How to Use Mechanical Ventilation (MV) on Prevention of Ventilator-Associated Pneumonia (VAP) at the Vietnam National Children's Hospital

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I. INTRODUCION

Mechanical ventilation is a measure of respiratory support, use of ventilators to ensure alveolar ventilation, improved blood oxygenation, and reduced patient breathing. This technique is widely used in intensive rehabilitation (ICU) departments to treat, alleviate and save patients.

Ventilator-associated pneumonia (VAP) is one of the commonest infections in hospitals and is the leading cause of death among the four currently infectious diseases of the hospital (HAI). In developed countries such as the United States and Europe, despite significant advances in technology as well as in the operation of ventilator operations, and the effective application of sterilization and sterilization procedures. The incidence of puberty remains high at 8-28% [15]. The study by Rosenthal et al conducted in 55 faculty of ICU in eight developing countries from 2002 to 2005 found that the incidence of new postoperative complications ranged from 10.0 to 52.7 per 1000 mechanical ventilation days, Is 24.1 / 1000 days of mechanical ventilation [34]. In Vietnam, according to a survey conducted by the Ministry of Health nationwide in 19 hospitals in 19 hospitals, the highest incidence of VAP was 55.4%, of which the

incidence of cerebral palsy was particularly high In the group of patients located in ICU (43-63.5 / 1000 days of mechanical ventilation) [6]. However, this rate is higher in pediatric patients, according to a study by Le Kien Ngai (2011) at the National Children's hospital found that the incidence of birth defects in infants accounted for 26.7% [14] 15]. The published studies also found that maternal deaths in adult patients were higher in children than in children, but the post-mortem consequences, such as mortality, severity, duration of mechanical ventilation, Hospitals in children are much worse than adults.

Studies have shown that the implementation of integrated precautionary preventive measures has been more successful, such as the improvement of routine VAP precautions at the ICU daily, in compliance with the VAP precautionary package guidelines (Ventilator Associate Pneumonia), monitoring and reminding the health workers to implement ... has reduced the VAP rate to 1/1000 days of mechanical ventilation in some hospitals [6]. In 2012, the Ministry of Health issued guidelines on prevention of VAP in health facilities and provided a package of measures to prevent VAP. However, the content and implementation of the package depends on the

characteristics and conditions. Every health facility when done. Although there have not been many studies evaluating the impact of such integrated solutions on VAP prevention, however, some research findings suggest that the application of some of the measures in the package has an impact on the The incidence of breast tenderness as in the improvement study on sputum aspiration in Cho Ray hospital showed that the VAP rate in the one-use group was reduced by 48% compared to the group using the used tube again [6]. VAP prevention measures such as reducing the inhalation of the patient, preventing cross-infection from the hands of the health worker, disinfecting and sterilizing properly breathing apparatus and use ventilation, educate the health workers and people. The disease has not yet been fully implemented in domestic hospitals.

At the National Children's hospital, an average of 120-150 patients had mechanical ventilation at ICU faculties per day. According to statistics from the surveillance system NKBV, the incidence of fractures accounted for 40-60% of the NKBV identified. In addition to preemptive measures such as: Patient posture, early mechanical ventilation, dental care, etc. One of the hospital's precautionary measures is Compliance with the respiratory infection control guidelines includes proper use of the breathing line, correct use of water traps, correct use of bacterial filters, proper use of warmers, humidifiers and Proper disinfection of the ventilator properly.

The purpose of this study is to:

1. Assessment of compliance with ventilator use practices in ventilator-associated pneumonia associated with mechanical ventilation At the National Children's hospital.

2. Comparison of levels of improved respiratory compliance in ventilatory practice in hospital through two stages.

3. Understand the impact of compliance with precautions for use of ventilator when using ventilator to the rate of mechanical ventilation for pneumonia At the National Children's hospital

II. OBJECTIVES AND RESEARCH METHODOLOGY

1. Object of study: The ventilators are being used in the hospital

2. Research Methodology

Study design: Intervention study

Study sites: In 3 faculties (ICU, SICU and NICU)

3. Research time: from February 2016 to October 2016

Divide into 3 phases:

- Phase 1 (02/2016 - 04/2016): Compliance assessment implementation

- Phase 2 (04/2016 - 07/2016): Feedback and suggestions for improvement

- Phase 3: (08/2016 - 10/2016): Reassess compliance of implementation

4. Study sample size: Select the entire ventilator used in the research department

5. Criteria for evaluation:

Existing use of the ventilator is monitored and evaluated against the content of the instructions for the prevention of fractures and the design of the ventilator that is appropriate for the purpose of the study.

