

**The availability and perceived knowledge of use of airway
management devices in emergency centres at referral
hospitals in Namibia**

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Abbreviations

DAS Difficult Airway Society

EC Emergency Centre

ILMA Intubating Laryngeal Mask Airway

LMA Laryngeal Mask Airway

NAP4 Fourth National Audit Project

SASA South African Society of Anaesthesiologists

SLIPA Streamlined Pharynx Airway Liner

Part A: Literature review

1. Objectives of the literature review

The objectives of the literature review were:

- i. To describe the use of basic airway devices in emergency centres
- ii. To describe the use of alternative airway devices in emergency centres
- iii. To describe the availability of airway devices in emergency centres
- iv. To determine the knowledge of use of airway devices in emergency centres

2. Literature search strategy, including inclusion and exclusion criteria

A search was conducted in five databases to identify relevant publications: i) Medline via PubMed, ii) Scopus, iii) Academic Search Premier, iv) Africa-Wide Information via EBSCO host and v) Google Scholar. A separate search was done for each objective.

The following key words were used:

- i. 'Basic airway devices' OR 'airway equipment', 'emergency department*' OR 'emergency centre*', 'use'
- ii. 'Alternative airway devices' OR 'airway equipment', 'emergency department*' OR 'emergency centre*', 'availability'
- iii. 'Level of knowledge', 'emergency department*' OR 'emergency centre*', 'clinician*'
- iv. 'Emergency Medicine Namibia', 'Ministry of Health and Social Services', 'airway equipment', 'referral hospitals'

The search was limited to publications in English and publications after 1997 up till 31 October 2016. The title and abstract of identified publications were reviewed and the full text of relevant publications were retrieved for inclusion in the review. Reference lists of retrieved publications were also searched to identify additional publications. The lead investigator performed the search and selected eligible publications; a second review author did not repeat this process.

3. Literature reviewed

3.1. Background

The human body is dependent on adequate oxygenation and ventilation. Oxygenation relates to the addition of oxygen to the body while ventilation relates to the air exchange between the lungs and the atmosphere to ensure that oxygen can be absorbed and carbon dioxide eliminated. The airway acts as a passage linking the atmosphere with the lungs and

is therefore a vital component to ensure both adequate oxygenation and adequate ventilation. Maintaining the airway is an essential element in the care of any ill or injured patient. Inadequate management of the airway may lead to hypoxia and hypercarbia with subsequent secondary brain injury, cardiopulmonary arrest, and ultimately death [1-3].

The management of an “easy” airway may be referred to as oxygenation and ventilation in non-obese, non-obstetric patients who have normal anatomy and didn’t experience desaturation or hypercarbia directly before or during the management process. A “difficult” airway is the exact opposite, and although the definition of a "difficult" airway varies, most authors define it as multiple attempts needed, multiple blades used, or a poor laryngeal view [4]. Furthermore, a difficult intubation is often defined as a Cormack-Lehane grade 3 laryngoscopic view or as one requiring the use of alternative devices [5]. Managing a difficult airway is a complex situation that is influenced by various factors including patient factors, the availability of alternative airway devices, the environment, the availability of guidelines for difficult airway management and the presence of trained or skilled clinicians [6, 7].

Airway management devices can be defined as mechanical devices used to assist with oxygenation (e.g. giving supplemental oxygen) or ventilation (e.g. maintaining a patent airway) [4]. Emerging technology continues to both improve on existing ones, such as the laryngeal mask airway (LMA), [8, 9] and to introduce new airway management devices. A wide variety of airway devices have been developed, but a standard classification of these devices is currently lacking. For the purpose of this literature review, we have categorised airway management devices as basic airway devices or as alternative airway devices.

Basic airway devices can be classified as follows: [10]

- a. Oxygen source (oxygen cylinders and regulators)
- b. Devices for supplemental oxygenation (nasal cannulas, nasal hoods, various mask designs, resuscitation bags)
- c. Devices for positive pressure supplemental and controlled ventilation (Bag valve mask, oxygen powered resuscitator)
- d. Basic airway adjuncts (oropharyngeal airway, nasopharyngeal airways, Yankauer suction device)

Alternative airway devices are devices that do not necessarily involve the use of a laryngoscope or need direct visualisation for tracheal intubation [8]. Supraglottic airway management devices are devices that ventilate patients by delivering oxygen above the level of the vocal cords and are designed to overcome the disadvantages of endotracheal intubation. Examples of supraglottic airway management devices are the laryngeal mask

airway (LMA), the intubating laryngeal mask airway (ILMA), Oesophageal-Tracheal Combitubes, the Easy Tube, the Laryngeal Tube/King tube, the perilaryngeal airway-Cobra, and the Streamlined Pharynx airway Liner (SLIPA) [11-13]. The above mentioned devices are the most important alternative airway devices when clinicians are confronted with patients experiencing difficult bag-valve-mask ventilation and failed intubation [14]. Emergency Centres (ECs) are often the first port of entry of these patients and physicians therefore need to have the necessary skills to deal with such emergencies.

3.2. The use of basic airway management devices in emergency centres

Basic airway management devices such as nasal cannulas and simple oxygen facemasks are essential equipment in all ECs [1]. They are used in the management of patients who requires supplemental oxygen support while receiving treatment such as in lower respiratory tract infections and they can also be used for routine intubation as adjuncts when managing difficult airways.

Fortunately, most patients can control their own airway. No data regarding the use of basic airway devices without endotracheal intubation have been reported; however, in a one year observational study by Sackles *et al*, 1% (n=610) of patients required airway control (endotracheal intubation) in an EC that serves 60 000 patients annually [2]. In a similar study, Wong *et al* assessed that about 0.3% of EC patients will require an advanced airway intervention [15]. Sackles *et al* also indicated that about 1% of those earmarked for endotracheal intubation had a surgical airway intervention for ensuring a patent airway [2]. Complications relating to airway management do also occur [16-18]. In ECs in the United Kingdom, most adverse events that occurred during airway management were deemed avoidable. Factors contributing to these events were lack of proper planning, lack of a backup plan, failure to identify a difficult airway and poor judgement with subsequent poor airway assessment [17]. The use of alternative airway devices could potentially reduce often devastating adverse events.

3.3. The use of alternative airway devices in emergency centres

The management of a difficult airway is a complex and often stressful situation. It is generally not easy to predict whether a patient will have a difficult airway or not. A meta-analysis by Shiga *et al*, found a 6.2% incidence of difficult intubation in non-obese, non-obstetric patients with no evidence of airway pathology [19].

Different airway devices have different and specific functions in airway management. Clinicians therefore need to be familiar with each airway device, its use and overall function to maintain adequate oxygenation and ventilation regardless of the underlying pathology [20]. Levitan *et al*, conducted a national survey of emergency medicine residency program directors where they evaluated the available airway devices in the ECs across the United States of American residency program and how often these devices were used. Out of the 95 programmes surveyed 20% did not have alternative airway devices in their ECs. Of the 83 emergency residency directors in the survey, 49% reported to have never used an alternative device for intubation [4]. This was due to the combination of unavailability of these devices and the lack of knowledge regarding their use.

3.4. The availability of airway devices in emergency centres

The devastating adverse results that occur during airway management can be lessened by the provision of alternative airway devices, and ensuring that clinicians are adequately trained in airway management [1, 6, 21]. A study by Cevic *et al*, demonstrated that only 13 (25.4%) of 51 emergency centres in a Turkish university, educational and research hospitals stored at least one each of the following devices: supraglottic airway, videoscopic imaging system, and a surgical airway instrument [12].

A study conducted by Hogh *et al*, between October 2002 and May 2003 investigated the discrepancy in the availability of airway equipment in different clinical wards. Surveys were drawn from 14 acute hospitals in the South West Thames region in London, UK. The results indicated that there were no significant differences in the availability of airway-related equipment. However, less than 80% of the airway equipment surveyed were available in ECs [22]. Similarly, ECs in the United States were also insufficiently stocked, specifically pertaining to the recommended paediatric airway devices (up to 94% not available) [23]. These studies were conducted in resource-rich environments, and one can argue that even less equipment will be available in resource-restricted settings.

Limited studies on the availability and level of knowledge on airway management devices have been conducted in a resource-restricted environment. Jooste *et al*, conducted a cross sectional study in 15 ECs across the Western Cape Province of South Africa. This study documented 26 different types of alternative airway devices, with three (20%) centres not having any alternative airway devices available despite the fact that these centres were situated in tertiary / referral hospitals [24]. Besides the Western Cape, no other studies have been performed to our knowledge in Southern Africa.

Namibia has a relatively well-run state-funded health system including clinics, regional and referral hospitals. To date there are no emergency medicine specialists to facilitate and manage the emergency services (especially in the referral hospitals) [25]. Anecdotally, the ECs of referral hospitals in Namibia have limited availability of alternative airway devices. This could be attributed to the deficit of monetary resources or the non-existence of emergency medicine physicians. Emergency medicine physicians are equipped with airway management skills needed in the ECs and are therefore in the position to recognise and motivate the need to equip ECs with appropriate and necessary airway devices.

3.5. Knowledge of use of airway devices in emergency centres

The absence of training and education are some of the causal and contributing factors of airway management complications experienced in the EC; accounting for 43% (77/184) and 6% (12/184) respectively amongst the cases reviewed [17, 26]. The lack of knowledge might even extend beyond the EC. Effective management of a patient's airway in the EC is the responsibility of every clinician regardless of their qualification level. An experienced, trained provider as well as an assistant should always be available when the need arises to use alternative airway devices [27, 28].

There is clear evidence that endotracheal intubation by a professional trained in airway management is more likely to be successful than by a non-trained professional [29]. A prospective study by Rosenthal *et al*, reported a significant increase in the success rate of airway management when clinicians were trained using a stepwise approach, various airway devices, and scenario based simulations [30]. Airway management skills for emergency physicians is such a critical skill to acquire that the US Emergency Medicine Residency Review Committee expects emergency medicine residents to complete at least 35 intubations (orotracheal and nasotracheal) as part of their training programme [20]. Frequent continuous learning in airway management is needed to improve and maintain the skills to achieve definitive airway in patients. Evidence in a Swiss study revealed a 90% endotracheal intubation success rate after an average of 57 attempts [31].

