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## Qualitative exploration of nurses' perspectives on clinical oxygen administration in Ghana

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### ABSTRACT

**Background:** Oxygen therapy is an integral part of emergency and immediate post-operative management.

**Objectives:** The study sought to gain full understanding on nurses' perspectives on clinical administration of oxygen within the emergency and immediate post-operative environment.

**Methods:** The study employed a descriptive qualitative design to achieve its objectives. The study was conducted at the adult emergency unit, Surgical Medical Emergency, and the Cardiothoracic Intensive Care Unit of the Korle-Bu Teaching Hospital (KBTH). The target population was nurses. A purposive sample of 12 nurses; six from each unit were involved in the study. Data was collected through individual face-to-face interviews which were audiotaped and transcribed verbatim. Data was analyzed concurrently applying the principles of content analysis.

**Results:** Themes generated on commencement and monitoring of oxygen therapy included initiation of oxygen therapy, and assessment and monitoring of patient. Other themes on challenges of oxygen therapy were knowledge and information gap, lack of protocol, availability and cost of delivery devices, and oxygen supply.

**Conclusion:** Nurses require further training in oxygen therapy and there is the need to develop appropriate protocols to guide oxygen therapy.

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### 1. Introduction

Oxygen is one of the most widely prescribed drugs in clinical practice and its use started many years ago. Joseph Priestley discovered the oxygen element in 1774 and it was named oxygen by Lavoisier (Martin, 2011). Oxygen is a component of air and an indispensable element of life; it is symbolized as O<sub>2</sub>. Oxygen is commonly used in the emergency and postoperative care. It is life saving and part of first line treatment in many critical conditions (Varvinski & Hunt, 2000). Oxygen can therefore be used in hospital, pre-hospital or community settings; depending on the needs of the patient and the views of the medical professional advising the care regimen (Howie et al., 2009). Porter-Jones (2002) explained that regardless of the setting in which oxygen is delivered; it should be regarded as a drug. Its potency in treating hypoxemia (a low concentration of oxygen in the blood) is often underestimated

and, if given inappropriately, it can be lethal. Hence, patients must receive this therapy in an appropriate, safe and comfortable way.

Oxygen can be administered in high or low concentrations in Chronic Obstructive Pulmonary Disease (COPD) where there is a risk for hypercarbia (high concentration of carbon dioxide in circulating blood). In acute lung conditions such as asthma, pulmonary oedema, a higher concentration of oxygen is administered (Singh, Singh, Singh, Brar, & Singh, 2001). Also, oxygen is required in conditions such as cardiac and respiratory arrest, systemic hypotension, low cardiac output and metabolic acidosis, and respiratory distress (O'Driscoll, Howard, Davison, & British Thoracic Society, 2008; Varvinski & Hunt, 2000).

Hypoxemia is reduced when a concentration of 24% oxygen is administered to improve oxygenation (Singh et al., 2001). It is observed that oxygen therapy has no specific contraindications, but like most other drugs, it can cause adverse reactions and complications (Henderson, 2008; Stich & Cassella, 2009). It therefore needs to be administered cautiously to patients with chronic obstructive pulmonary disease who have a hypoxic respiratory drive. Thus, awareness is required on the risk of oxygen toxicity

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(Henderson, 2008; Stich & Cassella, 2009). It is important that health professionals acquire appropriate knowledge to select the required dose and delivery method that suits the patient's needs and therapeutic dose (Ganeshan, Hon, & Soonawalla, 2006). It is noted that oxygen deficiency leads to deleterious effects on all organs of the body and it causes cell dysfunction and death (Brokalaki et al., 2004; Henderson, 2008). Therefore, there is the need for adequate assessment and monitoring of patients on oxygen therapy.

Records at the Korle-Bu Teaching Hospital (KBTH) indicate that the hospital uses about 600 m<sup>3</sup> of cylinder oxygen per month on the average and about 90% of the patients admitted at the Surgical Medical Emergency (SME) ward receive some amount of oxygen. However, the perspectives of nurses who administer oxygen are not fully understood within the Ghanaian clinical environment. Research findings elsewhere also show that oxygen use is poorly understood by health professionals including nurses (Ganeshan et al., 2006). Therefore, the purpose of this study was to gain in-depth understanding of the perspectives of nurses on clinical administration of oxygen.

