

Knowledge regarding Mechanical Ventilation and Practice of Ventilatory Care among Nurses in General Pulmonary and Medical Wards

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Abstract: *Medical intervention with mechanical ventilation becomes the priority in treatment of respiratory failure. As there are increase in number of patients needing mechanical ventilation in general wards in recent years, the knowledge of the nurses in these wards regarding care of patients on mechanical ventilator becomes a vital necessity. The study was initiated towards facilitating the independent role of a staff nurse in ventilatory care of patients in the general wards. The study aimed to assess knowledge regarding mechanical ventilation and practice of ventilatory care by nurses in general Pulmonary and Medical wards. A correlational study design is selected for this study. The study was conducted on registered staff nurses who were assigned to patients on mechanical ventilator. Purposive sampling technique was used to select 86 subjects. An investigator prepared questionnaire and an observation check list was used to assess knowledge and practice of nurses, respectively. Descriptive and inferential statistics were used to analyze data. Of the subjects, 46.5% had moderately adequate knowledge (score of 60-74%). Practice was found to be inadequate among 93% of the subjects (score <60%). There was a weak positive correlation between the knowledge and practice ($r = 0.084$ & $p = 0.440$). Practice showed a statistically significant association with qualification ($p = 0.036$). The study findings highlighted that though the knowledge seen among nurses was moderately adequate, the practice was low. This study is a mirror to look into their existing practice and will serve as a basis for improvement of this vital aspect of care.*

Keywords: Knowledge, practice, mechanical ventilation, ventilatory care

1. Introduction

Ventilatory strategies have been devised for different disease processes to protect pulmonary parenchyma while maintaining adequate gas exchange, and they may be responsible for the increased rates of survival (Allen, 1988). Hence, ventilation assistance is essential for patients with impaired breathing pattern which results in poor gas exchange in the alveoli.

Pulmonary ventilation is the first major process in the physiology of the respiratory system. *Blood flow or perfusion* is the second major process. The pulmonary capillaries are offered support from the epithelial lining of alveoli; therefore, they have potential to collapse or distend depending on the pressure within and around them (Urden, L. D., 1986). *Diffusion* is the mechanism with which gas exchange happens in the alveoli. Failure of respiratory system is the pathway to respiratory disorders.

Mechanical ventilation is used to maintain and optimize oxygenation and ventilation when other adjuncts are ineffective for an adequate acid-base balance (Delmar, 2005). Respiratory failure is assessed using blood gas analysis. Knowledge on independent interpretation of arterial blood gas analysis of patients is essential for a staff nurse as it is the means to early identification of respiratory compromise and failure.

Nurses use their wide knowledge base in collaboration with the patients to assess, plan, implement, and evaluate care. Basic competencies should be achieved in order to provide expert care to ventilator-dependent patients (Grossbach I, Stranberg S, & Chlan L., 2011). There is a new phenomenon in which shortages of ICU beds require that some mechanically ventilated patients be cared for in the general ward (Hersch M, Sonnenblick M, Karlic A, Einav S, Sprung C. L, Izbicki G., 2007). Hence, the need for nurses to be highly knowledgeable and have the necessary skills to manage critically ill patient becomes essential especially when the patients are located in general wards (Rose L. & Gerdtz M.F., 2009). Life threatening situations can be averted by well trained nurses who have good knowledge of mechanical ventilation. Therefore, focusing on empowering nurses to take on the role to become adept at handling mechanical ventilators the study was conducted with the following objectives:

- To determine correlation between the knowledge and practice of nurses regarding mechanical ventilation and ventilatory care.
- To study association of knowledge and practice among nurses regarding mechanical ventilation and ventilatory care with demographic variables.

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2. Conceptual Framework

The conceptual framework used was based on Graham's "the knowledge-to-action process framework".

In this study, *knowledge creation* denotes mechanical ventilation and ventilatory care. *Action cycle* begins with assessment of knowledge of staff nurses regarding mechanical ventilation. Next step is to *adapt knowledge to local context*, nurses who take care of mechanically ventilated patients in the general medicine and pulmonology wards were selected to translate knowledge in the practice. This *knowledge use* was monitored using non-participant observation practice check list. The use of knowledge and the practice were *evaluated* using descriptive and statistical analysis regarding the existing knowledge and practice. Then, to *sustain the use* of knowledge and practice, a mechanical ventilation care protocol was made and suggested to modify the existing daily monitoring sheet.

3. Methods

A correlational research design was selected. Staff nurses who consented to participate in the study, possessed more than 3 months experience in the present ward and were assigned to take care of adult mechanically ventilated patients were included. Those on annual, maternity or any other long leaves during data collection period were excluded from the study.