Clinicians are likely to lose their airway management skills within a short period of time (7% in 7 months) [32]. Although this study was related to anaesthesiology trainees, it can be generalised to EC clinicians as well. Continuous use of airway devices and repeated training is essential to maintain the necessary skills for airway management. It is for these reasons that the International Liaison Committee on Resuscitation (ILCOR) advocates that EC

clinicians should annually perform 6 to 12 tracheal intubations after initial appropriate formal training, in order to remain skilful [7].

Guidelines have been successfully implemented in disciplines like airlines and the military and have been proved useful and lifesaving [33,34]. Guidelines pertaining to airway management have been developed using consensus groups in order to reduce adverse events of airway management by providing a structured approach to clinicians [35]. The guidelines of the Difficult Airway Society (DAS) include a simple algorithm that outlines the required equipment. The list of equipment includes personal protective equipment, monitoring devices (saturation and capnography), different sizes of endotracheal tubes, laryngoscopes; airway adjuncts, and devices for difficult airways (e.g. LMA, video laryngoscopes). The guideline further underscores that all equipment must be checked to ensure that they are functional while preparing to manage a difficult airway [28]. The South African Society of Anaesthesiologists (SASA) recommends availability of airway devices according to the capability/level of the health care facility e.g., clinics do not need additional routine equipment for intubation or alternative devices for establishing a definitive airway [36,37].

4. Summary or interpretation of literature

Patients attending ECs are frequently severely ill and might require a definitive airway. Factors relating to the successful management of a compromised airway include patient factors, availability of airway devices and the knowledge and skill of physicians using these devices. EC clinicians have limited control over patient factors and the focus should therefore be on the availability of airway management devices and the skills to use them appropriately. The availability of airway devices in ECs is an essential step towards appropriate and adequate airway management. ECs often lack alternative airway devices and hence the availability of airway devices should be prioritised.

To establish a safe and effective airway management in the ECs, formal training in airway management, the knowledge of, and experience, as well as skill in using alternative airway management devices are equally important.

5. Identification of gaps or needs for further research

The availability of airway management devices and the knowledge to appropriately use these devices in the emergency setting cannot be overstated. The review highlighted areas that need to be addressed by further research.

Firstly, a well-defined standardised classification of airway management devices is required. Secondly, alternative airway management devices are not always available in ECs. This occurrence was witnessed in both resource-rich and resource-limited settings. A standardised and validated list of core or absolute essential equipment needed for adequate airway management in the EC is an imperative. This is most likely to be country-specific but can also function for world-regions.

Thirdly, the availability of airway management devices doesn't always relate to the knowledge or skill to appropriately use them. Training should be tailored to those devices available in the relevant working environment of clinicians.

Lastly, the availability of airway management devices, and the knowledge level of using them, in ECs in Namibia have never been researched. Similarly, the level of knowledge pertaining to the use of these devices is also unknown.

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PART B: Manuscript in article format

Title page

The availability and perceived knowledge of use of airway management devices in emergency centres at referral hospitals in Namibia

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Abstract

Introduction

Maintaining the airway is an essential element in the care of any ill or injured patient. Inadequate management of the airway may lead to hypoxia and hypercarbia with subsequent secondary brain injury, cardiopulmonary arrest, and ultimately death. The aim of the study was to identify which airway devices are available in public emergency centres of referral hospitals in Namibia and to determine the perceived level of knowledge of use regarding these devices.

Methods

A cross-sectional study was conducted in four emergency centres of referral hospitals in Namibia. Data regarding the availability of airway devices were collected on a standardised data sheet by means of a site inspection. A questionnaire was also distributed to emergency centre doctors to assess their perceived knowledge of use of airway devices. Descriptive statistics of all variables are reported.

Results

Twenty-two different airway devices were documented at study hospitals. All centres had some form of basic airway devices. Only one (25%) had venturi-masks. Two centres (50%) had one type of introducer (Gum elastic bougie) whilst none of the centres had video laryngoscopes, surgical airway devices or laryngeal tubes. Twelve participants (32.4%) had received formal training on airway devices (senior clinicians n=6, junior clinicians n=6), and 25 (67.6%) had no formal training (senior clinicians n=11, junior clinicians n=12). Majority of the clinicians lacked perceived knowledge in the use of alternative airway devices which were not available in their respective emergency centres, with a frequency of 81.4%.

Conclusion

The study indicates that basic airway devices are available in referral emergency centres in Namibia, however most of the alternative airway devices are not adequately stocked in the sampled emergency centres. Furthermore, a large number of clinicians had perceived knowledge of the basic airway devices. However, the perceived level of knowledge of use in alternative airway devices was inadequate.

Main text of manuscript

Introduction

Successful airway management is central to the survival of acutely-ill patients presenting to emergency centres (ECs), referred to as “Casualty” in Namibia. Various airway devices have been introduced to improve airway management as a consequence of serious adverse events (and ensuing morbidity and mortality) [1]. Many different classifications exist for categorizing airway devices [1-3]. The South African Society of Anaesthesiology (SASA) classifies airway devices into three categories according to individual patient’s airway assessment (Table 1)]. Alternative intubation devices can also be classified into: a) Blind devices (no visualisation of airway); b) Indirect visualization: video-based devices; and c) Indirect visualization: non-video-based devices [1]. Airway devices can also be classified according to their anatomical relationship into supraglottic and infraglottic devices [5, 6, 19].

Table 1 The South African Society of Anaesthesiology classification of airway devices

Routine equipment for endotracheal intubation	Alternative devices for establishing a definitive airway	Emergency airway equipment
Face masks	Specialised ET ^a tubes for blind intubation: - LMA ^b fastrach ET tube - Parker flextip ET tube	Supraglottic airway devices: - LMA - LM ^c
Oropharyngeal airways	McCoy laryngoscope	Non-anatomical supraglottic devices: - Laryngeal tube - Easy tube Combitube
Non-anatomical supraglottic devices: - Laryngeal tube - Easy tube - Combitube	Retrograde intubation kit	Cricothyroidotomy - Needle - ET tube and scalpel - Single stab kit - Non-Seldinger - Seldinger
Endotracheal tubes	Surgical tracheostomy equipment	Rigid bronchoscope
Yankauer suction nozzles	Alternative laryngoscopes: Video laryngoscopes	
Suction catheters	Video stylet: Flexible, Malleable, Rigid	
Margil forceps	Flexible Fibre optic scope	
Bag valve mask		

^aET- endotracheal tube, ^bLMA – Laryngeal mask airway, ^cLM- Laryngeal mask,

Most patients seen in ECs are able to maintain their own airway [7]. In EC-based studies, only 1% of patients required airway control [8], while only 0.3% of patients required advanced airway intervention [9]. Although only a minority of patients might require advanced airway management, all ECs should be adequately equipped and prepared to deal with unexpected airway complications [10].

The availability of airway devices in ECs can be very challenging; more so in resource limited settings [11, 12]. There is no data on the availability of airway devices and knowledge of its use in ECs in Namibia, a resource-limited setting. Standardised airway management guidelines with regards to the minimum airway devices that should be available in the EC are lacking. Specific minimum training

levels of EC staff on airway management is also unclear. The aim of the study was to determine which airway management devices are available in the ECs of public referral hospitals in Namibia, as well as to assess the perceived level of knowledge of EC staff regarding the use of airway devices.

Methods

A cross-sectional study design was employed and conducted in Namibia over a period of eleven days (01/10/2015 to 11/10/2015). Approval for the study was granted by the University of Cape Town Human Research Ethics Committee (ref no: 339/2015) and the office of the permanent secretary, Ministry of Health and Social Services (MoHSS) Namibia (ref: 17/3/3).

Namibia is a sub-Saharan country located in south-western Africa with a total surface area of 824 292 km² [13], and has an estimated population of 2.3 million people [14]. Two thirds of the population live in rural areas, which poses a unique health challenge in accessing the health facilities due to long travelling distances [14, 15]. Urbanisation has steadily increased since Namibia's independence from South Africa in the early 1990, from 28% to 43% in 2011, which resulted in increased patient visits to the ECs of the referral hospitals [16]. The health facilities in Namibia are divided into six categories, determined by the level of health care services offered. There is one national referral hospital, three referral/intermediate hospitals, 30 district hospitals, 44 health centres and 269 clinics [16-18]. Due to its vast and sparsely populated territories, and the low number of permanent health facilities, Namibia has about 1 150 outreach points across the country which most often provide the first response and stabilisation of emergencies [16]. According to Tansley *et al*, 88% of Namibian facilities were found to be unsuitable for providing emergency health care [14]. Seventy-two percent of Namibians were reported as not having access to higher levels of emergency care within a 50 km radius as per a spatial access survey done in low resource limited countries [15]. This lack of access was found to be more evident due to Namibia's vast and sparsely populated territories [15].

Medical officers currently manage ECs in Namibia and are grouped into four categories: junior and senior medical officers are determined based on years of working experience after internship whilst chief and principal medical officers are administrative posts that oversee the clinical work in an EC. Only one principal and one chief medical officer is employed by each EC. The surgical department oversees the general patient care within the EC even though all emergencies (medical, surgical and paediatric) are firstly seen by the EC staff before an appropriate referral is made. Medical officers are permanently employed except for Rundu State Hospital which does not have permanent EC clinicians.

Rundu State Hospital EC is covered by the on-call doctor from different disciplines. There are currently no specialist emergency medicine physicians in any of the Namibian public referral hospital's ECs.

All three referral/intermediate hospitals and the one national referral hospital were included as study hospitals (Table 2). The intermediate hospitals are located in the north, north east and central areas of Namibia and the national referral hospital is situated in the centre of Namibia. All clinicians working in the ECs of the study hospitals were eligible to participate in the study.

