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Health System Factors Associated with Adherence to Tracheostomy Care Guidelines among Critical Care Nurses at a National Referral Hospital in Kenya

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Abstract **Tracheostomy care is a routine nursing procedure in critical care units of many hospitals. This study therefore sought to** establish health system factors associated with adherence to tracheostomy care guidelines among critical care nurses. This was an analytical cross-sectional study conducted in a national referral hospital in Kenya among critical care nurses. The sample size comprised a total of 79 nurses working in the critical care unit. An observational checklist and a self-administered questionnaire was used to collect quantitative data. Data was analyzed using R studio version 1.4.1103. In the bivariate analysis Fishers exact test or chi-square test was used to find associations between health system factors and adherence to the guidelines while in the multivariate analysis binary logistic regression was used to establish health system factors associated with adherence to the guidelines. Statistical significance was set at a P value below 0.05 at 95% confidence interval. The study findings revealed that 18(22.8%) nurses adhered to tracheostomy care guidelines while 61(77.2%) did not. Awareness of hospital management strategies and activities regarding tracheostomy care guidelines was the only health system factor associated with adherence to tracheostomy care guidelines in the multivariate analysis (AOR 0.21; 95% CI: 0.05-0.73; P=0.019). Nurses who were not aware of hospital management strategies or activities regarding tracheostomy care guidelines were less likely to adhere to tracheostomy care guidelines compared to those who were aware.

Keywords Adherence, Tracheostomy care guidelines, Health system factors, Critical care unit

1. Introduction

1.1. Background of the Study

Tracheostomy placement is indicated for respiratory distress. The care of a tracheostomy is routine in intensive care units. This care should be done through utilizing tracheostomy care protocols. Internationally adherence to tracheostomy care guidelines is affected by various factors [1].

These guidelines give information on assessment of the airway for patency, sizes of suction catheters, use of a humidifier system or heat moisture exchange, duration for suctioning and infection prevention techniques such as through use of closed system suction catheters. The guidelines also give information on multidisciplinary team work in the care of a tracheostomized patient [2].

In Kenya the devolved system of governance allows for counties through partnerships with the national government to publish such guidelines. In the absence of county and national guidelines, hospitals or nurses can develop the guidelines based on scientific evidence. Studies from Sub Saharan Africa regions have established the importance of all stakeholders in provision of healthcare to work with government institutions to facilitate adherence to the guidelines and establish factors affecting adherence [3].

For adherence of tracheostomy care guidelines to be optimal Intensive care units should ultimately have infrastructure which facilitates access to tracheostomy care guidelines. This will enable practice of tracheostomy to be evidence based and upto current standards [4].

1.2. Research Objective

To establish health system factors associated with adherence to tracheostomy care guidelines among critical care nurses at a national referral hospital in Kenya.

2. Methodology

2.1. Study Design

This was an analytical cross-sectional study design. These are studies which measure exposure and outcomes but at a

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single time [5]. The design enabled collection of quantitative data at a single point for measurement of associations without influence. This design was relevant because it allowed for measurement of exposure and outcomes within the specific defined population in the study at one point.

2.2. Sampling and Recruitment Procedure

Due to the number of the study population, the researcher carried out a census that included a target population of 79 critical care unit nurses. The study therefore did not involve sampling. The inclusion criteria for this study were all nurses stationed at the general intensive care unit. The exclusion criteria included student trainees who are normally not routinely involved in provision of tracheostomy care.

2.3. Data Collection

A coded self-administered questionnaire and observational checklist for each nurse was used to collect quantitative data. To eliminate biasness nurses were observed without their knowledge when they were performing tracheostomy care. The guidelines for adherence were adopted from scientific databases such as PubMed and Cinahl published across various platforms for use including government websites [6]. Health system factors affecting adherence were obtained from filling a structured questionnaire by the nurses. Pre-testing of the data collection tools was done with ten nurses at the neurological intensive care unit of the national referral hospital. Data was collected for a period of three months. Data collection was done by a trained research assistant who is a licensed critical care nurse. The research assistant did not participate in the study and was trained on study objectives, study informed consent, data collection procedure and checking completeness of questionnaires.

2.4. Data Management

Data was coded then entered to Epidata version 3.1. It was later cleaned. Thereafter it was exported to Microsoft excel 2010. The data was then afterwards exported to Rstudio version 1.4.1103 for analysis. Descriptive Statistics was used to describe frequencies, means and percentages. Adherence to tracheostomy care guidelines was binary with a cut off of 80% [7]. Fishers test and Chi-square test was used to test for association between health system factors and observed adherence level in the univariate analysis. Binary logistic regression was later used in the multivariate analysis to determine statistically significant factors affecting adherence to the guidelines when controlling for possible confounders. The threshold for Statistical significance in the study was set at a P value of < 0.05 with a 95% confidence interval.

