

Relationship between Facemask Ventilation and Post Operating Nausea and Vomiting in Vietnam

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Abstract: Post operating nausea and vomiting (PONV) remains a significant problem in modern anesthetic practice because there are many complications such as delayed recovery, pulmonary aspiration, wound dehiscence, and dehydration. The knowledge of the nurse anesthetist ventilating the lungs prior to endotracheal intubation has been shown to influence the incidence of PONV, with those less knowledgeable having a significantly greater incidence of PONV. There are many researches try to find the relationship between PONV and gender, allergies, use morphine, smoking, surgical time. **Purpose:** This study aims to explore the relationship between facemask ventilation (FMV) and post operating nausea and vomiting. **Methodology:** This study is applied the cross-sectional design. **Results:** The pressure of FMV and the FMV oxygen volume effect to the PONV. FMV by hand increased by 2.013 points relatively and FMV by hand had 5.81-fold higher risk of vomiting in post operation. **Conclusion:** Nurse anesthetist has to attention to volume of oxygen, pressure of facemask ventilation and nurse anesthetists should use FMV by machine or using by hand softly and regularly, as FMV by hand lead to PONV.

Keywords Post operating nausea and vomiting, facemask ventilation, nurse anesthetist.

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I. Introduction

Post operating nausea and vomiting (PONV) remains a significant problem in modern anesthetic practice because there are many complications such as delayed recovery, pulmonary aspiration, wound dehiscence, and dehydration [1]. The knowledge of the nurse anesthetist ventilating the lungs prior to endotracheal intubation has been shown to influence the incidence of PONV, with those less knowledgeable having a significantly greater incidence of PONV [2]. Facemask ventilation (FMV) prior to intubation with inspiratory pressure less than 20 cm H₂O in adult and less than 15 cm H₂O in children prevent from PONV and aspiration [3].

In Vietnam, the PONV is nearly 40% at the case with general anesthesia [4]. However, there are many research try to find the relationship between PONV and sex, allergies, use morphine, smoking, surgical time... There are no study to find out the relationship between PONV and anesthesia technique. To conduct intubation for patient, nurse anesthetist must ventilate by facemask before intubation 60 to 120 seconds. Therefore, this study will find out the relationship between PONV and facemask ventilation in prior to intubation.

II. Methodology

2.1 Aim of study

This study aims to explore the relationship between facemask ventilation and post operating nausea and vomiting.

2.2 Research question

What is the demography of FMV and anesthesia technique affect to the PONV?

What are the factors of FMV and anesthesia technique affect to the PONV?

2.3 Study design

This study is applied the cross-sectional design

2.4 Setting

The study implements in Cancer Hospital and 115 Hospital in Vietnam, which have many cases for operating a day.

2.5 Population and sample

The patients are operated in Surgical and Anesthesiology Department of Cancer Hospital, 115 Hospital in Ho Chi Minh City.

Inclusion criteria:

The patient with ASA (American Society of Anesthesiologists) 1,2 and 3. The latest version of the American Society of Anesthesiologists (ASA) physical status classification system (ASAPS) as approved by the ASA House of Delegates on October 15, 2014 and adapted for this presentation. Note that there is no specific classification assigned to patients with a moderate systemic disease, just assignments for patients with mild systemic disease (ASA 2) and those with severe systemic disease (ASA 3). **ASA 1** means a normal healthy patient such as fit, nonobese (BMI under 30), a nonsmoking patient with good exercise tolerance. **ASA 2** means A patient with a mild systemic disease such as patient with no functional limitations and a well-controlled disease (e.g., treated hypertension, obesity with BMI under 35, frequent social drinker or is a cigarette smoker). **ASA 3** means a patient with a severe systemic disease that is not life-threatening such as patient with some functional limitation as a result of disease (e.g., poorly treated hypertension or diabetes, morbid obesity, chronic renal failure, a bronchospastic disease with intermittent exacerbation, stable angina, implanted pacemaker) [5]. The patient is conducted the general anesthesia with Endotracheal Tube (ETT)
The patient voluntarily participated in the study

Exclusion criteria

Patients have the history of aspiration
The patient with full stomach.
The patients have some diseases such as: pancreatitis, Meniere’s disease, GI trauma.
Patients with communication or mental problems.

2.6 Sample size

The estimate sample size based on the equal

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

n: estimated sample size.