## 2. Methods

### 2.1. Design

The study employed qualitative research approach with exploratory and descriptive design that allowed in-depth understanding of the perspectives of nurses on clinical oxygen therapy. Qualitative research affords in-depth understanding of phenomenon and represents data that preserves the participants' world (De Vos, Strydom, Fouché, & Delpont, 2011). Hence, the nurses' world regarding clinical administration of oxygen was fully described using this research approach.

### 2.2. Setting

The study was conducted at the Surgical Medical Emergency (SME) and the Cardiothoracic Intensive Care Unit (ICU) of the Korle-Bu Teaching Hospital (KBTH). The KBTH is a tertiary health facility located in Accra, Ghana. It is the first Teaching Hospital in Ghana and has facilities for specialist care such as urology, cardiology, obstetrics and gynaecology among others. The SME and the ICU have facilities for oxygen therapy and patients admitted to these two units are frequently given oxygen; therefore these units were involved in this study. The SME had 7 nurses and 6 doctors per shift and 50 patients per day averagely at the time of study. The total number of professional nurses was 16. The ICU also had 4 patients per day, 2 doctors and 3 nurses per shift. The total number of nurses was 20.

### 2.3. Population and sampling

The study targeted professional nurses who work at the SME and surgical ICU. The inclusion criterion was that the nurse should have worked at these units for a minimum of two years. Exclusion criteria were nurses who had spent less than two years at the unit, those who were not qualified nurses, and orientation/student nurses. Purposive sampling technique was used to recruit nurses who met the inclusion criterion and consented to participate in the study.

### 2.4. Ethics and recruitment of participants

The study was approved by the Institutional Review Board of the Noguchi Memorial Institute of Medical Research at the

University of Ghana. Appropriate institutional and unit permissions were obtained. Individual informed consent was obtained from all participants. Anonymity and confidentiality were explained to participants and they were assured of free withdrawal from the study at any time and that such withdrawal will not affect their employment status. Participants were given the information sheet of the study and the consent form was signed within a week. This gave the nurses ample time to decide to be part of the study. Biographic data were separated from transcripts to ensure that data is not linked to individual participants.

### 2.5. Data collection and management

Data was collected through individual face-to-face in-depth interviews. The days and venues of the interviews were at the convenience of participants. Interviews lasted for about forty-five (45) minutes to one hour. The interviews focused on issues relating to administration of clinical oxygen. Also, participants were told that there were no right or wrong answers to questions asked. Guiding questions included: 'could you please tell me about oxygen use in your Unit?' 'Please tell me how you administer oxygen to your patients'. Follow-up questions were asked during the interview based on participants' responses to gain full understanding of issues of oxygen therapy. During the interviews, there was attentive listening and comments were paraphrased to ensure understanding (De Vos et al., 2011). A tape recorder with micro cassette was used to record the interviews and the interviews were later transcribed verbatim. All the interviews were conducted in English. The first author conducted all the interviews. The transcripts were saved on a password protected computer to promote confidentiality. Also, copies of data were saved on pen drive to prevent data loss and hard copies were printed for analysis.

### 2.6. Data analysis

Data analysis was done concurrently with data collection to ensure that themes that emerged from the data were saturated. Transcripts were read several times to gain an understanding of the participants' world. The data analysis followed the steps of content analysis (Miles & Huberman, 1994) and data was managed manually. Data was coded and categorized and themes were developed. The major themes developed were clinical oxygen therapy and challenges of oxygen therapy. Sub-themes for these themes were identified from the data and presented at the results section. The authors reviewed and discussed the categories and themes to ensure the participants' world were faithfully represented. Field notes were also reviewed to add depth to the analysis. Identification (ID) codes were used to present verbatim quotes.

### 2.7. Rigor

Rigor or trustworthiness was ensured by applying the principles of credibility, dependability, confirmability and transferability (Lincoln & Guba, 1985). Member checking was done by verifying interpretations of data generated from participants enhance credibility and confirmability. To ensure dependability, all participants were interviewed using the same interview guide. A detailed description of the research process was done for other researchers to replicate the study in a similar setting. Also, peer debriefing was done where authors discussed themes to ensure all aspects of the data was covered. Transferability was ensured by using a detailed description and documentation of all stages in the research process so that other researchers can carry out a similar study.