2.5. Ethical Considerations

Ethical approval was provided by University of Nairobi ethical review body along with the study hospital ethical review body. Afterwards license to conduct the study was issued upon application by the National commission for science, technology and innovation of Kenya (NACOSTI). All the information in the study was held in strict confidentiality through assigning codes to the questionnaires. Signed informed consent was gained from the participants to collect data and no harm was present during the study period. Directives by the Kenyan government on prevention of transmission of COVID-19 during the study was also followed.

2.6. Study Limitation

Limitation of this study, is that it was conducted in one center and thus the situation in other hospitals may not have been reflected. Another limitation is that tracheostomized patients in the hospital, did not report what they viewed as health system factors affecting adherence to tracheostomy care guidelines as it was only done by the nurses.

3. Results

The study participants consisted of 79 nurses stationed at the intensive care unit.

Table 1. Socio-Demographic Characteristic of the Nurses

Socio - Demographics	Characteristic	n (%)
Gender	Male	23 (29.1)
	Female	56 (70.9)
Education	Diploma	3 (3.8)
	Higher Diploma	60 (75.9)
	Degree	14 (17.7)
	Masters	2 (2.6)
Specialty Training	Critical care nursing	70 (88.6)
	Not trained on critical care	9 (11.4)
Cadre	Nursing Officer III	6 (7.6)
	Nursing Officer II	21 (26.6)
	Nursing Officer I	8 (10.1)
	Senior Nursing Officer	39 (49.4)
	Assistant Chief Nursing Officer	5 (6.3)
Age	Years Mean(±SD)	39.1 (7.1)
Experience	Years Mean(±SD)	13.3 (6.8)
	Total	79

Mean age of the participants was 39.1 years and they had a mean experience of 13.3 years. A total of 23 (29.1%) nurses were male while 56 (70.9%) were female. Majority of the nurses 60 (75.9%) had trained up to higher national diploma level. In relation to specialty training, 70 (88.6%) nurses had been trained on critical care nursing while 9(11.4%) had no specialized training in critical care. In terms of cadre, senior nursing officers were the majority at 39(49.4%). Table 1 shows a descriptive analysis of the socio-demographic data.

An observational checklist was used to find out the observed adherence level towards tracheostomy care guidelines among the nurses. The nurses were observed on whether they were performing what is in the guidelines or if they were not. Observation was done during the care of patients with a tracheostomy. Table 2 gives the information on observation of tracheostomy care guidelines among the nurses. A total of 18 (22.8%) nurses adhered to the guidelines while 61 (77.2%) did not adhere to the tracheostomy care guidelines on observation.

Table 2. Observation of Adherence towards Tracheostomy Care Guidelines

Guideline	Performed n (%)	Not Performed n (%)
Clinical assessment of the airway for patency	79 (100.0)	0 (0.0)
Suctioning only when clinically indicated	31 (39.2)	48 (60.8)
Applying aseptic technique when performing tracheostomy suctioning	78 (98.7)	1 (1.3)
Using closed system catheter for suctioning patients on mechanical ventilation	0 (0.0)	79 (100.0)
Dividing the inner tracheostomy tube diameter by two then multiplying the result by three to get the French gauge of suction catheter	5 (6.3)	74 (93.7)
Maintaining suctioning pressure between 100mmHg-120mmHg	3 (3.8)	76 (96.2)
Suctioning for not more than 15 seconds	40 (50.6)	39 (49.4)
Pre oxygenate prior to performing suctioning	21 (26.6)	58 (73.4)
Not instilling normal saline routinely to liquefy secretion	76 (96.2)	3 (3.8)
Humidifying air using a humidifier system or heat moisture exchange filter	78 (98.7)	1 (1.3)
Referring swallowing difficulties to speech and language therapists for Screening	9 (11.4)	70 (88.6)
Checking 8 hourly to maintain cuff pressure between 15cmHg-25cmHg unless patient's condition indicates otherwise	6 (7.6%)	73(92.4%)
Inspecting the inner cannula 6 hourly and reinserting it after cleaning according to manufacturer's instruction	8 (10.1	71 (89.9)
Changing the stoma dressing and tapes daily or whenever it has been soiled	70 (88.6)	9 (11.4)
Planning and clearly documenting weaning, while evaluating the decision with other health care team members	34 (43.0)	45 (57.0)
Carrying out weaning gradually	78 (98.7)	1 (1.3)

Table 3. Bivariate Analysis between Health System Factors with Adherence to Tracheostomy Care Guidelines