Table 2 Study hospitals and the number of clinicians working in the relevant emergency centre.

Hospital	Number of clinicians
Katutura state hospital and Windhoek central hospital	12 ^a
Oshakati state hospital	8
Rundu state hospital	28 ^b
Total	48

^aClinicians working at Katutura state hospital emergency centre resort under the staff establishment of either Katutura state hospital or Windhoek central hospital, ^bRundu state hospital does not have EC designated clinicians, therefore all clinicians working in Rundu hospital work in the EC when on call.

The principal investigator collected the data by visiting each study hospital. An inspection of equipment was done firstly to ascertain which airway management devices were available using a standardised data collection sheet. Inter-device connectivity/operability was not investigated and verified but airway devices which were not in working order, broken or sent off for sterilisation at the time of inspection were categorised as not available.

Secondly, a non-validated questionnaire which was designed as a self-evaluating tool mainly to evaluate perceived level of knowledge, was used to collect data on the perceived knowledge of use of airway devices by the participants. The questionnaire was paper-based to ensure adequate participation from all clinicians, regardless of their computer literacy abilities and it was only available in English, the official language of Namibia. No personal identification particulars of the participating clinicians were collected to ensure anonymity of the participants. The questionnaire was devised to include photographs of 22 devices for identification based on the available literature on classification of airway devices. Clinicians had various options to choose from on the provided questionnaire to describe their own abilities in the use of the airway devices. Competence in the questionnaire was defined as the ability of the clinician to identify the device presented and the perceived level ability to

use the device. This information was shared with them while maintaining ethical and confidential assurances.

The principal investigator personally distributed the questionnaires to the EC clinicians who completed the questionnaires in his presence and on the same day of distribution. The questionnaire completion was conducted at the following times: during the clinicians break, before the beginning of a shift or at the end of the working shift. This was done to minimise interruption with patient care and services delivery.

A maximum of two days was spent at each study hospital to cover participants' working shifts. Two clinicians were not present at the time of the initial data collection, therefore these two questionnaires were distributed and collected at a later stage. We were assured by the EC supervisor that there was no tampering with the questionnaires and no discussions were entered into by the last two participants, which could have contaminated the data. A secure box was provided in the supervisor's office where the completed questionnaires could be left until collection at a later stage.

To prevent submission duplication, the number of questionnaires were marked off upon distribution and on collection such that each participating clinician was given only one questionnaire. Data were manually transferred to a password-protected Microsoft Excel® spreadsheet, before shredding and discarding the original questionnaires. Captured data was cleaned using column segmentation, deduplication, and spell checking. Access to the data were limited to the research team.

Descriptive statistics of all variables were performed and are reported. In the survey, three devices (namely OPA; ETT and video laryngoscope) were presented twice in order to capture differences in devices' presentation. For data analyses purposes, the answers were pooled for those three devices. Analysis was done using Microsoft Excel® and Statistical Package for the Social Sciences (SPSS) version 23.

Results

For the availability of airway devices, fourteen different airway devices were identified and documented at the study hospitals (Table 3). Although all emergency centres had some form of basic airway device available, only one centre (25%) had a venturi-mask. Some of the common basic airway devices which were available in all the emergency centres included; simple face mask airway, Bag Valve Mask, Oropharyngeal airway, nebulizer with a mask.

Table 3 The availability of airway devices in emergency centres of referral hospitals in Namibia.

Airway devices	n (%)
<i>Basic airway devices</i>	
Oxygen supply unit	4 (100%)
Nasal cannula	2 (50%)
Simple facemask oxygen	4 (100%)
Oropharyngeal airway (OPA)	4 (100%)
Nasopharyngeal airway (NPA)	2 (100%)
Bag valve mask (BVM) device	4 (100%)
Venturi mask	1 (25%)
Nebuliser facemask	4 (100%)
<i>Intubating guides/Intubating stylets</i>	
Malleable introducers	2 (50%)
Rigid stylet	0 (0%)
Eschmann tracheal tube introducer (Gum elastic bougie)	2 (50%)
Endotracheal tube	4 (100%)
Preformed intubating introducer	0 (0%)
<i>Fibreoptic endoscopy aids</i>	
Shikani Optical stylet	0 (0%)
<i>Supraglottic devices</i>	
Laryngeal mask airway (LMA)	2 (50%)
Combitube	1 (25%)
Laryngeal tube	0 (0%)
<i>Laryngoscopes</i>	
Laryngoscope with a blade	4 (100%)
Video Laryngoscope	0 (0%)
<i>Surgical airway devices</i>	
Needle cricothyroidotomy set	0 (0%)
Transtracheal jet ventilation	0 (0%)

For the survey on knowledge of use of the airway devices, 42 out of the total 48 clinicians were available to participate in the survey during the time of visiting the study hospitals. Of these, 37 surveys were completed (response rate = 88.1%). Five of the participants decided to withdraw from the study. In line with ethical considerations, undue pressure was not placed on them to participate. They also provided no reasons for their withdrawal.

The majority of respondents were male (n=26, 70.3%) while most were younger than 35 years old (n=16, 43.2%) (35-44 years n=12 (32.4%); ≥ 45 years n=9 (24.3%)). Twelve (32.2%) medical officers have been working for one year or less at the respective study hospital, 10 (27.0%) between 1 and 5 years, nine (24.3%) between 5 and 10 years, and six (16.7%) for more than 10 years. Seventeen (45.9%) were senior clinicians (senior medical officers n=15, principal medical officers n=1, chief medical officer n=1), 20 (54.1%) were junior clinicians (junior medical officers n=11, interns n=9). Twelve

participants (32.4%) had received formal training on airway devices (senior clinicians n=6, junior clinicians n=6), and 25 (67.6%) had no formal training (senior clinicians n=11, junior clinicians n=12, unknown n=2).

Regarding basic airway devices, out of a total of 370 answers, 57.6% of the answers given were correct, meaning the clinicians could identify the device. Further, 69.3% of the answers, the clinicians stated they had received some form of basic training in the use of these devices. Of note, all participating clinicians could correctly identify the laryngoscope with a blade whilst none of the participants could correctly identify the optical stylet (Shikani) or the transtracheal jet ventilation device (Table 4). For alternative airway devices, out of 444 answers, 43.0% were correctly identified. Clinicians could identify the airway devices (combined basic and alternative devices) which were available in their emergency centre at a frequency of 68.4%, however they lacked perceived knowledge in the use of alternative airway devices which were not available in their respective emergency centres, with 81.4% of the 307 answers being incorrect. Despite these results, the clinicians acknowledge that those airway devices are essential pieces of equipment in the management of airway in the emergency centres.

Table 4 Correct identification of airway management devices per professional category

Airway devices	All (n =37)	Senior clinicians (n=17)	Junior clinicians (n=20)
Basic airway devices			
Oxygen supply unit	17 (48.6%)	10 (58.8%)	7 (38.9%)
Nasal cannula	18 (51.4%)	12 (70.6%)	6 (33.3%)
Simple facemask oxygen	28 (80.0%)	13 (76.5%)	15 (83.3%)
Oropharyngeal airway (OPA) ^a	50 (67.6%)	24 (70.6%)	26 (65.0%)
Nasopharyngeal airway (NPA)	26 (74.3%)	10 (58.8%)	16 (88.9%)
Bag valve mask (BVM) device	34 (97.1%)	17 (100%)	17 (94.4%)
Venturi mask	7 (20.0%)	3 (17.6%)	4 (22.2%)
Nebuliser facemask	15 (42.9%)	8 (47.1%)	7 (38.9%)
Intubating guides/Intubating stylets			
Malleable introducers	15 (42.9%)	8 (47.1%)	7 (38.9%)
Rigid stylet	14 (40.0%)	8 (47.1%)	6 (33.3%)
Eschmann tracheal tube introducer (Gum elastic bougie)	8 (22.9%)	6 (35.3%)	2 (11.1%)
Endotracheal tube ^a	67 (90.5%)	31 (91.2%)	36 (90.0%)
Preformed intubating introducer	14 (40.0%)	8 (47.1%)	6 (33.3%)
Fibreoptic endoscopy aids			
Shikani Optical stylet	0 (0%)	0 (0%)	0 (0%)
Supraglottic devices			
Laryngeal mask airway (LMA)	25 (71.4%)	12 (70.6%)	13 (72.2%)
Combitube	7 (20.0%)	4 (23.5%)	3 (16.7%)
Laryngoscopes			
Laryngoscope with a blade	37 (100%)	17 (100%)	20 (100%)
Video Laryngoscope ^a	13 (17.6%)	8 (23.5%)	5 (12.5%)
Surgical airway devices			
Transtracheal jet ventilation	0 (0%)	0 (0%)	0 (0%)

^a Devices appearing twice in the questionnaire, therefore the total number of participants is doubled.

Four (10.8%) participants rated their level of knowledge in using airway devices as ‘very competent’ (Figure 1).

