



## Current status of care for patients with tracheostomy among nurses at Thai Binh Provincial general Hospital and some associated factors in 2023

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### ABSTRACT

**Objective:** To describe the current status of care for patients with tracheostomy at Thai Binh Provincial General Hospital and some related factors. **Research subjects and methods:** A cross-sectional study of over 110 visits for each procedure of chest percussion and sputum suction in nursing care of patients with tracheostomy. The assessment scale is based on the procedure issued by the Ministry of Health. The chi-square test was used to identify factors related to the current status of care for patients with tracheostomy. **Results:** The practice rate achieving the technique of chest percussion and sputum suction was 35.5% and 81.8%, respectively. The rate of nurses with bachelor's degrees, and care < 5 nurses/day satisfactorily practice in the technique of chest percussion is higher than the group of nurses with college degree and cared for  $\geq 5$  patients/day with ORs of 3.25 and 3.06, respectively. The nursing group is  $\geq 30$  years old, working experience > 10 years, experience in caring for tracheostomy patients > 10 years and number of training participations > 1 time passed the practice of sputum suction technique higher than the remaining nursing group with OR of 7.91; 4.71; 4.71 and 4.44 respectively. This difference is statistically significant with  $p < 0.05$ . **Conclusion:** The proportion of nurses practice satisfactorily the sputum suction technique is relatively high (81.8%), but it is too low with the chest percussion technique (35.5%). There are a number of factors related to percussion technique, including qualifications and the number of patients cared for per day. Some factors related to practicing the sputum suction technique are age, working experience, caring time for tracheostomy patients, and number of training session. Nurses need to pay attention to compliance with technical procedures, especially nurses aged < 30 years old, low qualifications, short working time and rarely participates in training.

**Keywords:** Tracheostomy, nursing, chest percussion, sputum suction.

### INTRODUCTION

Tracheostomy is a procedure to open a hole in the tracheal tube and place a catheter to make the respiratory tract open to the skin. The patient breathes through this hole.

Tracheostomy has many advantages such as: reducing 50 % “dead air space”, increasing air flow into the lungs, making it easier to suck out lung secretions, bringing oxygen directly into the lungs, and delivering drugs directly into the trachea <sup>1,2</sup>.

However, tracheostomy also has disadvantages such as: removing the upper respiratory tract from the respiratory system, which results in the loss of protective functions of the upper respiratory tract including warming, humidifying, and cleaning the air before it enters the lungs. Tracheostomy can also lead to certain complications such as: bleeding, subcutaneous emphysema, surgical wound infection, laryngotracheal stenosis <sup>1,3</sup>.

To prevent possible complications and ensure the safety of patients with tracheostomy, nurses need to manage various issues such as applying the tracheostomy tube properly, maintaining the humidity of inhaled air, conducting airway clearance, and caring tracheostomy cuff <sup>4,5</sup>. Procedures such as chest percussion and sputum suction can cause discomfort to the patient, so the nurse must be knowledgeable to motivate, inform the patient and provide appropriate care <sup>6</sup>. If the patient receive poor medical care, it can lead to many complications, worsen the condition, prolong the treatment time, and even result in death.

To provide information with practical value and a scientific basis to help nurses and hospital managers develop intervention plans to improve quality in the field of care for patients with tracheostomy, researching the current status of care for patients with tracheostomy and related factors is necessary. Therefore, we conducted research with the objective of describing the current status of nursing care for patients with tracheostomy among nurses and some related factors at Thai Binh Provincial General Hospital.

## RESEARCH SUBJECTS AND METHODS

**Research subjects:** Nurses' care activities for patients with tracheostomy

through two technical procedures: chest percussion and sputum suction at the Department of Neurological and Spinal Surgery, Thai Binh Provincial General Hospital.

**Inclusion criteria:** Each nurse who cared for a patient with a tracheostomy was observed practicing chest percussion and sputum suction 5 times during the study period (from April 2023 to September 2023).

