2O, has no risks of gastric inflation and regurgitation that are associated

with the use of the bag-valve-mask (Advanced Life Support Manual, 2022). The first generation LMAs offer a low pressure seal, while second generation LMAs, e.g. the ProSeal LMA, offer higher seals and a built-in gastric drainage tube.

A newer SAD is the i-gel which has a non-inflatable cuff that is shaped to the SG anatomy by thermoplastic gel technology. It has a stem that is designed with a built-in bite block and a small oesophageal drain tube. The i-gel is easy to insert and has a favourable airway leak pressure, making it ideal for emergency airway management for clinicians with limited experience of intubation, and it has shown high first pass success in resuscitation scenarios (Advanced Life Support Manual, 2022).

Bag-Valve-Mask Ventilation

Positive-pressure ventilation (PPV) of the apnoeic or poorly ventilating postoperative patient is the main tool available: bag-valve-mask (BVM) ventilation. It consists of a self-inflating resuscitation bag, a one-way valve, a face mask and an oxygen reservoir which can supply nearly 100% inspired oxygen through the use of a high flow oxygen source. BVM effective ventilation is dependent on proper mask size, seal technique, and in resource-limited environments when LMAs may not be readily available, BVM skills are an essential nursing skill (Berman et al., 2008).

Oxygenation: Delivery Systems and Device Selection

Oxygen therapy is a basic procedure in postoperative airway management which is the provision of supplemental oxygen above the ambient air of 21% as a strategy to prevent or correct hypoxaemia and hypoxia (Hardavella et al., 2019). Rational oxygen delivery involves the nurse to choose a suitable device and flow rate with a structured clinical assessment of the patient's level of consciousness, ability to maintain an open airway and spontaneous breathing, respiratory rate, pattern and depth of breathing, measured tidal volume, work of breathing, existing respiratory disease, surgical site and continuous monitoring of SpO_2 (Barbara, 2019).

Oxygen delivery systems can be divided into two groups: low flow and high flow. Low flow devices such as nasal cannulae, simple face masks, partial non-rebreathing, or non-rebreathing mask will flow the oxygen which is supplemented with entrained room air thus the fractional inspired oxygen concentration (FiO_2) will vary depending on the patient's tidal volume and inspiratory effort. High flow systems, on the other hand, provide oxygen at flow rates that are greater than the patient's maximal inspiratory flow and result in a fixed and reliable FiO_2, regardless of patient's breathing pattern (Barbara, 2019; Hardavella et al., 2019). The Venturi mask is the prototype high flow device: colour coded jet adapters with different sized orifices are used to entrain air at fixed ratios to create stable, concentration controlled FiO_2 values and is the device of choice for patients with a hypoxic respiratory drive, such as patients with chronic obstructive pulmonary disease (COPD) (Hardavella et al., 2019). The main oxygen delivery devices, their flow rate ranges, approximate FiO_2 output and important clinical considerations are summarised in table 1.

Table 1 *Summary of Principal Oxygen Delivery Devices, Flow Rates, FiO_2, and Clinical Considerations*

Device	Flow Rate	Approximate FiO_2	Key Considerations
Nasal cannula	2–6 L/min	24%–45%	Low flow; well tolerated
Simple face mask	6–10 L/min	44%–60%	FiO_2 variable with breathing effort
Partial non-rebreathing	6–10 L/min	44%–60%	CO_2 rebreathing risk < 2

mask			L/min
Non-rebreathing mask	10–15 L/min	60%–95%	Requires tight seal; not for long-term use
Venturi mask	Variable (colour-coded)	24%–40% (precise)	Fixed FiO_2; ideal for COPD
Bag-valve-mask	≥ 15 L/min	Up to 100%	Positive pressure; apnoeic patients

Note. FiO_2 = fractional inspired oxygen concentration; COPD = chronic obstructive pulmonary disease. FiO_2 values are approximate and vary with patient respiratory effort for low-flow devices. Adapted from Hardavella et al. (2019) and Maimie (2023).