The sample size estimated with the expected prevalence (p) of adequate knowledge and practice of 54% and 46% respectively and absolute precision (d) of 10%, the required sample size for the current study was $n = 100$ (Day, et al., 2002). The sample consisted of 86 staff nurses who took care of mechanically ventilated patients and fulfilled the inclusion criteria chosen by convenient sampling method.

The instruments for data collection was developed by the researcher based on literature review and was validated by nursing and medical experts. The first component of the instrument included demographic proforma. The second component was knowledge questionnaire regarding mechanical ventilation. Thirdly, the checklist on practice of ventilator care. The investigator prepared the list of staff nurses in medical and pulmonology wards and also noted the patients who were being mechanically ventilated. Observations of practice were carried out intentionally on the subjects as they cared for the patient on mechanical ventilator and then the knowledge was assessed. The practice check list was given a score of 1 if activity was performed and 0 for not performed and not applicable was excluded and the result was interpreted as adequate ($\geq 80\%$), moderately adequate (60 -79%) and inadequate ($< 60\%$). The knowledge questionnaire correct answer was granted a score of '1' while wrong answer was scored '0'. Maximum total score was 35. The result was interpreted as adequate ($\geq 75\%$), moderately adequate (50% – 74%) and inadequate ($< 50\%$). The content validity of the instruments was ensured based on opinions from experts. The tools were also validated on a few staff nurses before the pilot study.

Protection from Human Rights

Ethical clearance was obtained from the Dissertation Committee of the College of Nursing. Written permission was obtained from the Nursing Superintendent and Heads of Medical and Pulmonology department. Informed written consent was obtained from consenting staff nurses.

Data collection procedure

Data were collected over six weeks. For the first five weeks, investigator carried out non participant observation of ventilatory care provided by the staff nurses to patients on mechanical ventilator, using an observation checklist. The investigator observed maximum of 4 to 5 subjects per day in 2 to 3 wards, depending on the number of ventilated patients.

The sixth week was for assessment of the staff nurses' knowledge regarding mechanical ventilation, using self-reported questionnaire. The knowledge questionnaire was administered to all the participants simultaneously in their respective wards.

Results were analyzed using descriptive statistics such as frequency, percentage, mean and standard deviation to describe demographic variables and inferential statistics like Pearson's correlation coefficient to correlate between knowledge and practice of staff nurses and Chi-square test to find association of the level of knowledge/level of practice of staff nurses regarding mechanical ventilation and ventilatory care with demographic variables.

4. Results and discussion

The baseline data showed that out of 86 subjects 63 (73.3%) were below 30 years of age. Majority of the subjects (90.7%) possessed a qualification of GNM, 44 (51.2%) had less than 5 years of total experience, 51 (59.3%) had less than 5 years of experience in CMC and 60 (69.8%) had less than 5 years of experience in the present ward.

The knowledge score showed a mean score 21.09 out of 35 and the knowledge was found to be moderately adequate among 46.1% of the nurses and adequate in 20.9%.

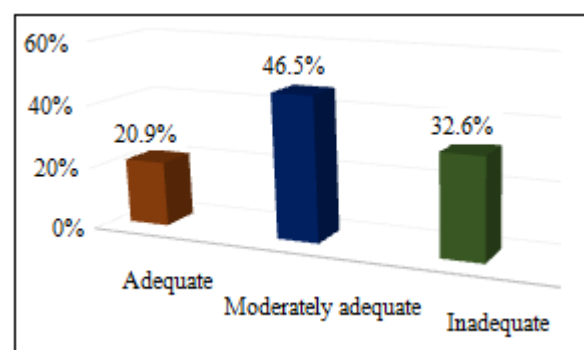


Figure 1: Knowledge among staff nurses regarding mechanical ventilation (n = 86)

There has been limited research on knowledge levels of general ward nurses on mechanical ventilation.

The finding was supported by a study done by Fulbrook, P., & Mooney, S. (2003) who conducted an international cross-sectional survey, with data collected from 20 European

countries. Data were collected from 1142 intensive care nurses in 11 knowledge areas. The overall mean knowledge score was 66% (SD ± 12). The knowledge category which scored lowest was respiration and ventilation (mean score 56%, SD±15), which was a concern. So, it is not surprising to see 32.6% of inadequate knowledge among general ward nurses in regard to mechanical ventilation in the present study.

The practice score showed a mean score of 16.35 out of 45 and majority (93%) of nurses have inadequate practice. None have scored for adequate practice.