Health System Factor	Category	OR	95% CI		P-Val
			Lower	Upper	
Availability of evidence based tracheostomy guidelines	Not available	0.35	0.06	1.64	0.193
	Not sure	1.77	0.51	6.74	0.373
Availability of reliable internet connection in the hospital	Inadequate access	0.22	0.01	6.14	0.311
	Others	0.33	0.01	8.90	0.451
Access to scientific databases	Yes	1.77	0.59	5.21	0.299
Availability of adequate printers for printing	No enough resource	0.40	0.02	10.58	0.527
	No resources	0.12	0.003	3.55	0.169
Status of critical care unit's workload	Ratio 1:2 and below	3.47	1.18	10.8	0.025
Hospital management strategies or activities regarding tracheostomy care guidelines	Not aware	0.002	0.000013	0.03	0.016
Source of Information on tracheostomy guidelines at the critical care	Information from colleagues	0.75	0.11	4.90	0.756
	Information from doctors	0.90	0.22	4.53	0.887
Format of evidence based tracheostomy care guidelines available in the critical care unit	Videos, Research papers, Published working documents	2.68	0.89	9.22	0.091
Mechanism to cover nurses when an unintended risk occurs from tracheostomy care	No	0.28	0.03	1.57	0.173
	Not sure	0.95	0.28	3.52	0.939
Availability of necessary equipment and supplies	No	0.65	0.16	2.14	0.277

Table 4. Multivariate Analysis between Health System Factors with Adherence to Tracheostomy Care Guidelines

Health system factor	Category	AOR	95% CI		P-Val
			Lower	Upper	
Status of critical care unit's workload	1:2 ratio and below	2.74	0.82	9.56	0.101
Awareness of hospital management strategies or activities regarding tracheostomy care guidelines	Not aware	0.21	0.05	0.73	0.019

Several aspects of health systems factors that were thought to affect the adherence of nurses to tracheostomy care guidelines were assessed as shown in table 3. There was a significant association between workload and adherence level to tracheostomy care guidelines (OR 3.47; 95% CI: 1.18-10.8 P=0.025). Nurses who agreed a workload ratio of 1:2 and below was attained in the unit were 3.47 times likely to adhere compared to those who said the ratio was above 1:2.

There was also a significant association between adherence level to tracheostomy care guidelines and awareness of hospital management strategies regarding tracheostomy care guidelines (OR 0.002; 95% CI: 0.000013-0.03.; P=0.016). Nurses who were not aware of the hospital management strategies or activities regarding tracheostomy care guidelines were less likely to adhere to tracheostomy guidelines compared to those who were aware of the management strategies.

Adjusting for other factors using binary logistic regression in the multivariate analysis between health system factors with adherence to tracheostomy care guidelines, nurses who were not aware of the hospital management strategies or activities regarding tracheostomy care guidelines were less likely to adhere to tracheostomy guidelines compared to those who were aware. (AOR 0.21; 95% CI: 0.05-0.73; P=0.019). Table 4 gives the analysis during multivariate analysis between health system factors with adherence to tracheotomy care guidelines.

4. Discussion

On observation majority of the nurses did not adhere to tracheostomy care guidelines. This finding is different from a study done in Canada by Leddy who established majority of the nurses followed tracheostomy care guidelines. In this study pre-oxygenation prior to performing suctioning was performed by 26.6% of the nurses while in Leddy's study it was performed by 60% of the sample size. Use of a closed system suction was performed by none of the nurses in this study while in Leddy's study it was performed by 99% of the nurses [8,9]. These observations might have been influenced by different levels of technology and types of work equipments.

Awareness of mechanisms by the hospital to cover nurses when an unintended risk occurs from adopting tracheostomy care guidelines was not associated with adherence to tracheostomy care guidelines. This is in contrast with Thomas in the USA who found adoption of a care bundle on tracheostomy care that had mechanisms of protection against tracheostomy related ulcers led to adherence [10,11]. The differences from the two studies could be attributed to many number of litigation because of patient awareness in the developed USA as compared to Kenya.

In this study a ratio of 1:2 and below in the critical care unit was significantly associated with adherence to tracheostomy care guidelines. This is similar to other studies which find a work ratio of 1:2 and below is associated with adherence. In this study nurses who were not aware that hospital management strategies and activities regarding tracheostomy care guidelines exist were less likely to adhere to tracheostomy care guidelines. This is similar to other studies which established awareness of organizational management support among the nurses led to adherence [12,13]. These findings imply hospitals which are staffed adequately and also disseminate policies to their staff are likely to practice tracheostomy care which follows current guidelines.

5. Conclusions

Overall based on the results majority of the nurses in the critical care unit did not adhere to tracheostomy care guidelines when observed. The health system factor associated with adherence to the guidelines was awareness of hospital management strategies or activities regarding tracheostomy care. Nurses who were aware of the hospital management strategies and activities regarding tracheostomy care guidelines were more likely to adhere to the guidelines compared to those who were not aware. Furthermore the nurses reported they did not know of mechanisms by the hospital to cover them when unintended risks occur from applying new tracheostomy care guidelines.

6. Recommendations

The study recommends that nurses in critical care units to undergo refresher training on tracheostomy care periodically to update practice to current guidelines. Hospital policies on application of new guidelines and mechanisms to cover nurses when risks occur from application of the guidelines should be made aware to nurses.

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