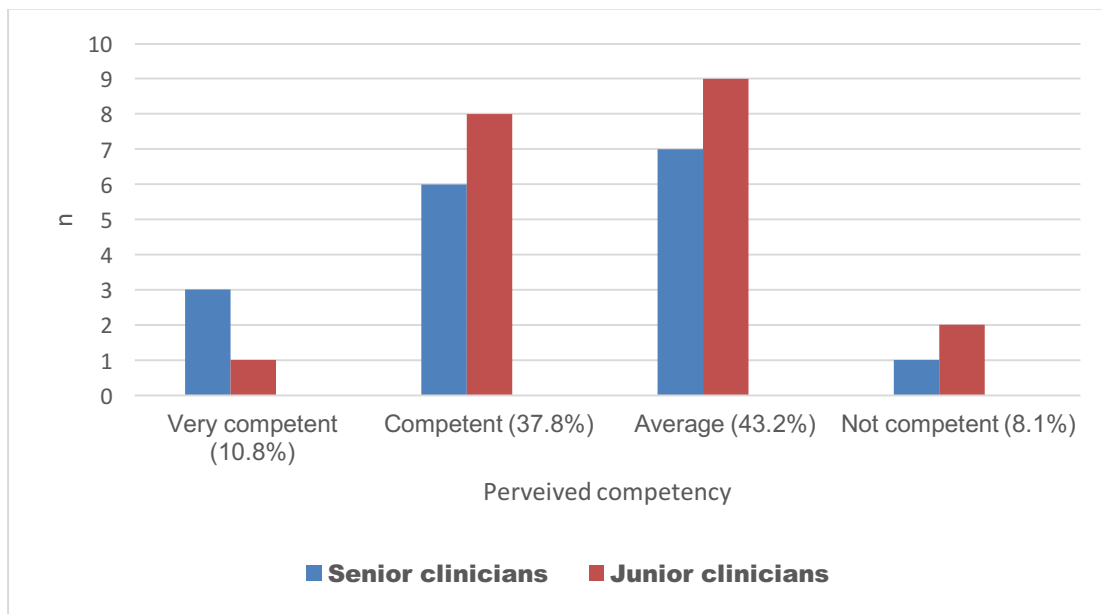


Figure 1 Perceived competency level in using airway devices, overall and according to professional category

Discussion

The study reveals that most of the basic airway devices are available in all the public referral/intermediate hospital ECs in Namibia but that a significant number of alternative or difficult airway devices are inadequately stocked. Clinicians with some form of formal training in airway devices are more confident in using devices available in their respective emergency centres.

No similar studies have been conducted in Namibia on the availability and perceived knowledge of use of airway devices in ECs. However, the availability of alternative devices for the management of the difficult airway appears to be limited compared to the majority of the bigger ECs in the Western Cape, South Africa where at least one alternative form of equipment is available [12]. South Africa is perceived as the leader in developing Emergency Medicine in the Southern African region and standards, albeit imperfect, should be strived for.

The inadequate availability of alternative airway devices in the study hospitals (Table 3) might attribute to the decreased perceived level of knowledge in alternative airway devices by clinicians working in the study hospital ECs. Furthermore, it may also be due to lack of resources or management thereof. The low perceived level of competence of clinicians regarding use of airway

devices reflects the lack of a formalised refresher training courses to update clinicians in current evidence based airway management.

The study demonstrated variation in perceived level of knowledge in the use of airway devices. With increased training and access or exposure to these devices, clinicians will be more comfortable in using them. Furthermore, our study findings are consistent with those of other studies globally. Clinicians who are not trained in the use of airway devices and who are not exposed to airway devices have decreased perceived level of knowledge as compared to clinicians who are trained and exposed [11,21]. Furthermore, alternative airway devices are generally not well stocked in the emergency centres [11, 12, 20, 21]. The lack of airway devices and the decreased level of knowledge regarding its use could compromise effective patient management and subsequently increase morbidity and mortality. The low perceived level of knowledge in the use of airway devices is of particular concern as it also compromises the patients' right to receive high quality care by a competent clinician working in the emergency centre. The study substantiates the need for adequate training on the use of the airway devices followed by provision of sufficient alternative or difficult airway devices across all the emergency centres of referral hospitals in Namibia.

The large distances between healthcare centres in Namibia has limited the study to referral/intermediate hospitals only. Therefore, the results of the study might not be generalizable to all hospitals in Namibia. Similarly, the results can't be generalised to all clinicians in Namibia due to the small sample size.

Data collection by a single investigator and possible errors during the data transfer process could have created bias in the survey of the availability of the airway devices. A standardised data collection sheet was used to limit potential bias. To further safeguard accuracy, the data collector then double-checked the data after it was captured electronically.

Over decades, self-assessment has been the mainstay for assessing the self-continuous professional development for the health professional [22-26]. Although there are conflicting outcomes on the effectiveness on this method in the existing literature, there is no clear superior educational or assessment tool that provides evidence of superior self-directed lifelong learning to acquire knowledge and necessary skills [22-26]. Anecdotally it is known that self-assessment of knowledge may be rated upward by participants [25,27]. This may also create bias as participants may have been in different stages of employer/employee relationship that may have affected the reliability of their

answers. However, the questions were designed as closed ended to avoid deviating from the aim and objectives of the survey.

Even though individuals rank themselves high in self-assessment and skill, a study by Burson et al found broad agreement between self-assessment and objective knowledge and that individuals had relatively a general sense of their strengths and weakness in their abilities and knowledge [28]. A study by Wayne et al on ACLS scenarios by internal medicine registrars in the USA found that there was a high strong self-confident rating compared to actual practical performance (median $r = 0.0750$) [29,30]. Similarly, Hodges et al found that physicians in family medicine had higher self-assessment scores in theory than in practical assessment scores [30].

It is worth noting that there was no improvement in scores seen in studies without bench mark comparisons prior to self-assessment on knowledge of skill in most of the available literature. Due to the lack of such literature in low resource settings like Namibia, it can be speculated that training and continuous self-assessment might add value and improve perceived knowledge of use of airway devices closer to practical knowledge and competence.

We are satisfied that adequate measures were taken to ensure valid and empirical results. The study only investigated the availability and perceived knowledge of use of airway devices and further research is required to determine the essential competency level in the use of these devices.

Basic airway devices are generally available in referral emergency centres in Namibia, however most of the alternative airway devices are not adequately stocked in the sampled emergency centres. A shortage of alternative airway devices potentially compromises the effective management of patients presenting with difficult airways to the emergency centre, ultimately affecting the patients' outcome. The study also determined that senior clinicians demonstrated above average knowledge of basic airway devices and that good perceived level of knowledge was not witnessed in the use of alternative airway devices is of critical concern.

Regular formal training could further assist to ensure that adequate skill levels are obtained and maintained by all emergency centre clinicians.

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Competing interests:

None

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PART C: Addenda

1. African Journal of Emergency Medicine Relevant Instructions to Authors

Original Article: Original studies of basic or clinical investigations in areas relevant to emergency medicine. Reference to the relevance of the research in a resource poor setting is essential and should be alluded to in the discussion section. References and a structured abstract (see Preparation below) are required. Maximum length: 3,000 words, 5 tables and/or figures, plus the abstract (300 words) and references (max 50). The checklists found on the following websites should be used to structure your manuscript (a copy of the checklist indicating which elements of the reporting format you adhered to, a signed conflict of interest form and Additional material form- see below- should be submitted with your manuscript).

Article Structure

Ensure that author identifiers are not included in the main manuscript file submitted. Inclusion of an abstract in the manuscript is not required. Consult the guidance and checklists described in Types of Articles above to structure your manuscript correctly. All article types will require the signed conflict of interest form to be submitted as a supplementary file. Original articles, abbreviated papers, case reports and review articles will require the reporting checklist and Additional material form to be submitted as supporting files. Where these have not been supplied, the manuscript will be returned to the author.

Subdivision

Divide your article into clearly defined sections as per the guidance given in Types of Articles above. Numbers are not to be used for sections or subsections. Section headings should be in **bold**. Subsection headings should be in italics. Each heading should appear on its own separate line. Subsections in addition to the sections described in Types of Articles above should be used sparingly.

Essential	Title	Page	Information
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- *Title.*

Concise and informative. Titles are often used in information-retrieval systems. Avoid abbreviations and formulae where possible.

- **Author names and affiliations.** Where the family name may be ambiguous (e.g., a double name), please indicate this clearly. Present the authors' affiliation addresses (where the actual work was done) below the names. Indicate all affiliations with a lower-case superscript letter immediately after the author's name and in front of the appropriate address. Provide the full postal address of each affiliation, including the country name and, if available, the e-mail address of each author.

- **Corresponding author.** Clearly indicate who will handle correspondence at all stages of refereeing and publication, also post-publication. **Ensure that phone numbers (with country and area code) are provided in addition to the e-mail address and the complete postal address. Contact details must be kept up to date by the corresponding author.**

- **Present/permanent address.** If an author has moved since the work described in the article was done, or was visiting at the time, a 'Present address' (or 'Permanent address') may be indicated as a footnote to that author's name. The address at which the author actually did the work must be retained as the main, affiliation address. Superscript Arabic numerals are used for such footnotes.

- **Word count.** Please provide a word count

- **Table/figure count.** Please provide a table/ figure count

2. Consent forms and any related participant information sheets

Title of the research project: The availability and perceived knowledge of use of airway management devices in emergency centres at referral hospitals in Namibia

Appendix 1 – Data collection sheet.