Two special ways of administering normobaric oxygen therapy should be mentioned. Continuous positive airway pressure (CPAP) is a medium dependency system that delivers supplemental oxygen with a certain level of positive airway pressure to spontaneously breathing patients who need more than supplemental oxygen alone (Maimie, 2023). Non-invasive positive pressure ventilation (NIPPV) or tracheal tube ventilation with mechanical ventilation are in the high dependency category and are used for patients who are unable to manage their own breathing or have poor or absent spontaneous breathing.

The source for the oxygen also has to be taken into account. An oxygen concentrator extracts air from the surrounding atmosphere, passes it through a molecular sieve and filters out the nitrogen, resulting in a high concentration of oxygen, without having to be refilled from a cylinder; it may operate for about 1,500 hours continuously. Alternatives are the compressed gas cylinders and liquid oxygen systems where the boiling point is -138°C and large volumes of oxygen can be stored in compact containers (about 860 litres of gas is produced from every litre of liquid oxygen) and have a high level of purity (99.5% or higher) and are particularly useful where the need for high volume oxygen is anticipated (Hardavella et al., 2019; Maimie, 2023).

Airway Suctioning

Suctioning is an essential part of airway maintenance in postoperative patients which is the process by which secretions are aspirated from the airway with the use of a sterile suctioning catheter, a suctioning apparatus or a wall suction outlet (Kozier & Erb, 2008). The clinical indication for suctioning depends on the assessment of the patient for symptoms of secretion accumulation such as dyspnoea, bubbling/rattling breath sounds, cyanosis and reduction in oxygen saturation. Suctioning should NOT be done as a routine, but is indicated only if the patient is clinically assessed as not being able to effectively cough up secretions on their own.

Suctioning can be done either via natural airways or via artificial airways such as oropharyngeal airway, nasopharyngeal airways and endotracheal tubes (Lamichhane et al., 2020). Indications for using endotracheal suctioning (insertion of a suction catheter through the endotracheal tube into the trachea) in mechanically ventilated patients include to maintain patency of the air passages, to support mechanical ventilation, to facilitate removing the secretions from the lower respiratory tract, to reduce the risk of aspiration in patients who cannot secure their airway due to neurological impairment or reduced consciousness, and to deliver high concentration oxygen directly into the lower respiratory tract (Afenigus et al., 2021). It is very important that the strict aseptic technique is maintained throughout to reduce the risk of contamination of lower airway with pathogens.

Teamwork and Communication in Postoperative Airway Management

Good team dynamics is one factor that determines a good outcome of resuscitation in postoperative airway emergencies. Each team member should have clarity, not only regarding their own technical role, but also in terms of communication and collaboration within the team, under stressful conditions (Disque, 2020). Three fundamental building blocks of cohesive teamwork in emergency airway management are roles and responsibilities, communication, and post-event debriefing.

It is important that roles are clear to improve team efficiency. In any airway emergency the tasks should be delegated based on each team member's verified skill and scope of practice. Every clinician should be aware of his/her own limitations, especially when it comes to advanced airway care (endotracheal intubation), and should be sure to call for senior help early in the course of clinical deterioration (American Heart Association, 2020). Constructive intervention: The ability of team members to give feedback on a teammate's incorrect or unsafe actions while administering a drug or performing an airway procedure is another valued team behaviour (American Heart Association, 2020).

The medium for coordination of team performance is communication. Verbal summarising allows the creation of a running clinical record, helps to reflect on the patient's trajectory and team's progress in the management algorithm and allows for adaptive responses to changing clinical status (Disque, 2020). To minimise the risk of miscommunication and error in treatment, closed loop communication, where the sender gives a message, the receiver restates it word for word and the sender confirms that this has been repeated correctly, is the recommended method when dealing with airway emergencies. Each team member should be called by name, eye contact should be made when giving instructions and verbal confirmation should be obtained before delegating additional tasks to the team member. All team members should use language that is clear, concise and measured and delivered at the appropriate level of volume and tone that has a calm authoritative tone while maintaining mutual respect and professional composure throughout (Disque, 2020).