Include: use proper ventilator strings, use the correct water trap, use the correct bacterial filter, use the correct set warm, moist.

6. Method of data collection:

Use the current observation form using the ventilator

to evaluate the practice of ventilator use in preventing postpartum depression in the research department.

7. Method of data analysis: The data after cleaning was entered by Epidata 3.1 software and processed by SPSS 16.0 software. Variables are expressed in terms of frequency and ratio. Quantitative variables are expressed in the form of mean values. Apply $\chi 2$ test when comparing ratios.

III. REPORTOF STUDY

1. The characteristics of the ventilator used in the research faculties

1.1 Distribution of number of ventilators at the research faculties

Table 1. Proportion of ventilator / beds at research faculties

No	Faculties	Number machine	Number bed	Rate of ventilator / beds
1	ICU	53	65	1:1.22
2	SICU	49	50	1: 1.02
3	NICU	48	180	1: 3.75

The results in Table 1 show that the number of ventilators is mainly concentrated in 53 ICU. The SICU is equipped with relatively adequate ventilation, with one hospital bed with one ventilator on average, while this rate is based on NICU on an average of 3.75 beds with a ventilator.

1.2. Classification of ventilators

Table 2. Classification of respirators according to technological structure at research faculty

No	***Classification***	**ICU N = 53**	**SICU N = 49**	**NICU N = 48**	**Total N = 150**
1	Portable breathing apparatus	2/2 100%	0	0	2/150 1.3%
2	CPAP breathing apparatus	0	0	11/11 100%	11/150 7.4%
3	Normal breathing machine	11/40 27.5%	9/40 22.5%	20/40 50%	40/150 26.7%
4	Breathing Machine	37/83 44.6%	35/83 42.3%	11/83 13.2%	83/150 55.3%
5	High functionality	3/14 21.4%	5/14 35.8%	6/14 42.8%	14/150 9.3%

According to the results in Table 2, among the ventilators currently in use in the hospital, the high respiratory rate was the highest (55.3%) and the focus was on the ICU (44.6%).

1.3.Frequency of use of ventilator

Table 3. Frequency of exploitation used in research faculties

No	Faculty	N = 98	Average frequency (M ± SD)	Minimum frequency (Min)	Maximum frequency (Max)
1	Intensive treatment faculty	44	63.4%	35.7%	80%

2	Positive resuscitation faculty	32	62.2%	31.7%	87%
3	Neonatal resuscitation faculty	22	69.2%	38.6%	91.5%

According to Table 3, the frequency of use of ventilators at 3 resuscitation clinics was maximized from 80% to 91.5%..

1.4.Existing use of ventilators in preventive practice

Bảng 4 . Existing use of ventilators for preventing postpartum depression at faculty in pre-retreat state

No	Substance	ICU N = 53	SICU N = 49	NICU N = 48	Total N = 150
1	**Use the breathing line**				
1.1	The diameter of the breathaline matches the age	34 (64.2%)	38 (77.5%)	48 (100%)	12 0
1.2	The breathing (breathing out) of the Y-spigot is lower than the upper end of the endotracheal tube	33 (62.3%)	27 (55.1%)	25 (54.2%)	85 (56.7%)
1.3	Clean breath, no drainage or water in the tube	42 (79.2%)	39 (79.6%)	37 (77%)	11 (78.7%)
1.4	Change the ventilator after each patient	44 (83%)	42 (85.7%)	38 (79.2%)	12 (120%)
1.5	Breaths are sent sterilized after use	46 (86.8%)	38 (77.5%)	28 (58.3%)	11 (74.7%)
1.6	Use the correct breathing line	17 (32.1%)	12 (24.5%)	22 (45.8%)	5 (34%)
2	**Use water trap**				
2.1	Water trap to the lowest position	34 (64.2%)	32 (65.3%)	28 (58.3%)	9 (62.7%)
2.2	Water trap does not have water beyond the specified threshold	39 (73.6%)	35 (71.4%)	31 (64.8%)	10 (70%)
2.3	Use the right water trap	34 (64.2%)	32 (65.3%)	28 (58.3%)	9 (62.7%)
3	**Use a warm, moist heater**				
3.1	Turn on the thermostat	24 (45.3%)	33 (67.3%)	31 (64.6%)	8 (58.7%)
3.2	Monitor the temperature of the kettle warm, moist	0	0	0	0
3.3	Monitor breathing air temperature at the Y spigot	0	0	0	0
3.4	Use sterile water in the humidifier	32 (60.4%)	34 (69.4%)	27 (56.3%)	9 (62%)
3.5	Make sure the water level in the humidifier is set correctly	29 (54.7%)	26 (53.1%)	21 (43.8%)	7 (50.7%)
3.6	Use sealed systems to direct sterile water directly into the humidifier	25 (47.2%)	18 (36.7%)	28 (58.3%)	7 (47.3%)
3.7	Warmers and heaters are replaced and sterilized after use	25 (47.2%)	20 (40.8%)	28 (58.3%)	7 (48.7%)
3.8	Use a warm, moist suit	25 (47.2%)	18 (36.7%)	21 (43.8%)	6 (42.7%)
4	**Use a bacteriostatic filter for the ventilator**				
4.1	Use the bacteria filter on the airway	0	0	0	0
4.2	Monitor the time to replace the filter to filter out airborne bacteria	0	0	0	0