Hospital:			
Basic airway devices	Types/Names/Similar	Available sizes	Working condition (Y/N)
Devices to provide supplementary oxygen			
Oxygen supply (oxygen supply/wall unit Nasal Cannula Face Mask Venturi Mask			
Oropharyngeal airway Nasopharyngeal airway			
Bag-Mask Ventilation			
Intubating guides	Types / Names / Similar	Available sizes*	Working condition (Y/N)
Stylets (malleable introducers)			
Tracheal Tube Introducers Eschmann Tracheal Tube Introducer (Gum elastic bougie) The Flex-Guide Flextrach ETTube Guide			
Intubating stylets	Types / Names / Similar	Available sizes*	Working condition
Directional Stylets			

Shroeder Directional Stylets			
Lighted stylets/wands Trachlight			

Fibre-optic Endoscopy Aids	Types / Names / Similar	Available sizes*	Working condition
Fibre-optic stylets (semi-rigid) Shikani Optical Stylet Levitan/FPS Scope			
Fibre-optic stylets (rigid) Bonfils Retromolar Intubating Fiberscope Airway RIFL Bullard laryngoscope UpsherScope WuScope			
Flexible fibre-optic bronchoscope			
Extra-glottic devices	Types / Names / Similar	Available sizes*	Working condition
Supra-glottic class: Laryngeal mask airways			

Disposable LMA-type designs (e.g. Ambu LMA) Cookgas ILA & Air Q CobraPLA Pharyngeal Airway Express (PAXpress)			
Infra(retro)-glottic class: Esophageal Obturator Airway Esophageal Tracheal Combitube King LT airway (Laryngeal Tube Airway) Rusch Easy Tube			
Scopes	Types / Names / Similar	Available sizes*	Working condition
Video laryngoscope GlideScope Karl Storz videoscope McGrath videoscope Pentax Airway Scope Res-Q-Scope II			
Optical laryngoscope Airtraq TruView EVO			
Surgical airway devices	Commercial set:	Self assembled (✓ if present):	
Needle cricothyriodotomy (with percutaneous jet ventilation)	Types / Names:	Equipment: IV catheter (12-16 G) 20-ml syringe High pressure O ₂ source High pressure O ₂ tubing Regulator On-off valve Luer lock / adaptor Other:	

Surgical cricothyriodotomy	<p>Types / Names:</p> <p>Direct airway placement devices (e.g. Nu-Trake, Pertrach):</p>	<p>Equipment:</p> <p>Trousseau dilator</p> <p>Tracheal Hook</p> <p>Scalpel with no 11 blade</p> <p>Cuffed, non-fenestrated no 4</p> <p>tracheostomy tube</p> <p>Gauze</p> <p>Two small haemostats</p> <p>Surgical drapes</p> <p>Other:</p>

Appendix 2 – Questionnaire

Title of the research project: The availability and perceived knowledge of use of airway management devices in emergency centres at referral hospitals in Namibia

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I, Kaveto Sikuvi, am the principal investigator of the research project regarding the availability and perceived knowledge of use of airway management devices in emergency centres at the referral hospitals in Namibia. This study is being conducted for degree purposes.

You are invited to participate in this research project because you are a member of staff at the emergency centre of this hospital. The study aims to determine which airway devices are available in

public emergency centres of referral hospitals in Namibia as well as to investigate the perceived level of knowledge regarding the use of all airway devices at these hospitals.

We would therefore like to request your participation in this study. Your participation is entirely voluntary and you are free to decline participation in which case, you will not be affected negatively. If you agree to participate but choose to withdraw at any time, you will not be penalised.

Completion of the questionnaire will take approximately 20 minutes. Your responses will be confidential and the result of this study will be used for scholarly purposes only. No identifying information such as your name, ID number or contact details is required. Recommendations and feedback will be given to the emergency centre management on conclusion of the study.

There are no anticipated risks or particular benefits associated with participation in the study. There are no incentives for your participation; however the result of the study will be used to give feedback and recommendations to the study hospitals and participating clinicians via emergency centre supervisors.

The study has been approved by the following research ethics committees:

1. The Human Research Ethics Committee (HREC)
 - Faculty of Health Sciences, University of Cape Town (Ref 339/2015),
 - Room E52-24 Old Main Building, Groote Schuur Hospital
 - Observatory 7925.
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Please contact the above ethics research committees if you have any ethical concern, or questions about your rights or welfare as a study participant.

Please contact me if anything is unclear.

Kind regards

Dr KA Sikuvi

Principal Investigator

Declaration by the participant:

Title of the research project: The availability and perceived knowledge of use of airway management devices in emergency centres at referral hospitals in Namibia

By marking a cross in the box below, I agree to take part in a research study **which aims to** determine the perceived level of knowledge regarding the use of all the airway devices in public emergency centres of referral hospitals in Namibia.

I declare that:

- I have read or had read to me this information and consent form and it is written in a language with which I am fluent and comfortable. I have had a chance to ask questions and all my questions have been adequately answered
- I understand that taking part in this study is voluntary and I have not been pressurised into taking part.
- I understand that all data collected in this research will be handled confidentially.

Signed at (place).....on (date).....

.....

Signature of participant

Declaration by investigator/ emergency centre supervisor:

I (name) declare that:

- I explained the information in this document to the participant
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that he/she adequately understands all aspects of the research as discussed
ab

Signed at (place).....on (date).....

.....

Signature of investigator/ emergency centre supervisor

3. Questionnaire/ data capture instrument

Title of the research project: The availability and perceived knowledge of use of airway management devices in emergency centres at referral hospitals in Namibia

PART A:

1. Please indicate your gender
 - a. Male
 - b. Female

2. Please indicate your age
 - a. 18-24
 - b. 25-34
 - c. 35-44
 - d. 45-54
 - e. 55-64
 - f. >65

3. What is your current rank?
 - a. Chief Medical Officer
 - b. Principle Medical Officer
 - c. Senior Medical Officer
 - d. Junior Medical Officer
 - e. Other (specify).....

4. For how long have you been working in the emergency centre?
 - a. >10yrs
 - b. 5-10yrs
 - c. 1-5yrs
 - d. <1yr

5. How competent are you in airway management?
 - a. Very competent
 - b. Competent

- c. Average
- d. Not competent
- e. Poor

6. Have you had any formal training on airway management?

- a. No formal training
- b. ACLS
- c. APLS/PALS
- d. ATLS
- e. NALS
- f. Other (specify).....

7. Please indicate your gender

- c. Male
- d. Female

8. Please indicate your age

- a. 18-24
- b. 25-34
- c. 35-44
- d. 45-54
- e. 55-64
- f. >65

9. What is your current rank?

- a. Chief Medical Officer
- b. Principle Medical Officer
- c. Senior Medical Officer
- d. Junior Medical Officer
- e. Other (specify).....

10. For how long have you been working in the emergency centre?

- a. >10yrs
- b. 5-10yrs
- c. 1-5yrs
- d. <1yr

11. How competent are you in airway management?




- a. Very competent
- b. Competent
- c. Average
- d. Not competent
- e. Poor




12. Have you had any formal training on airway management?




- g. No formal training
- h. ACLS
- i. APLS/PALS
- j. ATLS
- k. NALS
- l. Other (specify.....)





PART B:





Please answer each question within the block and circle your answer where applicable.





	<p>1. Please identify the airway management device.</p> <p>_____</p>	<p>2. Have you used it before?</p> <p>a) Yes b) No</p>	<p>3. If yes in Q2, what training did you receive to use it?</p> <p>a) No formal training b) ACLS c) APLS/PALS d) ATLS e) NALS Others(specify)</p>	<p>4. How competent are you in using this device?</p> <p>a) very competent b) competent c) average d) below average e) don't know</p>	<p>5. Do you think it is an essential piece of equipment?</p> <p>a) Yes b) No</p>
	<p>1. Please identify the airway management device.</p> <p>_____</p>	<p>2. Have you used it before?</p> <p>a) Yes b) No</p>	<p>3. If yes in Q2, what training did you receive to use it?</p> <p>a) No formal training b) ACLS c) APLS/PALS d) ATLS e) NALS f) Others(specify)</p>	<p>4. How competent are you in using this device?</p> <p>a) very competent b) competent c) average d) below average e) don't know</p>	<p>5. Do you think it is an essential piece of equipment?</p> <p>a) Yes b) no</p>
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	<p>1. Please identify the airway management device.</p> <p>_____</p>	<p>2. Have you used it before?</p> <p>a) Yes b) No</p>	<p>3. If yes in Q2, what training did you receive to use it?</p> <p>a) No formal training b) ACLS c) APLS/PALS d) ATLS e) NALS f) Others(specify)</p>	<p>4. How competent are you in using this device?</p> <p>a) very competent b) competent c) average d) below average e) don't know</p>	<p>5. Do you think it is an essential piece of equipment?</p> <p>a) Yes b) no</p>
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	<p>1. Please identify the airway management device.</p> <p>_____</p>	<p>2. Have you used it before?</p> <p>a) Yes b) No</p>	<p>3. If yes in Q2, what training did you receive to use it?</p> <p>a) No formal training b) ACLS c) APLS/PALS d) ATLS e) NALS f) Others(specify)</p>	<p>4. How competent are you in using this device?</p> <p>a) very competent b) competent c) average d) below average e) don't know</p>	<p>5. Do you think it is an essential piece of equipment?</p> <p>a) Yes b) no</p>
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4. Supplementary data

Appendix 3 – Supplementary data

Title of the research project: **The availability and perceived knowledge of use of airway management devices in emergency centres at referral hospitals in Namibia**

Table 1 Frequency of incorrect and correct answers, only for not available devices

Answer	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Incorrect	250	81.4	81.4	81.4
Correct	57	18.6	18.6	100.0
Total	307	100.0	100.0	

Table 2 Frequency of incorrect and correct answers, only for available devices

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Incorrect	160	31.6	31.6	31.6
Correct	347	68.4	68.4	100.0
Total	507	100.0	100.0	

Table 3 Proportion of correct and incorrect answers for available and not available devices, with X2 test (P=0.000)

Availability * Answer Cross tabulation

Count		Answer		Total
		Incorrect	Correct	
Availability	Not available	250	57	307
	Available	160	347	507
Total		410	404	814

Table 4 Proportion of correct and incorrect answers for participants who had training or no training, BUT only for the devices that are AVAILABLE, with X2 test (P=0.540)
training status * Answer Cross tabulation

		Answer		Total
		Incorrect	Correct	
training status	No training	57	114	171
	Training	103	233	336
Total		160	347	507

Table 5 Frequency of incorrect and correct answers, only for participants who are senior medical officers or higher, and only for available devices

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Incorrect	62	26.7	26.7	26.7
	Correct	170	73.3	73.3	100.0
Total		232	100.0	100.0	

Table 6 Frequency of incorrect and correct answers, only for participants who are junior medical officers or lower, and only for available devices

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Incorrect	98	35.6	35.6	35.6
	Correct	177	64.4	64.4	100.0
Total		275	100.0	100.0	

Table 7 Proportion of correct and incorrect answers for participants by professional rank, BUT only for the devices that are AVAILABLE, with X2 test (P=0.031)

Professional rank * Answer Cross tabulation

		Answer		Total
		Incorrect	Correct	
Professional_rank	higher than senior	62	170	232
	lower than junior	98	177	275
Total		160	347	507

Table 8 Proportion of correct and incorrect answers for participants by professional rank, with X2 test (P=0.012)

Professional rank * Answer Cross tabulation

		Answer		Total
		Incorrect	Correct	
Professional rank	higher than senior	171	204	375
	lower than junior	239	200	439
Total		410	404	814

Table 9 Frequency of incorrect and correct answers, only for basic airway management devices

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Incorrect	157	42.4	42.4	42.4

Correct	213	57.6	57.6	100.0
Total	370	100.0	100.0	

Table 10 Frequency of incorrect and correct answers, only for advanced airway management devices

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Incorrect	253	57.0	57.0	57.0
	Correct	191	43.0	43.0	100.0
	Total	444	100.0	100.0	

Table 11 Proportion of correct and incorrect answers by devices, basic airway management vs others, with X2 test (P=0.000)

Basic device * Answer Cross tabulation

		Answer		Total
		Incorrect	Correct	
Basic_device	Basic device	157	213	370
	Advanced device	253	191	444
Total		410	404	814

5. Acknowledgements

This study would not have been possible without the tremendous contributions from the following people.