α: statistically significant level in study α = 0.05.

Z (1-α/2), with alpha =0.05, Z =1.96

p: percentage of patients with post-operative nausea and vomiting in Vietnam is 17.7% [6].

d: accuracy, with p=0.177 select d=0.05

So, the minimum sample size in the study was n = 224 patients

2.7 Data collection

The researcher gets the data in 4 phrases:

First phrase: before the patient go to operating room, nurse anesthetist collects age, ASA, type of surgery, female, history of motion sickness and nonsmoking status.

Second phrase: while patient is conducted anesthesia. The researcher gets the highest pressure while the patient is ventilated by facemask from 1 to 2 minutes before intubation.

Third phrase: when patient is moved to the recovery room, the researcher check whether patient is used opioids.

Forth phrase: after operating 6 hours, patient is evaluated the VAS about nausea feeling and checked whether patient vomits.

2.8 Research ethics

The participant will receive the cover letter and consent information. The participant will read and ask any question before they agree participate. Participants may withdraw without prejudice at any time.

III. Results

3.1 Characteristic of participants

Table 3.1. The descriptive of demography variable (n=259)

Variables	Minimum	Maximum	Mean
Age	9.00	74.00	47.76±14.53
BMI	12.13	31.60	21.57±3.04
Lowest Pressure of FMV	5.00	30.00	15.64±4.61
Highest Pressure of FMV	15.00	60.00	25.58±6.66

Highest Oxygen of FMV	2.30	10.00	7.02±1.19
Lowest EtCO ₂	17.00	41.00	29.16±4.43
Highest EtCO ₂	22.00	54.00	37.26±4.51
Nausea	1.00	8.00	3.45±2.55

The result showed that the average of participant's age is 47.76±14.53 mean the rage was high from 9 to 74 years old. The pressure of facemask ventilation was from 15.64±4.61 to 25.58±6.66, which is higher than the theory of nurse anesthesia. The oxygen volume of facemask ventilation was 7.02±1.19 and end tidal CO₂ was from 29.16±4.43 to 37.26±4.51, which is suitable in theory. The mean of nausea was 3.45±2.6, which showed that feeling of nausea was middle and the range was quite wide.

Table 3.2. The frequency of demography variable (n=259)

Variable		Frequency	Percent
ASA	1	82	31.7
	2	165	63.7
	3	12	4.6
Type of Surgery	Incision	75	29.0
	Laparoscopy	184	71.0
Gender	Male	129	49.8
	Female	130	50.2
History of Motion Sickness	No	201	77.6
	Yes	58	12.4
Smoking	No	169	65.3
	Yes	90	34.7
Type of Anesthesia	General anesthesia	241	93.1
	Combination of local and general anesthesia	18	6.9
Type of Facemask Ventilation	Hand	227	87.6
	Machine	32	12.4
Using opioids in post-operation	No	172	67.4
	Yes	87	32.6
Vomiting	No	191	73.7
	Yes	68	26.3

The results indicated that the major percentage of American Society of Anesthesiology (ASA) physical status classification is ASA II with 63.7%. The rate of laparoscopy surgery is higher than one of incision surgery, 71% compared with 29%. Percentage of male and female was nearly equal, 49.8% male compare with 50.2% female. The smoking participant was 34.7%. History of motion sickness was 18.5% the participants who joined general anesthesia was 93.1%. The percentage of FMV's type was 87.6% by hand and 12.4% by machine. 67.4% participants were used opioid in post operation and 32.6% participants were not used opioid in post operation. 73.7% participants were not vomiting, and 26.3% participants were vomiting.

3.2 Explore factors from anesthesia technique, which effect on PONV

Table 3.3. Factors which effected to Nausea (n =259)

Items		Mean of Nausea	T	Sig. (2-tailed)
Type of surgery	Incision	3.28±2.62	-691	.490
	Laparoscopy	3.52±2.53		
Gender	Male	4.03±2.81	3.727	.000
	Female	2.88±2.12		
History of Motion sickness	Yes	5.50±2.79	-5.826	.000
	No	2.99±2.25		
Smoking	Yes	3.840±2.92	-1.692	.093
	No	3.24±2.31		
Type of	General	3.57±2.60	9.133	.000

Relationship between Facemask Ventilation and Post Operating Nausea and Vomiting in Vietnam

anesthesia		Combination	1.83±.38		
Type of Facemask Ventilation	of	By machine	3.17±2.49	-5.821	.000
		By hand	5.47±2.03		
Using in post-operation	opioid	Yes	4.78±2.29	-5.930	.000
		No	2.87±2.44		

This result indicated that the gender, history of motion sickness, type of anesthesia, type of facemask ventilation and using opioid in post operation effected to the nausea in post operation. The male got higher nausea feeling than female. The rate of nausea was higher in the patient with history of motion sickness and using general anesthesia. The patients who were used facemask ventilation by hand got nausea higher the ones used facemask ventilation by machine. The patients using opioids in post operation got higher score in nausea.