**Research design:** Descriptive cross-sectional study.

**Sample size:** Applying the sample size calculation formula for a one-proportion study:

$$n = Z_{1-\alpha/2}^2 \frac{p(1-p)}{d^2}$$

In which:

n: Minimum sample size of 1 technique

$Z_{1-\alpha/2}$ : Reliability coefficient, 2-sided test (= 1.96)

$\alpha$ : Significance level (= 0.05)

d: Acceptable error of estimate, choose d = 0.1

p: Estimated rate of satisfactory practice of procedure, p = 0.514 (According to research by Vu Thi En <sup>7</sup>)

From there, the sample size n = 96. The estimated error rate in the data collection process is about 10%. Therefore, the minimum sample size needed to collect is 106 observation times for each technique.

The Department of Neurological and Spinal Surgery currently has 22 nurses directly taking care of tracheostomy patients. In fact, we observed 110 times for each technique (each nurse was observed 5 times/technique).

**Sampling:** Choose a convenient sample

**Measurement and methods:** The data collection measurement includes nurses' general information and a checklist for observing nurses practice chest percussion and sputum suction issued by the Ministry of Health <sup>8</sup>. Each step is performed satisfactorily and sufficiently, the score was 1 point, if not, the score was 0 points. The nurse practice satisfactorily when all the steps in the checklist 7 were performed correctly (the satisfactory score is 15 points and 17 points for chest percussion procedure and sputum suction procedure respectively)

**Data collection and analysis:** Data were processed using SPSS 20.0 software. Descriptive statistics and chi-square were used to understand the relationship between nurses' characteristics and the practice procedure of caring for patients with tracheostomy.

**Ethical issues:** The study was approved by the Ethics Council in Biomedical Research of Nam Dinh University of Nursing with certificate No. 885/GCN-HĐĐĐ dated on April 18, 2023 and was conducted with the consent of Thai Binh Provincial General Hospital.

## RESULT

**Table 1. Results of practice of chest percussion procedure (n = 110)**

Content		Satisfactory	
		n	%
Nurses' preparation	Nurse uniform	110	100
	Hand hygiene	93	84.5
Patients' preparation	Inform and encourage	100	90.9
Instruments' preparation	Hand sanitizer or clean gloves	110	100
	Medical records or care notes	110	100
Procedure	Nurse put on gloves (if necessary)	110	100
	Place the patient in the appropriate position: pat first, vibrate later		
	Patting: the nurse pinches the fingers together, cupping the palms of the hands	110	100
	Pat with the right technique and force	110	100
	Pat gently and steadily on the chest or back	110	100
	Pat continuously for about 10 minutes then vibrate	87	79.1
	Vibration technique: nurse stretches hand, places hand on chest wall or back (if vibration is on the back)	89	80.9
	Vibrate for about 10 minutes	52	47.3
	Help the patient return to a comfortable position	108	98.2
	Remove gloves (if wearing gloves), hands hygiene	104	94.5
Fill in care notes	110	100	

Some steps of chest percussion that nurses do not practice satisfactorily include: vibration for about 10 minutes (47.3%), continuous patting for about 10 minutes and then

vibrate (79.1%), vibration technique: nurse stretches hand, places hand on chest wall or back (if vibrating in back) (80.9%), and hands hygiene (84.5%).

**Table 2. Results of preparation steps in the sputum suction procedure (n = 110)**

Content		Satisfactory	
		n	%
Nurses' preparation	Nurses in uniform	110	100
	Hands hygiene	103	93.6
Patient's preparation	Assess the patient's status, give an explanation to the patient (if the patient is conscious), and give an explanation to the patient's family.	105	95.5
	Give 100% oxygen for 30 seconds – 1 minute before suction.	110	100
Instruments' preparation	A suction or negative pressure source has a hose connected to the suction line. Suction catheter (depending on size): 01 piece, 9‰ NaCl solution, catheter rinsing solution mixed with 10% Betadine.	110	100
	1 pair of sterile gloves, sterile gauze. Container for dirty things. 10ml syringe with medicine needle attached.	110	100

Regarding the preparation process, most nurses practiced satisfactorily but there were still some steps that were not practiced satisfactorily such as: hands hygiene (93.6%), assessment of the patient's condition, and prior explanation. (if the patient is conscious), inform and explain to the patient's family (95.5%).