My Supervisors for their encouragement, guidance and support

- Dr DJ Van Hoving (Division of Emergency Medicine, University of Cape Town and University of Stellenbosch)
- Dr Tyson B Welzel (Division of Emergency Medicine University of Cape Town)

6. Research Protocol

The availability and perceived knowledge of use of airway management devices in emergency centres at referral hospitals in Namibia

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Dr. DJ van Hoving
Division of Emergency Medicine
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1. Introduction

1.1. Background

Airway devices are adjunct tools that can be used to maintain a patent airway, such as facemasks for ventilation and laryngoscopes for direct visualisation during tracheal tube placement. (1) Since the 1940s there have been significant advances in airway management devices particularly due to the development of the Macintosh and Miller designed laryngoscope blades. Emerging technology continues to introduce new airway management devices as well as improve existing ones. (2)

Most patients seen in emergency centres can maintain their own airway.(1) However, some may require supplemental oxygen via basic or simple airway devices such as nasal prongs and facemasks. In a one year observational study by Sackles *et al*, 610 patients required airway control in an emergency centre that serves 60 000 patients annually. (3) Furthermore, only 0.29% of patients will require advanced airway intervention according to Wong *et al*. These include difficult airway devices such as laryngoscopes (curved or straight blades and gum elastic bougies) and surgical airway devices or alternative airway devices including laryngeal mask airways, needle cricothyroidotomy kits and oesophageal-tracheal twin-lumen airways (Combitubes).(4,5)

Although only the minority of patients will require advanced airway management, all emergency centres should be adequately equipped and prepared to deal with unexpected airway complications. (6) A survey undertaken by Hogg *et al* between October 2002 and May 2003 looked at the variations in the provision of resuscitation equipment in different clinical wards at 14 acute hospitals in the South West Thames, a resource rich region. There was no significant difference in provision of airway equipment or devices but emergency centres were undersupplied; less than 80% of airway management equipment was available.(7) Furthermore, availability of these devices in emergency centres is often limited in resource poor settings and there are few studies regarding the availability of such within this context.

More often than not, adverse respiratory events are due to inadequate or poor airway management.(8) The majority of adverse respiratory events during advanced airway management are due to inadequate ventilation (34%) followed by oesophageal intubation (18%) and difficult tracheal intubation (17%).(8) Inadequate oxygenation and ventilation leads to hypoxia and eventually death. Hence, airway control must be prioritised during the initial emergency centre assessment.

In order to reduce these adverse events, emergency centres should be sufficiently equipped with airway management devices and staffed with skilled clinicians that can facilitate adequate ventilation, endotracheal intubation as well as manage difficult airways effectively.(6) Additionally, knowledge of airway devices and their use is of the utmost importance for successful airway control by the clinicians in emergency centres.(9) This is evidenced by a large multicentre study undertaken by Sagarin *et al* which demonstrated a high success of airway management by emergency medicine residents over years of training. (5,11) Airway management skill performance may decline early after initial training but continuous independent practice and feedback is effective in maintaining skills or knowledge of airway management. (10)

1.2 Motivation

Airway management is a crucial component of patient management in every emergency centre. Doctors therefore need to be aware of the airway devices available to them and they must know how to use these devices in order to provide optimum health care. In Namibia, no studies regarding the availability and knowledge of airway devices in emergency centres have been undertaken. This study will be vital in providing such information so that recommendations relating to adequate access to airway devices can be made. Should it be found that doctors working in the emergency centres have inadequate knowledge of airway devices; training programmes can then be initiated. In this way, this study will contribute to improving the quality of emergency airway management in Namibia.

1.3. Research question

Which airway devices are available in public emergency centres of the referral hospitals in Namibia and what is the perceived level of knowledge regarding their use?

1.4. Aims

- i. To determine which airway devices are available in public emergency centres of referral hospitals in Namibia
- ii. To determine the perceived level of knowledge regarding the use of available airway devices in public emergency centres of referral hospitals in Namibia.

2. Methodology

2.1. Study design

A cross-sectional study design will be used.

2.2. Study Setting

The study will take place in Namibia where health facilities are divided into five categories, determined by the level of health care services offered (Table 1). (11,12)

Table 1. Categories and number of health facilities in Namibia

Hospital Category	Number of health facilities
National referral hospital	1
Referral/intermediate hospitals	3
District hospitals	30
Health centres	40
Clinics	260
Total	334

2.3. Study population

The emergency centres of all three referral/intermediate hospitals and the one national referral hospital in Namibia will be included in the study (Table 2). The three intermediate hospitals are located in the centre, north and north east of Namibia. All patients from primary level health care services (i.e. clinics, health centres and district hospitals) that require more specialised care are referred to these intermediate level hospitals from around the country; thus each facility serves a large proportion of the Namibian population. Patients that require even more specialised care are then referred from the intermediate level hospitals to the national referral hospital which in turn serves the entire country. Patients that require referral to intermediate and national level health care facilities are often critically ill and frequently require airway management.

2.3.1. Study sample:

All clinicians working in the emergency centres of the study hospitals will be eligible to participate in the study. (see table 2).

Table2. Study hospitals and the number of medical officers working in the emergency centres

Hospital	Number of clinicians (medical officers)
Katutura state hospital and Windhoek central hospital	12*
Oshakati state hospital	10
Rundu state hospital	8
Total	30

* The same doctors works at both Katutura state hospital and Windhoek central hospital emergency centres

2.3.2. Inclusion criteria:

All medical officers working in the emergency centres of the study hospitals

2.3.3. Exclusion criteria:

Medical students, interns and specialists recognised by the Health Professions Council of Namibia

Study Hospital	Location	Category	Type of emergency
Windhoek Central Hospital	Windhoek, Khomas region, Central Namibia	National referral Hospital	Adult and paediatric Trauma and medical
Katutura State Hospital	Windhoek, Khomas region, Central Namibia	Referral/intermediate hospital	Adult and paediatric Trauma and medical
Rundu State Hospital	Rundu, Kavango region, North East Namibia	Referral/intermediate hospital	Adult and paediatric Trauma and medical
Oshakati State Hospital	Oshakati, Oshana region, Northern Namibia	Referral/intermediate hospital	Adult and paediatric Trauma and medical

Table 3. Study hospitals

2.4. Data collection and management

Data will be collected by the principal investigator by means of a site inspection and questionnaire distribution. A standardised data collection sheet, completed by the principal investigator during inspection will be used to assess the availability of airway devices in the emergency centres (Appendix 1). A questionnaire will be used to assess the perceived knowledge of use of airway devices (Appendix 2).

Due to time constraints, the principal investigator will spend a maximum of two days at each study hospital to distribute the questionnaire to participants working shifts. In order to ensure that all clinicians are approached to participate, questionnaires will be given to the emergency centre supervisors to distribute to the clinicians who were not present at the time of initial data collection. A box will be provided in the emergency centre supervisor's office where participants may leave their completed questionnaires. Follow up telephone calls will be made by the principle investigator to the emergency centre supervisors on day 3 and day 6 after the visit to ensure that the remaining participants have submitted their questionnaires. The completed questionnaires will be faxed or scanned and emailed to the principal investigator and the original paper questionnaire will be shredded and discarded. Data collected during the principle investigator's visit and data collected one week later will be used for the study.

The questionnaire will be paper-based thus ensuring participation by all clinicians regardless of computer literacy. No personal identification particulars of the participating clinicians will be required thus maintaining anonymity and confidentiality. Data will be manually transferred to a password-protected Microsoft Excel spreadsheet. Following this, the remaining paper questionnaires will be

shredded and discarded. The captured electronic data will be saved on a password protected computer.

2.5. Timeline

Upon ethics approval, the study will be completed within 7 months (see table below).

Task	Time Frame						
	May	June	July	August	September	November	December
Ethic approval	X						
Consent from study hospitals		X					
Data collection and management			X	X			
Statistical analysis					X		
Writing					X	X	
Preparation for submission							X

3. Statistical analysis

The investigator will analyse the captured data. The study aim to describe the availability and perceived knowledge of airway management devices in emergency centres in Namibia therefore descriptive summary statistics such as the average, mean or median and variable distributions will be presented via histograms and frequency tables. These include measures of central tendencies and measures of dispersion.

The following variables will be analysed: Gender, age, sex, working experience in emergency centres as well as competency in airway management. Data processing will involve placing collected data into table formats for further analysis on a standardised spread. Correlation and/or causation will be used to identify relationships among the variables. Data cleaning via column segmentation, deduplication and Microsoft word spell checker will be used to correct errors.

4. Ethical and legal considerations

In addition to local ethics review, once obtained, the study will also be presented for local ethics review prior to the start of data collection.