Clinical Guidelines and Algorithms

Clinical guidelines and emergency algorithms are used to provide a structure for making decisions around postoperative airway management. Guidelines are in place to handle various high acuity scenarios such as cardiac arrest, adult/paediatric choking, difficult intubation, advanced cardiac life support and trauma life support. As has been noted by Spruijt and Huitink (2024), there is no algorithm for postoperative emergency airway management specifically created, and the evidence-based. This lack of guideline leaves no option for clinicians but to modify the existing protocols, which were mainly developed for either resuscitation or surgery to the specific physiology and logistics of the postoperative setting, with a consequent variation in practice and decision-making.

This represents a huge patient safety issue. An algorithm for airway management with airway risk stratification, escalation pathways and context-sensitive decision nodes should be considered a priority for professional bodies and airway management societies to be developed and potentially validated. Such an algorithm would give the nurses and medical staff a common approach to dealing with postoperative airway emergencies in a systematic, reproducible and defensible way.

Emerging Technological Trends in Airway Management

Airway Triage Applications

The Airway Triage App Method (ATAM) is an important new development in the pre-procedural airway assessment process. ATAM is a mobile application-based tool developed by the non-profit Airway Management Academy that allows for structured, objective decision

support using PHASE and HELPET checklists, and allows clinicians to identify factors of airway complexity within 60-90 seconds (Huitink, 2024). Taking account a wide spectrum of factors, including patient history, vital parameters, human factors (team availability and clinician experience) and contextual factors (time constraint), the application then uses embedded algorithms to provide a risk stratification, which is used to help select the device and personnel. ATAM has shown an ability to standardise the pre-procedure assessment and to make it readily available to the airway management team (Huitink, 2024) by being mobile and accessible at the point of care, which could help to reduce complexity factors as well as procedural complications, improve interprofessional communication and enhance the situational awareness of the airway management team.

Video Laryngoscopy

The Video Laryngoscopy is one of the most significant developments in the field of airway instrumentation in the last 20 years. Video laryngoscopes offer a magnified video image of the laryngeal inlet, displayed on a screen in real time, and are significantly better for viewing the glottis, both in patients with predicted and unanticipated difficult airways, and have been correlated with greater first-pass intubation success than direct laryngoscopy in similar patient populations (Myatra et al., 2023). Video laryngoscopy also has an educational value as it allows all learners and supervisors to have a simultaneous view of the airway, which helps to enhance procedural teaching and feedback.

Point-of-Care Ultrasound

Point-of-Care Ultrasound (POCUS) is a novel bedside tool that is increasingly being used in the evaluation and management of airways. Pre-procedurally, POCUS can be used to assess gastric contents (including evaluating the risk of pulmonary aspiration) and to characterise anatomical features that may predict airway difficulty including the position of the larynx in the anterior/posterior plane and its mobility (Courteney et al., 2022). In the operating room and emergency situations POCUS can help quickly confirm endotracheal tube (ET) tube placement and detect the presence of pneumothorax, haemothorax or other complications that can occur after intubation. POCUS use in nursing and non-anaesthetist clinical practice is becoming increasingly promoted to enhance the bedside diagnostic repertoire and make emergency airway management (EAM) safer (Courteney et al., 2022).