**Table 3. Results of practice steps in the sputum suction procedure (n = 110)**

Content	Satisfactory	
	n	%
Place the patient in a suitable position.	110	100
Turn on the suction machine and adjust the pressure	110	100
The nurse tears the suction tube bag, puts on gloves and connects the suction tube to the suction system.	110	100
Gently insert the suction tube through the tracheostomy cannula (fold the suction tube) to the desired depth.	110	100
Release the hand to bend the tip of the straw, gently rotate the straw and pull the straw out (hold the straw longer in places with a lot of phlegm). Monitor the patient while suctioning process.	110	100
During suction process, let the patient breathe oxygen again for 30 seconds - 1 minute (each suction period should not exceed 15 seconds, no more than 5 minutes/1 session).	102	92.7

Content	Satisfactory	
	n	%
After suctioning is done at the tracheostomy cannula and then suctioning to the patient's nose and mouth.	110	100
Remove the straw and put it in the yellow bag.	110	100
Collect instruments and remove gloves	110	100
Hands hygiene	106	96.4
Fill in care notes	110	100

During practice procedure, most nurses practice satisfactorily all the steps, but there are still some steps which were not practice satisfactorily such as: providing oxygen for 30 seconds - 1 minute (each time) in the interval during suction and no more than 15 seconds each time, no more than 5 minutes/1 session (92.7%), hands hygienic (96.4%).

**Table 4. Results of practicing technical procedures among nurses (n = 110)**

Practice the procedure	Unsatisfactory (< 100%)	Satisfactory (100%)
	n (%)	n (%)
Chest percussion	71 (64.5)	39 (35.5)
Sputum suction	20 (18.2)	90 (81.8)

The rate of satisfactory practice of chest percussion and sputum suction is 35.5% and 81.8%, respectively.

**Table 5. Relationship between nurses' characteristics and practice of chest percussion procedure**

Characteristic	Practice of chest percussion		OR (95% CI)	p	
	Satisfactory	Unsatisfactory			
Age	≥ 30	35 (36.8)	60 (63.2)	1.60 (0.48 – 5.42)	0.444
	< 30	4 (26.7)	11 (73.3)		
Qualification	University	9 (60.0)	6 (40.0)	3.25 (1.06 – 9.96)	0.032
	College	30 (31.6)	65 (68.4)		
Working experience	> 10 years	22 (36.7)	38 (63.3)	1.12 (0.51 – 2.47)	0.771
	≤ 10 years	17 (34.0)	33 (66.0)		
Working experience of caring tracheostomy patients	> 10 years	22 (36.7)	38 (63.3)	1.12 (0.51 – 2.47)	0.771
	≤ 10 years	17 (34.0)	33 (66.0)		
Number of patients whom nurse take care of/day	< 5	14 (56.0)	11 (44.0)	3.06 (1.22 – 7.64)	0.015
	≥ 5	25 (29.4)	60 (70.6)		

Characteristic	Practice of chest percussio		OR (95% CI)	p
	Satisfactory	Unsatisfactory		
Number of tracheostomy patients whom nurse take care of/day	< 3 29 (36.2)	≥ 3 51 (63.8)	1.14 (0.47 – 2.76)	0.776
	10 (33.3)	20 (66.7)		
Number of training participation	> 1 times 23 (35.4)	once 42 (64.6)	0.99 (0.45 – 2.19)	0.985
	16 (35.6)	29 (64.4)		

The proportion of nurses who have bachelor’s degrees and care < 5 patients/day practiced satisfactorily chest percussio procedure was higher than that of nurses who have college’s degrees and care > 5 patients/day with ORs of 3.25 and 3.06, respectively. This difference is statistically significant with  $p < 0.05$ .