4.1 Autonomy

Written permission will be obtained from the management of the study hospitals prior to data collection. The participation in the study by the clinicians is voluntary, and the clinicians may choose not to participate. The clinicians may decide to withdraw from the study at any time. Informed written consent (appendix 2) will be taken from all participants before distributing an anonymous questionnaire. Informed consent documents and questionnaires will be kept separately and the questionnaire doesn't contain the participants' names.

4.2 Justice

No personal identification from the participating clinicians is required and confidentiality of participants will be guarded. Participating clinicians will not be penalised if they decide not to participate or withdraw from the study. The participants will be clearly informed that whether or not they participate in the study, it will not in any way affect their working conditions. Data collected will be entered into a password protected electronic spreadsheet which will only be accessible by the research team.

4.3 Beneficence

There are no anticipated risks or particular benefits associated with participation in the study. The result of the study will be used to give feedback and recommendations to the study Hospitals and participating clinicians via emergency centre supervisors.

The Ministry of Health Management Research Committee in Windhoek, Namibia will be approached to review this protocol once UCT HREC approval has been obtained.

5. Limitations

The study will only investigate the availability and perceived knowledge of use of airway devices in emergency centres. Therefore further research is required to determine the practical skills of the clinicians on the use of airway devices. Since there is no existing research on this topic in Namibia, no comparisons can be made regarding the improvement in perceived knowledge of use of airway devices by clinicians.

Distance between district hospitals and between health centres has limited the study to referral/intermediate hospitals only; therefore the results of the study might not be generalizable to all hospitals in Namibia. Further studies will be required to investigate airway devices and perceived knowledge of such at district hospitals, health centres and clinics.

Data collection by a single investigator may create bias in the study and errors during transferral of paper-based data to electronic datasheets are possible. This may in turn influence the study conclusions and consequently affect the validity of the study.

6. Reporting and implementation of results:

The study results will be reported in a peer reviewed journal. Participating emergency centre and hospital management teams will be given feedback regarding the study outcomes and recommendations to improve management of compromised airways at these institutions will be made. If it is found that the clinicians' knowledge of use of airway devices is poor, then recommendations for airway management courses will be made to the participating hospitals. Further recommendations to extend airway management educational programmes to the School of Medicine as well as to other governmental healthcare facilities around the country will also be made.

7. Resources

7.1. Available resources

There is an existing four-year scholarship agreement between the Namibian Students Financial Assistance Fund (NSFAF) and the primary investigator for specialisation in emergency medicine. This institution will be approached to provide further funding for the study and in the event that such a request for financial assistance cannot be granted, the following institutions will be approached for funding:

- Windhoek Central Hospital, Namibia
- University of Namibia School of Medicine

7.2. Budget and budget motivation:

The budget for the study is R 30 890.75. A detailed budget is attached (Appendix 3).

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Appendices

Title of the research project: The availability and perceived knowledge of use of airway management devices in emergency centres at referral hospitals in Namibia

Appendix 1 – Data collection sheet.

Hospital:			
Basic airway devices	Types/Names/Similar	Available sizes	Working condition (Y/N)
Devices to provide supplementary oxygen			
Oxygen supply(oxygen supply/wall unit Nasal Cannula Face Mask Venturi Mask			
Oropharyngeal airway Nasopharyngeal airway			
Bag-Mask Ventilation			
Intubating guides	Types / Names / Similar	Available sizes*	Working condition (Y/N)
Stylets (malleable introducers)			
Tracheal Tube Introducers Eschmann Tracheal Tube Introducer (Gum elastic bougie) The Flex-Guide Flextrach ETTube Guide			
Intubating stylets	Types / Names / Similar	Available sizes*	Working condition

Directional Stylets Shroeder Directional Stylets			
Lighted stylets/wands Trachlight			

Fibre-optic Endoscopy Aids	Types / Names / Similar	Available sizes*	Working condition
Fibre-optic stylets (semi-rigid) Shikani Optical Stylet Levitan/FPS Scope			
Fibre-optic stylets (rigid) Bonfils Retromolar Intubating Fiberscope Airway RIFL Bullard laryngoscope UpsherScope WuScope			
Flexible fibre-optic bronchoscope			
Extra-glottic devices	Types / Names / Similar	Available sizes*	Working condition
Supra-glottic class: Laryngeal mask airways Disposable LMA-type designs (e.g. Ambu LMA) Cookgas ILA & Air Q CobraPLA Pharyngeal Airway Express (PAXpress)			
Infra(retro)-glottic class: Esophageal Obturator Airway Esophageal Tracheal Combitube King LT airway (Laryngeal Tube Airway) Rusch Easy Tube			

Scopes	Types / Names / Similar	Available sizes*	Working condition
Video laryngoscope GlideScope Karl Storz videoscope McGrath videoscope Pentax Airway Scope Res-Q-Scope II			
Optical laryngoscope Airtraq TruView EVO			
Surgical airway devices	Commercial set:	Self assembled (✓ if present):	
Needle cricothyriodotomy (with percutaneous jet ventilation)	Types / Names:	Equipment: IV catheter (12-16 G) 20-ml syringe High pressure O ₂ source High pressure O ₂ tubing Regulator On-off valve Luer lock / adaptor Other:	

Surgical cricothyriodotomy	<p>Types / Names:</p> <p>Direct airway placement devices (e.g. Nu-Trake, Pertrach):</p>	<p>Equipment:</p> <p>Trousseau dilator</p> <p>Tracheal Hook</p> <p>Scalpel with no 11 blade</p> <p>Cuffed, non-fenestrated no 4 tracheostomy tube</p> <p>Gauze</p> <p>Two small haemostats</p> <p>Surgical drapes</p> <p>Other:</p>
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Appendix 2 – Questionnaire

Title of the research project: The availability and perceived knowledge of use of airway management devices in emergency centres at referral hospitals in Namibia

Student: Dr. Kaveto A Sikuvi
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I, Kaveto Sikuvi, am the principal investigator of the research project regarding the availability and perceived knowledge of use of airway management devices in emergency centres at the referral hospitals in Namibia. This study is being conducted for degree purposes.

You are invited to participate in this research project because you are a member of staff at the emergency centre of this hospital. The study aims to determine which airway devices are available in

public emergency centres of referral hospitals in Namibia as well as to investigate the perceived level of knowledge regarding the use of all airway devices at these hospitals.

We would therefore like to request your participation in this study. Your participation is entirely voluntary and you are free to decline participation in which case, you will not be affected negatively. If you agree to participate but choose to withdraw at any time, you will not be penalised.

Completion of the questionnaire will take approximately 20 minutes. Your responses will be confidential and the result of this study will be used for scholarly purposes only. No identifying information such as your name, ID number or contact details is required. Recommendations and feedback will be given to the emergency centre management on conclusion of the study.

There are no anticipated risks or particular benefits associated with participation in the study. There are no incentives for your participation; however the result of the study will be used to give feedback and recommendations to the study hospitals and participating clinicians via emergency centre supervisors.

The study has been approved by the following research ethics committees:

- The Human Research Ethics Committee (HREC)
- Faculty of Health Sciences, University of Cape Town (Ref 339/2015),
- Room E52-24 Old Main Building, Groote Schuur Hospital
- Observatory 7925.
- Tel.: +27 21 406 6338 · Fax: +27 21 406 6411.
- Email: sumayah.ariefdien@uct.ac.za
- The Ministry of Health Management Research Committee (Namibia)
- Directorate of Human Resource and Development
- 2nd floor, Ministerial Building Room 20. Harvey Street, Windhoek.
- Tel: +264 61 203 2125
- Fax: +264 61 222558

Please contact the above ethics research committees if you have any ethical concern, or questions about your rights or welfare as a study participant.

Please contact me if anything is unclear.

Kind regards

Dr K.A. Sikuvi
Principal Investigator

Declaration by the participant:

Title of the research project: The availability and perceived knowledge of use of airway management devices in emergency centres at referral hospitals in Namibia

By marking a cross in the box below, I agree to take part in a research study **which aims to** determine the perceived level of knowledge regarding the use of all the airway devices in public emergency centres of referral hospitals in Namibia.

I declare that:

- I have read or had read to me this information and consent form and it is written in a language with which I am fluent and comfortable. I have had a chance to ask questions and all my questions have been adequately answered
- I understand that taking part in this study is voluntary and I have not been pressurised into taking part.
- I understand that all data collected in this research will be handled confidentially.

Signed at (place).....on (date).....

.....

Signature of participant

Declaration by investigator/ emergency centre supervisor:

I (name) declare that:

- I explained the information in this document to the participant
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that he/she adequately understands all aspects of the research as discussed ab

Signed at (place).....on (date).....

.....

Signature of investigator/ emergency centre supervisor

Title of the research project: The availability and perceived knowledge of use of airway management devices in emergency centres at referral hospitals in Namibia

PART A:

13. Please indicate your gender

- e. Male
- f. Female

14. Please indicate your age

- a. 18-24
- b. 25-34
- c. 35-44
- d. 45-54
- e. 55-64
- f. >65

15. What is your current rank?

- a. Chief Medical Officer
- b. Principle Medical Officer
- c. Senior Medical Officer
- d. Junior Medical Officer
- e. Other (specify).....

16. For how long have you been working in the emergency centre?

- a. >10yrs
- b. 5-10yrs
- c. 1-5yrs
- d. <1yr

17. How competent are you in airway management?

- a. Very competent
- b. Competent
- c. Average

- d. Not competent
- e. Poor




18. Have you had any formal training on airway management?




- m. No formal training
- n. ACLS
- o. APLS/PALS
- p. ATLS
- q. NALS
- r. Other (specify.....)




Title of the research project: The availability and perceived knowledge of use of airway management devices in emergency centres at referral hospitals in Namibia





PART B:





Please answer each question within the block and circle your answer where applicable.