4.3	Use bacterial filter on exhalation	0	0	0	0
4.4	Monitor the replacement time of the outbreak filter	0	0	0	0
4.5	Bacterial filters are replaced when used for different patients	0	0	0	0
4.6	The bacterial filter is sent to steam sterilization as prescribed	0	0	0	0
4.7	Use the right bacteria filter	0	0	0	0
5	Cleaning and disinfection of ventilator	38 (71.7%)	39 (79.6%)	35 (73%)	112 (74.7%)

Table 4 shows that, in the pre-response period, the correct rate of use for the respiratory system in the 3 faculties was 34%, using the correct water trap was 62.7%, using the correct warmer 42.7%. No department has made use of filter bacteria for breathing machines.

Compare the level of practice improvement using the ventilator in preventing postpartum depression through 2 stages

Table 5. The level of practice improvement using ventilators in preventing postpartum depression through 2 stages

No	Substance	Phase 1 N = 150	Phase 2 N = 150	Value P, OR
1	Use the correct breathing line	51 (34%)	140 (93.3%)	P < 0.01 OR=27.1 (12.5-60.2)
2	Use the right water trap	94 (62.7%)	143 (95.3%)	P < 0.01 OR=12.1 (5.0-30.6)
3	Use a warm, moist suit	64 (42.7%)	108 (72%)	P < 0.01 OR=1.6 (1.3-2.1)
4	Use the right bacteria filter	0	100 (66.7%)	-
5	Clean the ventilator properly	112 (74.7%)	150 (100%)	-
6	Use the correct instructions	51 (34%)	108 (72%)	P < 0.01 OR = 1.9 (1.8 -2.7)

Table 5 shows that correct use rates for respiratory strings and water entrails and warmers, breathing air tend to increase from 34% to 93.3% and from 62.7% to 95.3%. The difference was statistically significant with P <0.05. At stage 2, the department used a bacteriostatic filter for the ventilator, accounting for 66.7%.

2. The impact of compliance rates on the use of ventilator precautions on the incidence of VAP in phase 2

Table 6. Compare the incidence of VAP in two stages

No	Hospital Infections	ICU		SICU		NICU		Total	
		Phase I	Phase II	Phase I	Phase II	Phase I	Phase II	Phase I	Phase II
1	VAP rate	46 (7.4%)	41 (6.7%)	29 (3.4%)	16 (2.4%)	92 (4.5%)	62 (3.8%)	167 (4.6%)	119 (4.0%)
2	HAI rate	80 (12.8%)	63 (10.2%)	59 (6.9%)	44 (6.5%)	94 (5.8%)	127 (6.2%)	233 (4.1%)	334 (4.7%)

In Table 6, the prevalence of nosocomial infections is likely to increase from 4.1% to 4.7%. However, the rate of respiratory pneumonia associated with mechanical ventilation is likely to decrease in all three departments from 4.7%. 4%.

IV. DISCUSSION

Based on the results of the study, the total number of ventilators available in 3 clinics is 150, which results in Table 1 shows that the rate of ventilator-based respiratory equipment (SICU) One ventilator, while the rate in the intensive care unit is 1: 1.22, so for every 1 ventilator used for 1.22 beds, in this allocation, the Department of Rehabilitation The NICU is the most helpless unit, with a 1: 1.37 ratio of ventilator equivalent to one ventilator that will be used for 3.75 beds. On the other hand, the use of ventilators in 3 faculties is always high at 80-91.5%. The lack of ventilators and the maximum use of power will place managers and clinicians at risk in safeguarding patients' compliance with infection control regulations. Cleaning, sterilizing and preserving the ventilator after the end of mechanical ventilation for subsequent use.