Artificial Intelligence

Artificial intelligence (AI) is becoming an important supportive tool to clinical airway management. AI systems using deep learning algorithms on facial imaging with structured clinical information have been shown to predict difficult airways anatomy with greater accuracy and speed than current clinical scoring systems (Mingzhu et al., 2025). AI's data handling capabilities of processing vast amounts of multidimensional data and identifying subtle patient variations can help inform device selection and staffing decisions before airway complications arise. In addition to prediction, AI-powered virtual reality and simulation tools are increasingly being used to provide personalised and adaptive training for clinicians, leading to enhanced competency in complex airway situations (Duffy et al., 2023). The use of these technologies in the regular clinical and educational practice in resource-poor environments will be an important consideration in the future as these technologies get established and more affordable.

Combining Techniques and Invasive Airway Access

Recent advances in airway management have seen more and more a multi-modal approach to combine the advantages of various modalities, while reducing the risk associated with each modality (Myatra et al., 2023). For instance, video laryngoscopy can be used in

conjunction with supraglottic airway devices or fibreoptic scope as an aid to navigate tricky airways. Surgical and needle cricothyrotomy provide definitive emergency invasive airway access in situations where non-invasive and supraglottic techniques fail, or are contraindicated. Nowadays, the skills of these procedures are being incorporated into international difficult airway management guidelines and knowledge of their indications and performance – even outside of anaesthetist practice – is being increasingly acknowledged as a patient safety issue (Myatra et al., 2023).

Training, Individual Competence, and Professional Development

Personal motivation towards lifelong learning and skills development is an important factor for competency of airway management at the bedside. Despite the basic importance of pulse oximetry in airway monitoring, there have been identified gaps in knowledge and capacities of healthcare professionals in both LMICs and LMICs, as identified by Peterson et al. (2023) through a scoping review of pulse oximetry training. Such gaps are indicative of underinvestment in clinical education, not a lack of capability. Mugyenyi et al. (2021), also in an East African referral hospital, reported on sub-optimal vital sign monitoring practices, a common issue in the challenge of making training investments impact clinical practice.

Several studies have highlighted the importance of nursing education in airway care, noting that proper training and knowledge are essential for preventing complications and maintaining patient safety (Nigatu et al., 2022; Miranda et al., 2020). In a random assignment study, Elhabashy and Moawad (2024) showed that SDL models were similar in effectiveness to traditional instructor-led models for building competency in airway management skills among nurses, indicating that flexible models of learning with the use of technology could potentially represent a scalable pathway to competency development in limited resource settings. The training of good clinical tutors capable of bringing theory into practical supervised training is still an essential for effective training. Enabling community health workers (CHWs) and first aid (FA) responders to perform emergency airways in situations where certified providers are scarce has been shown to be feasible and safe by Goto et al. (2019) and is an example of a tiered, task-shared model.

Challenges to Effective Postoperative Airway Management

Post-operative airway emergencies are of course emergencies that are not expected and require quick, precise and coordinated action under time pressure. The barriers to successful management can be summarised into five domains of management, all interrelated: time and urgency; team make-up and skills; care environment; airway triage infrastructure; and equipment available.

The most pressing problem is time pressure. Post-operative airway emergencies do not happen in the operating theatre setting where time can be taken to prepare and assemble a team, to systematically assess the clinical situation, etc., but takes place with no prior warning. At the same time, the makeup of the responding team is rarely ideal and the first team on the scene is often the ward nurses or on call physicians who may have different levels of advanced airway skills. The core of the response is typically the anaesthetists and nurse anaesthetists and recovery room nurses as these are the experts working in the recovery room, however, the surgeon who performed the procedure may be required to deal with complications related to the site of the procedure such as haematoma or oedema causing extrinsic airway compression (Spruijt & Huitink, 2024).

The care scene poses an additional major hurdle. The acute surgical airways emergencies that happen in ward or non-theatre settings do not have the same physical structure, equipment set-up or team dynamics as an operating theatre. The more advanced

procedures, such as endotracheal intubation, are much harder to do safely in the confined spaces of wards, especially where there is poor lighting, unfamiliar equipment setups, etc. When patient transfer to the theatre is not possible, the team needs to work proactively to ensure optimal environmental factors; in other words, arranging the appropriate personnel and equipment, clear role assignments and a structured management plan prior to commencement of the process (Spruijt & Huitink, 2024).