	<p>1. Please identify the airway management device.</p> <p>_____</p>	<p>2. Have you used it before?</p> <p>c) Yes d) No</p>	<p>3. If yes in Q2, what training did you receive to use it?</p> <p>f) No formal training g) ACLS h) APLS/PALS i) ATLS j) NALS Others(specify)</p>	<p>4. How competent are you in using this device?</p> <p>e) very competent f) competent g) average h) below average e) don't know</p>	<p>5. Do you think it is an essential piece of equipment?</p> <p>c) Yes d) No</p>
	<p>1. Please identify the airway management device.</p> <p>_____</p>	<p>2. Have you used it before?</p> <p>c) Yes d) No</p>	<p>3. If yes in Q2, what training did you receive to use it?</p> <p>f) No formal training g) ACLS h) APLS/PALS i) ATLS j) NALS f) Others(specify)</p>	<p>4. How competent are you in using this device?</p> <p>e) very competent f) competent g) average h) below average e) don't know</p>	<p>5. Do you think it is an essential piece of equipment?</p> <p>a) Yes b) no</p>
	<p>1. Please identify the airway management device.</p> <p>_____</p>	<p>2. Have you used it before?</p> <p>c) Yes d) No</p>	<p>3. If yes in Q2, what training did you receive to use it?</p> <p>l) No formal training m) ACLS n) APLS/PALS o) ATLS p) NALS q) Others(specify)</p>	<p>4. How competent are you in using this device?</p> <p>f) very competent g) competent h) average i) below average j) don't know</p>	<p>5. Do you think it is an essential piece of equipment?</p> <p>a) Yes b) no</p>

	<p>1. Please identify the airway management device.</p> <p>_____</p>	<p>2. Have you used it before?</p> <p>c) Yes d) No</p>	<p>3. If yes in Q2, what training did you receive to use it?</p> <p>f) No formal training g) ACLS h) APLS/PALS i) ATLS j) NALS f) Others(specify)</p>	<p>4. How competent are you in using this device?</p> <p>f) very competent g) competent h) average i) below average j) don't know</p>	<p>5. Do you think it is an essential piece of equipment?</p> <p>a) Yes b) no</p>
	<p>1. Please identify the airway management device.</p> <p>_____</p>	<p>2. Have you used it before?</p> <p>c) Yes d) No</p>	<p>3. If yes in Q2, what training did you receive to use it?</p> <p>g) No formal training h) ACLS i) APLS/PALS j) ATLS k) NALS l) Others(specify)</p>	<p>4. How competent are you in using this device?</p> <p>f) very competent g) competent h) average i) below average j) don't know</p>	<p>5. Do you think it is an essential piece of equipment?</p> <p>a) Yes b) no</p>
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	<p>1. Please identify the airway management device.</p> <p>_____</p>	<p>2. Have you used it before?</p> <p>c) Yes d) No</p>	<p>3. If yes in Q2, what training did you receive to use it?</p> <p>r) No formal training s) ACLS t) APLS/PALS u) ATLS v) NALS f) Others(specify)</p>	<p>4. How competent are you in using this device?</p> <p>f) very competent g) competent h) average i) below average j) don't know</p>	<p>5. Do you think it is an essential piece of equipment?</p> <p>a) Yes b) no</p>
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	<p>1. Please identify the airway management device.</p> <p>_____</p>	<p>2. Have you used it before?</p> <p>c) Yes d) No</p>	<p>3. If yes in Q2, what training did you receive to use it?</p> <p>f) No formal training g) ACLS h) APLS/PALS i) ATLS j) NALS f) Others(specify)</p>	<p>4. How competent are you in using this device?</p> <p>f) very competent g) competent h) average i) below average j) don't know</p>	<p>5. Do you think it is an essential piece of equipment?</p> <p>a) Yes b) no</p>

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	<p>1. Please identify the airway management device.</p> <p>_____</p>	<p>2. Have you used it before?</p> <p>c) Yes d) No</p>	<p>3. If yes in Q2, what training did you receive to use it?</p> <p>f) No formal training g) ACLS h) APLS/PALS i) ATLS j) NALS f) Others(specify)</p>	<p>4. How competent are you in using this device?</p> <p>e) very competent f) competent g) average h) below average e) don't know</p>	<p>5. Do you think it is an essential piece of equipment?</p> <p>a) Yes b) no</p>

	<p>1. Please identify the airway management device.</p> <p>_____</p>	<p>2. Have you used it before?</p> <p>c) Yes d) No</p>	<p>3. If yes in Q2, what training did you receive to use it?</p> <p>f) No formal training g) ACLS h) APLS/PALS i) ATLS j) NALS f) Others(specify)</p>	<p>4. How competent are you in using this device?</p> <p>e) very competent f) competent g) average h) below average e) don't know</p>	<p>5. Do you think it is an essential piece of equipment?</p> <p>a) Yes b) no</p>
	<p>1. Please identify the airway management device.</p> <p>_____</p>	<p>2. Have you used it before?</p> <p>c) Yes d) No</p>	<p>3. If yes in Q2, what training did you receive to use it?</p> <p>f) No formal training g) ACLS h) APLS/PALS i) ATLS j) NALS f) Others(specify)</p>	<p>4. How competent are you in using this device?</p> <p>f) very competent g) competent h) average i) below average j) don't know</p>	<p>5. Do you think it is an essential piece of equipment?</p> <p>a) Yes b) no</p>
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	<p>1. Please identify the airway management device.</p> <p>_____</p>	<p>2. Have you used it before?</p> <p>c) Yes d) No</p>	<p>3. If yes in Q2, what training did you receive to use it?</p> <p>f) No formal training g) ACLS h) APLS/PALS i) ATLS j) NALS f) Others(specify)</p>	<p>4. How competent are you in using this device?</p> <p>e) very competent f) competent g) average h) below average f) don't know</p>	<p>5. Do you think it is an essential piece of equipment?</p> <p>a) Yes b) no</p>

	<p>1. Please identify the airway management device.</p> <p>_____</p>	<p>2. Have you used it before?</p> <p>c) Yes d) No</p>	<p>3. If yes in Q2, what training did you receive to use it?</p> <p>f) No formal training g) ACLS h) APLS/PALS i) ATLS j) NALS f) Others(specify)</p>	<p>4. How competent are you in using this device?</p> <p>f) very competent g) competent h) average i) below average j) don't know</p>	<p>5. Do you think it is an essential piece of equipment?</p> <p>a) Yes b) no</p>
	<p>1. Please identify the airway management device.</p> <p>_____</p>	<p>2. Have you used it before?</p> <p>c) Yes d) No</p>	<p>3. If yes in Q2, what training did you receive to use it?</p> <p>f) No formal training g) ACLS h) APLS/PALS i) ATLS j) NALS f) Others(specify)</p>	<p>4. How competent are you in using this device?</p> <p>f) very competent g) competent h) average i) below average j) don't know</p>	<p>5. Do you think it is an essential piece of equipment?</p> <p>a) Yes b) no</p>
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f) very competent
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5. Do you think it is an essential piece of equipment?
a) Yes
b) no

Title of the research project: The availability and perceived knowledge of use of airway management devices in emergency centres at referral hospitals in Namibia

Appendix 3 - Detailed budget

	Unit cost	Total cost
Personnel Compensation		R 0
Consulting services		R 0
Statistical services (@ R175 per hour)	R 0	
Travel*		
Transport	R3,50 x 4 894km	R 17 129.00
Accommodation	R 1150 x 8 nights	R 9 200.00
Equipment & Furniture		R 0
Stationary		R 120.00
Telephone / Internet		R 850.00
Total direct cost		R 27 299.00
Inflation (10%)		R 2 729.90
Total costs		R30 028, .00

Travel breakdown *

	Sleep over	distance(Km)	Cost at R3.50/Km (Calculated according to UCT FND_Mileage_PAY004)
Trip 1: Cape Town to Windhoek	Windhoek 3nights	1 477	R 5 169.50
Trip 2: Windhoek to Rundu	Rundu 2nights	720	R 2 520.00
Trip 3: Rundu to Oshakati	Oshakati 2nights	500	R 1 750.00
Trip 4: Oshakati to Windhoek	Windhoek 1night	720	R 2 520.0
Trip 5: Windhoek to Cape Town		1 477	R 5 169.50
Total		4 894	R 17 129.00

7. HREC approval letter

8. Ministry of Health Management Research Committee (Namibia) approval letter



REPUBLIC OF NAMIBIA

Ministry of Health and Social Services

Private Bag 13198
Windhoek
Namibia

Ministerial Building
Harvey Street
Windhoek

Tel: 061 - 203 2125
Fax: 061 - 222558
E-mail: msimasiku@mhss.gov.na

OFFICE OF THE PERMANENT SECRETARY

Ref: 17/3/3

Enquiries: Mr. M. Simasiku

Date: 22nd July 2015

Dr. Kaveto Andreas Sikuvi
P.O. Box 44982
Claremont, 7735
Cape Town
South Africa

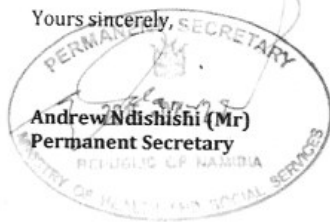
Dear Dr. Sikuvi

Re: The availability and perceived knowledge of use of airway management devices in emergency centres at referral hospitals in Namibia.

1. Reference is made to your application to conduct the above-mentioned study.
2. The proposal has been evaluated and found to have merit.
3. **Kindly be informed that permission to conduct the study has been granted under the following conditions:**
 - 3.1 The data to be collected must only be used for operational purpose;
 - 3.2 No other data should be collected other than the data stated in the proposal;
 - 3.3 Stipulated ethical considerations in the protocol related to the protection of Human Subjects should be observed and adhered to, any violation thereof will lead to termination of the study at any stage,

- 3.4 A quarterly report to be submitted to the Ministry's Research Unit;
- 3.5 Preliminary findings to be submitted upon completion of the study;
- 3.6 Final report to be submitted upon completion of the study;
- 3.7 Separate permission should be sought from the Ministry for the publication of the findings.

Yours sincerely,



"Health for All"