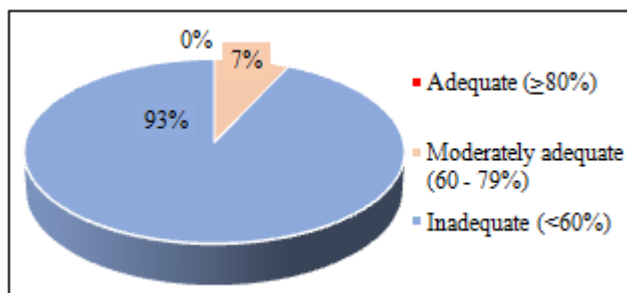


Figure 2: Practice among nurses regarding ventilatory care (n = 86)

This finding was supported by Faidy, A., Ouesph, B., Yutuc, N., Melki, S., Tamonan, E., Jamaly, A., & Mohidi, S. (2014) who did a cross-sectional descriptive study among nurses in Kingdom of Saudi Arabia, 149 participants shared their perception on the knowledge and competencies. All participants in general, perceived neutrally on their ability and competencies when dealing with mechanical ventilation patients (M= 3.39 ±0.62). They strongly disagreed on the suitability of the setting in general ward for caring of MV patients (M=1.67±.95)

Khimani, R., Ali, F., Rattani, S., & Awan, S. (2015) conducted an observational study to assess the nurses' practices of tracheal suctioning in the cardiac intensive care unit (CICU) and the general intensive care unit (GICU) in Ireland, revealed that among the CICU nurses (n=17) only two nurses, i.e. 12% out of 34, from CICU and four nurses, i.e. 14%, from GICU performed chest auscultation to assess the need of suctioning.

There was a weak positive correlation noted between knowledge and practice of staff nurses with $r = 0.084$ and $p = 0.440$.

There are various factors that can contribute to the weak positive correlation and statistical insignificance between knowledge and practice among general ward nurses. Cason, C. L., Tyner, T., Saunders, S., & Broome, L. (2007) reported that as workload increases, compliance to guidelines decreases and educational interventions can reduce the complications. Ricart, M., Lorente, C., Diaz, E., Kollef, M. H., & Rello, J. (2003) studied nursing adherence with evidence-based guidelines for preventing ventilator-associated pneumonia. Fiftyone nurses at two critical care nursing meetings from many European countries participated. Overall non adherence was 22.3%.

Table 1: Association of knowledge among nurses with demographic variables (n=86)

Demographic variables	Knowledge						p value
	Adequate		Moderately adequate		Inadequate		
	N	%	N	%	N	%	
Total experience (yrs)							0.017*
≥5	12	28.6	13	31.0	17	40.5	
<5	6	13.6	27	61.4	11	25.0	

*p<0.05

Table 2: Association of practice among nurses with demographic variables (n = 86)

Demographic variables	Practice				p value
	Moderately adequate		Inadequate		
	N	%	N	%	
Qualification					0.036*
GNM	4	5.1	74	94.9	
BSN	2	25.0	6	75.0	

*p<0.05

Table 1 & 2 shows there is no evidence of statistically significant association between knowledge and demographic variables except total years of experience (p = 0.017) and between practice and qualification (p = 0.036).

These findings were supported by Cason, et al. (2007), who studied nurses' implementation of guidelines for ventilator-associated pneumonia, to evaluate the extent to which nurses working in intensive care units implement best practices when managing adult patients receiving mechanical ventilation. Twelve thousand nurses completed the questionnaire. The association between care practices and demographic characteristics of respondents suggested no clear relationships between these two practices and respondents' demographic characteristics.

A mechanical ventilation care protocol was developed and the existing daily monitoring sheet was suggested to be modified, based on the recent Center for Disease Control and Prevention (CDC, 2015) guidelines on VAP prevention and guidelines for the provision of intensive care services.

Limitation to the study were that Nurse: patient ratio in general wards do not conform to stipulated recommendations for mechanically ventilated patients, number of patients receiving mechanical ventilation is higher than the accepted number per ward.

The implication for nursing practice and research: This study indicates the importance of knowledge regarding mechanical ventilation and practice of high quality ventilatory care among staff nurses in general medical and pulmonology wards. Every medical and pulmonology ward must adopt the mechanical ventilation care protocol with regular updates, so that, the knowledge gained from the protocol may help nursing staff and students to maintain and update their current knowledge and to offer the best care for patients on mechanical ventilation. There is a paucity of research knowledge as to whether ventilatory education programs and associated in-service make a difference to nursing clinical practice among registered staff nurses in non-critical care units.

5. Conclusion

The results of the study have brought to light an area not explored in relation to knowledge and practice of nurses working in general wards. Caring for patients receiving mechanical ventilation is a challenge to the nurse, patient and the family in a general ward. The current study revealed that nurses in general wards need more knowledge and skill on mechanical ventilation and ventilatory care. The specialist role of a nurse and a scheduled consistent educational program will empower staff nurses working in the general wards with enhanced knowledge and skills which will promote and ensure improved patient outcomes.

6. Conflicts of interest

The authors have declared no conflicts of interest

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