### 3. Findings

#### 3.1. Participant characteristics

The participants were made up of twelve (12) nurses (6 from ICU and 6 from SME). They were aged between 25 and 55 years. Some of the nurses were graduate nurses (BSc nursing), critical care nurses (advanced diploma), registered general nurses (diploma), and State Registered Nurses (certificate). The nurses had worked at their present unit (SME or ICU), for a period ranging from 2 years to 10 years.

The study revealed themes that described perspectives of nurses on clinical oxygen therapy such as initiation of therapy, patient assessment and monitoring; and perspectives on challenges of oxygen therapy such as knowledge and information gap, lack of protocol, availability and cost of delivery device, workload, and oxygen supply.

The perspectives of participants on clinical oxygen therapy describe the initiation of oxygen therapy and patient assessment before the commencement of the therapy and monitoring of patient during the oxygen therapy.

#### 3.2. Initiation of oxygen therapy

Oxygen therapy was indicated for patients with respiratory distress or patients who had undergone surgery. Oxygen was prescribed by the doctors but administered by nurses. However, in emergency situations, nurses administered oxygen without doctor's prescription. Nurses initiated O<sub>2</sub> therapy based on knowledge gained during training and experience. A participant from the SME said, they took the initiative when they thought the patient was in distress;

*'Most of the time when the patient comes in and you observe and think that he is in distress and needs O<sub>2</sub>, we give; but most often, it is the doctor who gives the instruction'. (SME1)*

#### 3.3. Patient assessment and monitoring

All the nurses did some form of assessment before they administered oxygen to patients. Some of the participants in the ICU used gadgets such as the pulse oximeter or took blood sample for blood gas analysis to assess the condition of the patient.

*'...we normally check our arterial blood gases because the patients who come are put on the pulse oximeter so we check their O<sub>2</sub> saturation. But if we are not convinced we do our ABGs (arterial blood gases) to see whether it tallies with the SPO<sub>2</sub> (oxygen saturation) and afterwards, we decide on what to do'. (ICU1)*

However, at the SME, nurses did not have access to pulse oximeter or the blood gas analyzer to assess the oxygen saturation before administration. Hence, they assessed patients by using the signs and symptoms and the vital signs.

*'...we use vital signs especially the respiratory rate because we do not have instruments to assess the oxygen level. So, it is the vital signs especially respiratory rate, the B/P (blood pressure) and the pulse that we use'. (SME2)*

Some of the participants at the SME did not do any specific monitoring except the routine four (4) hourly monitoring of the vital signs.

*'We don't do any special monitoring if the patient is on oxygen; we check the vitals 4-hourly just like all the other patients'. (SME3)*

In addition, the nurses perceived challenges of clinical oxygen therapy and themes such as information gap, lack of protocol, availability and cost of delivery device, and oxygen supply are described.

#### 3.4. Knowledge and information gap

Some nurses reported lack of knowledge on oxygen therapy such as the dosage to be administered. Some participants were conscious of the knowledge deficit and suggested in-service education for nurses working at the emergency ward. Nurses at the SME did not calculate the amount of O<sub>2</sub> the patient was given.

*'...we as nurses need to be educated, we give the amount that we think will make the patient recover faster... we need to be educated about the therapy itself'. (SME2)*

There were lapses in information among the health personnel regarding O<sub>2</sub> administration especially among nurses at the SME. Thus, some nurses stopped the therapy or used their discretion to continue.

*'...when I take up and meet a patient on higher amount of oxygen without any information about the therapy, I use my discretion to continue or stop the oxygen'. (SME4)*

The gap in information was attributed to increased workload at the SME which sometimes prevented the nurses from documenting and handing over specific oxygen therapy information.

*'This place is an emergency and we get a lot of cases; so, it is common to start O<sub>2</sub> therapy and forget to chart the time you started or even hand over'. (SME3)*

However, nurses at the ICU documented and handed over appropriately which enhanced information transfer.

*'...when we have a patient, we document everything we do for the patient and hand over everything that we do which includes oxygen therapy'. (ICU3)*

#### 3.5. Lack of protocol

Within both units of the study, there was no protocol to guide oxygen therapy. Therefore, nurses employed previous knowledge to administer oxygen.

*'...there is no protocol for delivery of oxygen here; we observe the patient for signs of distress or difficulty in breathing then we start giving O<sub>2</sub>'. (SME5)*

The lack of protocol led to inadequate continuity of oxygen therapy at the SME.