Limited equipment is a significant challenge, which is pervasive and multi-dimensional in low resource settings like Nigeria. The lack of hospital infrastructure, lack of electricity at hospitals, and weak medical supply chains all contribute to the lack of operational airways equipment (Jarzebowski et al., 2022). Often, critical equipment (such as nasopharangeal and oropharyngeal airways, bag-valve-masks, laryngoscopes, video laryngoscopes, bougie guides, endotracheal tubes, etc.) is not readily available or in good condition and makes room for improvisation which is inherently dangerous for patients (Olatunji et al., 2024). Moreover, there are varying qualification levels of healthcare workers including non-specialist nurses which may result in variations in technique and clinical decision making. This lack of guidelines and regular updates of training programmes adds to this variability and hinders practitioners from staying current with evidence and best practice.

The Way Forward: Recommendations

A multi-level approach is needed to tackle the issues raised by this review: individual, institutional and systemic.

Professional training: In terms of professional training, a professional training programme aimed at the postoperative emergency airway should be specifically designed, taught and periodically assessed by providing professional resources in healthcare institutions. These should be based on the principles of competency-based education and should have a strong focus on basic skills (airway recognition, manual airway manoeuvres, adjunct insertion, oxygen therapy and effective BVM ventilation) before moving on to advanced skills. The evidence presented here (Elhabashy & Moawad, 2024) supports using both traditional simulation-based modalities and flexible self-directed learning platforms. Airway management skills tutors should be integrated into training programmes and confirm their clinical skills in airway management to facilitate conversion of theoretical skills to safe clinical practice.

Institutions need to do a systematic audit and procurement of basic airway management equipment and ensure that the appropriate equipment is readily available in all areas where postoperative patients are cared for. Establishing standardised postoperative airway emergency trolleys based on evidence-based minimum equipment checklists, would facilitate the nurses to obtain all the necessary equipment in a timely fashion. Mobile application systems to help with airway triage, like ATAM, would also be beneficial in systematically risk-stratifying patients and assist in structured decision-making at the point of care (Huitink, 2024).

Professionally and regulatory, there is a need to focus on creating and testing a specific, validated postoperative airway management algorithm that gives a multidisciplinary, common cognitive map to nurses and others to handle these emergencies. POCUS and AI-driven airway prediction models could be considered in the context of overall investments in healthcare technology, considering the feasibility of implementation and affordability in resource-limited settings. Lastly, community-level training programmes should be sustained, expanding basic skills in airway management to all first responders and community health

workers, to create an important safety net where specialist clinical support may not be readily available (Goto et al., 2019).

Conclusion

Airway management in the post operative patient is a basic patient safety skill which requires a combination of technical competence, knowledge of the airway, judgement, and teamwork. This narrative review has shown that although the evidence base for the assessment of the airway, use of adjuncts, oxygenation and emerging technologies is strong and growing, there are still significant gaps that remain unmet when it comes to implementation, especially in low resource countries like Nigeria. These factors such as time pressure, inadequate team skills, poor care environment, poor airway triage and equipment limitations combined, diminish postoperative airway care quality and put patients at risk for unnecessary harm.

Solutions to these gaps require ongoing commitment at a system level; investing in systematic competency-based nursing training, sourcing of basic airway equipment, scaling up use of airway triage tools in hospitals, and the development of dedicated postoperative emergency airway guidelines. New innovations such as video laryngoscopy, POCUS, AI risk prediction and mobile triage apps are game changers and should be increasingly adopted in clinical and teaching settings as resources allow. Most importantly, a united multidisciplinary team that communicate with each other respectfully is the most basic factor in a favorable outcome in postoperative airway emergencies. Everything about postoperative patients is at stake when it comes to the skill and readiness of those tasked with the airway.

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