**Table 6. The relationship between nurses’ characteristics and practice of sputum suction**

Characteristic	Practice of sputum suction		OR (95% CI)	p
	Satisfactory	Unsatisfactory		
Age	≥ 30 83 (87.4)	< 30 12 (12.6)	7.91 (2.43– 25.76)	0.000
	7 (46.7)	8 (53.3)		
Qualification	University 14 (93.3)	College 1 (6,7)	3.50 (0.43 – 28.30)	0.297
	76 (80.0)	19 (20.0)		
Working experience	> 10 years 55 (91.7)	≤ 10 years 5 (8.3)	4.71 (1.57 – 14.12)	0.003
	35 (70.0)	15 (30.0)		
Working experience of caring tracheostomy patients	> 10 years 55 (91.7)	≤ 10 years 5 (8.3)	4.71 (1.57 – 14.12)	0.003
	35(70.0)	15 (30.0)		
Number of patients whom nurse take care of/day	< 5 20 (80.0)	≥ 5 5 (20.0)	0.86 (0.28 – 2.65)	0.789
	70 (82.4)	15 (17.6)		
Number of tracheostomy patients whom nurse take care of/day	< 3 66 (82.5)	≥ 3 14 (17.5)	1.18 (0.41 – 3.42)	0.762
	24 (80.0)	6 (20.0)		
Number of training participation	> 1 times 59 (90.8)	once 6 (9.2)	4.44 (1.55 – 12.69)	0.003
	31 (68.9)	14 (31.1)		

The rate of nurses aged ≥ 30 years, with working experience > 10 years, experience in tracheostomy patient care > 10 years and participation in training > once, practicing sputum suction satisfactorily, was higher than that of nurses aged < 30 years, with working experience ≤ 10 years, experience in taking care of tracheostomy patient ≤ 10 years and participation in training once with OR respectively 7.91; 4.71; 4.71 and 4.44. This difference is statistically significant with  $p < 0.05$ .

## DISCUSSION

**Results of chest percussion procedure practice:** The rate of satisfactory practice of chest percussion is relatively low, only 35.5%. This result is similar to Vu Thi En's research <sup>7</sup> (30.9%). This may be due to the time required to perform this procedure is quite long, while there are still many other procedures that need to be practiced and monitored on that patient. The low satisfactory rates often focus on a number of steps such as:

Hand hygiene before procedure accounted for 84.5%. This result is higher than Vu Thi En's study <sup>7</sup> (80.4%). Although hand hygiene before procedure does not directly affect infection at the patient's contact site, nurses need to wash their hands before and after interacting with patients to prevent infection. Hand hygiene is the most important measure in preventing hospital infections because hands may be an important means of spreading infectious agents.

Patting and vibrating time of about 10 minutes which is satisfactory practice accounted for 79.1% and 47.3%, respectively. For the chest percussion, it is necessary to ensure 10-15 minutes of patting and vibrating to have the desired effect of removing phlegm. If this procedure is not practiced or is practiced in too short time, there is no effectiveness in chest percussion. Other steps practiced previously become meaningless and a waste of time. For techniques that require a lot of care time, such as chest percussion, the nurse is required not to be pressured by work overload.

Vibration technique has a success rate of 80.9%, similar to Vu Thi En's research <sup>7</sup> (81.3%). This may be due to nurses do not

have much time, they prioritize practice other emergency techniques.

**Results of practicing the sputum suction procedure:** The rate of satisfactory practice of sputum suction is 81.8% which is higher than Vu Thi En's study <sup>7</sup> (76.6%). This result shows that nurses are aware of the importance of sputum suction and especially that compliance with the procedure brings great significance in restoring the patient's health. However, there are still some steps that are not well practiced:

The proportion of hands hygiene before and after practicing the procedure accounted for 93.6% and 96.4%, respectively. This result is higher than that of hand hygiene in the chest percussion which indicated that nurses are aware of preventing infection for themselves as well as for other patients.

Assessing the patient's condition, providing prior explanation (if the patient is conscious), and providing explanation to the patient's family reached 95.5%, higher than Vu Thi En's research <sup>7</sup> (85%). The results of Bui Truong Hy's <sup>9</sup> study about providing mental care to patients showed that 63.5% of participants practice satisfactorily during office hours and 45.1% practice satisfactorily outside office hours. This may be due to the patient feel uncomfortable when nurses practice this procedure and may not cooperate during the procedure, so the nurse needs to explain and encourage the patients.