*'...a staff may turn off the O<sub>2</sub> because a patient was trying to remove the delivery device and there is no protocol to handle some of these situations'. (SME2)*

#### 3.6. Availability and cost of delivery devices

The ICU had variety of delivery devices as compared to the SME. The ICU had devices such as the face mask, nasal prongs, re-breather mask, T-Piece, ventilator and trachy-mask for patient with tracheostomy whilst the SME had the nasal prongs and the face mask.

*'The ventilator is our major delivery device at the ICU, then we also have the re-breather mask, the face mask, nasal prongs ... nasal catheter ... the tracheostomy mask; we use them as necessary'. (ICU2)*

Nurses at the SME used the face mask and the nasal prongs because these were the only ones available at the time of the study. In view of this, some nurses at the SME did not have adequate information about oxygen delivery devices. The nurses were not happy about the unavailability of other forms of delivery devices. The ICU nurses perceived that the delivery devices were expensive and they re-used some devices.

*'The face mask is disposable, but due to the financial situation in Ghana, relatives have difficulties purchasing these devices. So, we are not able to dispose them off as often as we should...we reuse them until we see that they are no more safe to be used'. (ICU4)*

Also, participants thought that patients' family/relatives found the cost of the delivery devices unbearable. Thus, patients' relatives purchased the cheaper delivery devices such as the nasal prongs when prescriptions were given.

*'...many relatives find the cost unbearable... because the face mask is more expensive than the nasal cannula; most relatives can only afford the nasal cannula'. (SME2)*

### 3.7. Oxygen supply

Oxygen was supplied mostly with cylinders as the wall or the pipe supply was not reliable. The nurses needed help to convey oxygen cylinders from one point to the other and also in changing the flow meters when the O<sub>2</sub> was finished. Male orderlies or the technicians from the O<sub>2</sub> room changed the flow meters and moved the cylinders as necessary. Technicians spent between 10 and 20 min to come to the ward to change the flow meter when needed. The nurses used other means of resuscitation until the flow meter was changed such as 'bagging' – the use of self-inflating bag.

*'...immediately we see that the O<sub>2</sub> is finished, we disconnect the gadget and bag the patient till someone comes in and changes the flow meter. It is an inconvenience. It takes about 10 to 20 min before someone comes and is very tiresome because you have to be on your feet bagging'. (ICU4)*

Moving the cylinder from a point of administering O<sub>2</sub> to another was difficult for the nurses and they called the orderlies to move the cylinders as necessary. Some of the nurses thought that the wall or the pipe O<sub>2</sub> is ideal for ICU or emergency areas, because the cylinders occupied a lot of space and were heavy.

*'The O<sub>2</sub> cylinder is a problem when it gets finished...I do not have the skill to change the cylinder. We rely on the male orderlies and I have not seen any of my colleagues changing it'. (ICU4)*

## 4. Discussion

The study revealed some findings that were similar to those of previous authors such as inadequate knowledge on oxygen therapy. Previous studies found knowledge gap among nurses, doctors and other health personnel on O<sub>2</sub> administration such as Glenn, O'Connell, Gardner, & Considine, 2009; Ganeshan et al., 2006; Ogunlesi, Dedek, Adekanmbi, Fetuga, & Okeniyi, 2008. The finding suggests that nurses require further training in oxygen administration to enhance the therapeutic effect of oxygen. This study indicated that it was the primary responsibility of the doctor to prescribe O<sub>2</sub> and the nurse took the initiative in emergencies where the doctor was not available. This finding confirms findings of previous authors (Ganeshan et al., 2006; Howie et al., 2009). This implies that doctors are to be available at clinical settings where

oxygen administration is common. Nurses' use of discretion in administering O<sub>2</sub> to either commence or discontinue oxygen therapy alerts that the doctor may not always be available. Thus, nurses should be guided by a standard protocol to guide their care (Pirret, 2007). The use of oxygen without prescription confirms previous finding that O<sub>2</sub> is often administered without prescription (specifying the amount and the rate); indicating that both the doctors and nurses have inadequate knowledge of administration of O<sub>2</sub> (O'Driscoll et al., 2008).