Comprehensive measures such as correct posture (high head 30-45 degrees) or oral care, early respiratory rate evaluation are among the precautionary measures to prevent pneumonia related to mechanical ventilation. It has been shown to reduce the rate of mechanical ventilation for pneumonia in hospitals. The recommendations emphasized that the implementation of synchronous solutions will be highly effective but depending on the conditions and capabilities of each health care facility, the implementation of the package varies. Many health facilities do not really pay much attention to the role of precautionary measures when using ventilators such as the use of ventilators or water traps and filtration systems or the operation of warmers, Humid breathing gas guided. At the National Children's Hospital, the package of preventive measures for pneumonic pneumonia is reviewed and promulgated in 2012, in which, besides the recommended solutions, the package of solutions applied in the hospital also emphasizes and focuses on Precautionary measures for the use of ventilators such as proper use of respiratory

traps, water trap status, use of bacterial filter or monitoring of the function and temperature of the warming system, breathing air, hygiene Disinfection of the ventilator ... These are important parts when the patient uses an artificial airway.

In the study by Craven DE et al. [10], there was evidence of contamination from respiratory-associated devices during use such as septic traps or infective respiratory tract, using Inactivated filter filters are not effective ... although epidemiological measurements are not yet available, but are also described as factors that increase the incidence of pneumonia associated with mechanical ventilation. Another study by Mayra Goncalves et al. (2012) was conducted when conducting an overall review of studies on the effectiveness of preventive ventilation (VAP) In patients with mechanical ventilation, the absence of hydration in the respiratory tract in patients with mechanical ventilation reduces the effect of air exchange, sputum metabolism, and increased risk of coronary artery disease. Steamed On the other hand, the development of bacteria (moisture, mold, etc.) from the respiratory system into water traps or "water traps" can re-enter the respiratory tract causing respiratory infections. Research shows that there is no difference between the use of heat exchangers (HMEs) and humidifiers (HHs) in reducing the occurrence of SO. However, consideration should be given to the cost of using the heat exchanger exchange mentioned above in the prevention of the VAP [17].

In this study, the author focused on adherence to the implementation of the above mentioned solutions when using the ventilator at the 3 emergency medical departments of the hospital. Results of the study show that when evaluating the current status of ventilators used in the research departments, the pre-respiratory rate was used correctly for all 3 respiratory tract lines. Proper use of water trap reached 62.7%, using the

correct set of warm, humid only reached 42.7%. The use of filter bacteria on the breathing machine has not been focused on implementation. However, after feedback and suggestions for improvements such as the use of filter bacteria repeatedly, replacement, repair of warmers, humid not working ... In stage 2 there is a clear improvement of the centipede. The proportion of respirators using the correct ventilator increased to 93.3%, 95.3% of the controlled water traps, and 72% of the ventilators had a particularly effective 66.7% humidifier. Poles and Resuscitates have used bacterial filters as directed. Cleaning and disinfection of the ventilator after use is routinely performed. The difference was statistically significant with P <0.05.

In addition to comprehensive preventive measures in place such as high patient position 30-45 degrees, oral hygiene with physiological saline ... preventative measures focused on the correct use of history guidelines. Using the ventilator mentioned above at the National Children's hospitalshowed that although the incidence of nosocomial infections tended to increase from 4.1% to 4.7%, the rate of new cases was The trend is down from 4.6% to 4%. It can be said that focusing on specific precautionary measures for the use of ventilators is thought to be effective in the preven- tion prevention strategy currently adopted at the National Hospital of Paediatrics.

V. CONCLUSION

Mechanical ventilation that play a very important role in medical facilities, contributing to the survival of patients, minimizing mortality in emergency departments and supporting Physicians in the process of treatment and patient care. Using a ventilator in accordance with the guidelines for preventing postpartum depression not only helps patients to shorten treatment time, but also prevents ventilator-associated pneumonia (VAP) risk that has been recommended in studies. In addition to the other precautions that are

currently being recommended such as 30-45 degree head positioning, oral hygiene, breathing relief, etc., attention should be paid to the use of ventilators such as Proper use of a ventilator cord, warmer, humidifier, water trap, or bacteriological filter for use in ventilatory support is highly effective. At the same time, regular monitoring and training for health workers with practical measures when using the ventilator in the package of preventive measures. This is one of the strategies for practicing a precautionary VAP precautionary package that is being applied and is effective in the prevention strategy of the postpartum at the National Children's hospitalsuch as the use of microbial filters on the airway. Weight, warming up, humidification or water trapping or disinfection of ventilation after use will contribute to a reduction in the incidence of mechanical ventilation.

VI .RECOMMENDATIONS

Attention should be paid to the practice of ventilatory use in the prevention of pneumonia associated with mechanical ventilation currently being applied and further assessments of the effectiveness of the implementation when practical monitoring is practiced. Use a ventilator in a health-care package.

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