The proportion of nurses letting patients re-breathe oxygen for 30 seconds - 1 minute (each suction should not exceed 15 seconds, no more than 5 minutes/1 session) in the interval during suction sessions accounted for 92.7%. According to our observations, the nurse gave the patient oxygen again in the interval during suction sessions, but

there were still a few nurses who did not let the patient breathe oxygen for the full 30 seconds.

Research results showed that the rate of nurses  $\geq 30$  years old practice satisfactorily sputum suction procedure than those of nurses  $< 30$  years old (OR = 7.91) Research by Trinh Van Tho <sup>10</sup> reported that the proportion of nurses over 30 years old have satisfactory practice than that of nurses under 30 years old ( $p < 0.05$ ). Research by Vu Ngoc Anh <sup>11</sup> also showed similar results. For the medical profession in general and nurses in particular, when practicing techniques and procedures that require precision and care, besides high qualifications, working experience is also required. Therefore, older nurses often have many years of experience, so they are able to practice better than younger nurses.

Research results presented that the rate of nurses with bachelor's degree practice satisfactorily chest percussion was higher than that of nurses with college (OR = 3.25). This result is similar to the study of Vu Thi En <sup>7</sup> and Trinh Van Tho <sup>10</sup>, the difference is statistically significant with  $p < 0.05$ . The results show that improving qualifications and updating knowledge together with working experience help nurses work confidently and effectively and ensure patients' safety.

Our research indicates that the rate of nurses with working experience  $> 10$  years and experience in tracheostomy patient care  $> 10$  years practice satisfactorily sputum suction procedure is higher than that of nurses with working experience  $< 10$  years (OR = 4.71). This result is similar to Vu Thi En's <sup>7</sup> study when it showed that the rate of nurses with working experience  $> 10$  years and 6 - 10 years of sputum suction practice is higher than those for nurses with working

experience  $\leq 5$  years. Nurses with many years of working experience will have more experiences and skills than new nurses. Trinh Van Tho's study <sup>10</sup> results also show that the proportion of nurses with working experience  $> 10$  years practice satisfactorily is higher than that of nurses with  $\leq 10$  years of working experience. This difference is statistically significant with  $p < 0.05$ . Reality shows that long-term work experience not only helps facilitate work when encountering many situations that need to be handled, but even imparting experience and training to newly recruited employees is the purpose targeted by employers.

Our research results showed that the rate of nurses who care  $< 5$  patients/day practice satisfactorily chest percussion was higher than that of nurses who care for  $\geq 5$  patients/day (OR = 3.06). This result is similar to Trinh Van Tho's <sup>10</sup> study which presented that nurses who took care of less than 10 patients a day had the proportion of satisfactory practices in caring for infected surgical wounds than nurses who took care of more than 10 patients a day. This difference is statistically significant with  $p < 0.05$ . This presented that the increasing number of patients and the hard work are factors causing a decrease in the quality of patient care, therefore it is necessary to have supporting policies and measures to ensure nurses' quality of care.

Our research results indicated that the rate of nurses participating in training  $> 1$  once practice satisfactorily sputum suction is higher than those who have been trained once (OR = 4.44). This result is similar to Trinh Van Tho's <sup>10</sup> study when it showed that the rate of nurses who were trained  $> 1$  once in the past 12 months is higher than that only were trained once. This difference is statistically significant with  $p < 0.05$ .

Our study still has some limitations. The study evaluated the care activities of nurses in a department and used a convenient sampling method, the level of evaluation is relatively narrow. In addition, during data collection, it is necessary to observe the nurses working, so maybe the nurses discovered that they were being observed and were more aware of practice the procedure better.

### CONCLUSION

The rate of nurses who practiced satisfactorily sputum suction is relatively high (81.8%), but it is too low with chest percussion procedure (35.5%). There are a number of factors related to practicing chest percussion procedure including qualifications and the number of patients cared for/day. Some factors related to practicing sputum suction are age, working experience and experience in caring for tracheostomy patients, and number of times participating in training.

**RECOMMENDATIONS:** Nurses need to pay attention to complying with procedure practices, especially nurses who are < 30 years old, have low qualifications, short working time and rarely participate in training.

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