Patient assessment and monitoring during oxygen therapy is important for optimal clinical use of oxygen. In this study, nurses either used vital signs or oxygen saturation to inform their practice. The aim of O<sub>2</sub> therapy policy is to ensure that all patients who require supplementary oxygen therapy receive therapy that is appropriate to their clinical condition. Oxygen must be prescribed according to a target saturation range, and aimed to achieve a specified outcome, rather than specifying the oxygen delivery method alone (O'Driscoll et al., 2008). Thus, nurses and other healthcare personnel who administer oxygen must monitor the patient and keep within the target O<sub>2</sub> saturation range. Inadequate assessment or monitoring could result in complications such as decrease in respiration, a state of narcosis and respiratory stasis or arrest in the case of elevated therapy (Collopy, Kivlehan, & Snyder, 2012). Also, patients on oxygen may develop skin break down around the mask or the cannula, dry mouth, nose or lips and sore throat among others. It is therefore necessary that the nurses identify the need for O<sub>2</sub> and have adequate skills on procedures of O<sub>2</sub> therapy in order to avert harm to the patient (Jevon & Ewens, 2001). The complications associated with oxygen therapy also calls for effective team work, proper documentation, and handing over of oxygen therapy specific issues. In this regard, the findings of this study demonstrate the need for nurses to undergo re-training to afford effective oxygen therapy. Similar clinical challenges have been reported among nurses in Ghana (Aziato & Adejumo, 2014).

Oxygen therapy requires the use of appropriate delivery devices. The nurses reported that patient's relatives or family usually procured the O<sub>2</sub> delivery devices. The cost of the devices was perceived to be exorbitant and this contributed to re-use of some disposable devices and unavailability specific types of devices. This confirms studies reported by Reisfield and Wilson (2004), DesRosiers and Russo (2000) that delivery devices are generally expensive and indicated that health insurance initiatives are required to reduce the cost. The re-use of devices may contribute to infections. Hence, it is advocated that delivery devices should be subsidized to enable patients' family to afford. This is important because different patients may require specific delivery devices according to their needs (Henderson, 2008). The availability and supply of oxygen are central to oxygen therapy. The use of the oxygen cylinder was challenging for nurses; and, the need for training to change flow meters and easy access to oxygen technicians was identified. Nurses preferred that oxygen is supplied through a pipe to avert challenges of moving cylinders and its possible complications such as injuries.

### 4.1. Implications of findings

The findings of this exploratory study can be used to institute oxygen therapy education or training to afford positive attitudes and enhanced skills for nurses. Also, the findings can inform curriculum review to address the gaps in knowledge and skills for oxygen therapy identified. There was high cost of oxygen delivery devices for administering oxygen therapy. Thus, the KBTH or the Ministry of Health or Ghana Health Service should solicit other avenues for funding oxygen therapy devices to minimize challenges associated with oxygen therapy.

There is the need for nurses to improve documentation of care such as oxygen therapy. Documentation is necessary for continuity of care and evaluation of care outcomes. Nurses require enhancement of skills to document effectively. Appropriate sanctions could be instituted to ensure that nurses comply with documentation policies or protocols developed for oxygen therapy. Also, simple forms or charts could be developed to ensure accurate oxygen therapy documentation. This is necessary especially at the SME where increased workload is anticipated.

In addition, the findings point to the need for future studies to involve other health professionals to have a comprehensive understanding of clinical oxygen therapy. Also, it is necessary to include other hospitals and units of oxygen therapy such as the ambulance service in future studies so that context appropriate protocols or policies can be developed to guide oxygen therapy in Ghana. Also, future studies could conduct a survey involving a large sample with a triangulation with interviews and observations to provide avenues for generalization of findings. However, this study has relevance for the SME and the ICU and can only be applicable to similar contexts.

## 5. Conclusion

Oxygen is a vital drug within the emergency and immediate post-operative context. The prescription, assessment, and monitoring of patients are necessary components for effective administration of oxygen. The inappropriate use of oxygen leads to deleterious complications; hence, appropriate steps should be taken to curb these. The need for continuing education for nurses has been highlighted by this study. It is recommended that nurses should be given further training in O<sub>2</sub> therapy to afford a better outcome of O<sub>2</sub> therapy in Ghana.

## 6. Author contribution

FEA, LA, and ANZ conceptualized the study. FEA collected data and FEA, LA, and ANZ analyzed the data. LA drafted the manuscript and FEA and ANZ reviewed the manuscript.

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None.

## Conflict of interest

The authors report no conflict of interest in relation to this study.

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