Table 3.4. The factors effect to Vomiting (n=259)

Items	Vomiting		Value	Pearson Chi-Square		
	No, n (%)	Yes n (%)		df	Asymp. Sig. (2-sided)	
Surgery	Incision	57 (76%)	18 (24%)	.277 ^a	1	.599
	Laparoscopy	134 (72.8%)	50 (27.2%)			
Gender	Male	82 (63.6%)	47 (36.4%)	13.754 ^a	1	.000
	Female	109 (83.8%)	21 (16.2%)			
History of Motion sickness	No	172 (85.6%)	29 (14.4%)	35.514 ^a	1	.000
	Yes	19 (32.8%)	39 (67.2%)			
Smoking	No	130 (76.9%)	39 (23.1%)	2.537 ^a	1	.111
	Yes	61 (67.8%)	29 (32.2%)			
Type of Anesthesia	General	173 (71.8%)	68 (28.2%)	6.887 ^a	1	.009
	Combination	18 (100%)	0 (0%)			
Type of FMV	By hand	15 (46.9%)	17 (53.1%)	13.615 ^a	1	.000
	By machine	176 (77.5%)	51 (22.5%)			
Using opioids in post operation	No	142 (82.6%)	30 (17.4%)	8.064 ^a	1	.005
	Yes	49 (56.3%)	38 (43.7%)			

The results indicated that nausea was correlated to ASA with $r = -.221$, $n = 259$, $p < .01$; BMI with $r = -.302$, $n = 259$, $p < .01$; lowest pressure of FMV with $r = -.151$, $n = 259$, $p < .05$; high pressure of FMV with $r = -.137$, $n = 259$, $p < .05$; highest oxygen supplement of FMV with $r = .300$, $n = 259$, $p < .01$; highest EtCO₂ with $r = -.186$, $n = 259$, $p < .05$; age with $r = -.164$, $n = 259$, $p < .01$.

Table 3.5. The factors effect to Vomiting (n=259)

Vomiting		Mean	t	Df	Sig. (2-tailed)
Age	Yes	44.46±16.31	2.200	257	.029
	No	48.94±13.70			
BMI	Yes	19.57±2.62	6.843	257	.000
	No	22.28±2.86			
Lowest Pressure of FMV	No	15.50±5.25	-1.272	256.995	.205
	Yes	16.06±185			
Highest Pressure of FMV	Yes	22.56±3.11	6.336	248.760	.000
	No	26.65±7.25			
Highest Oxygen of FMV	No	6.88±1.04	-2.911	91.720	.005
	Yes	7.44±1.48			

Lowest EtCO2	No	29.63±4.39	2.938	257	.004
	Yes	27.82±4.29			
Highest EtCO2	No	37.98±3.92	4.459	257	.000
	Yes	35.24±5.40			

This table presented that the Age, BMI, the highest pressure of FMV, highest oxygen of FMV and value of EtCO2 effected to the vomiting in post operation. The result demonstrated that the mean of age, BMI the highest pressure of FMV, highest oxygen of FMV and value of EtCO2 were significant differences between vomiting group and no vomiting group.

The results indicated that the 2 groups difference of gender, history of motion sickness, type of anesthesia, type of facemask ventilation and using opioid in post-operation was significant about vomiting. The rate of vomiting in male was quite higher than female. The vomiting of participants who got motion sickness were higher. The patients with general anesthesia combined with local anesthesia were lower vomiting rate. The groups of using facemask ventilation by hand and using opioid in post operation were higher vomiting.

Table 3.6. The factors effect to Vomiting (n=259)

Items	Vomiting		Pearson Chi-Square			
	No, n (%)	Yes n (%)	Value	df	Asymp. (2-sided) Sig.	
Surgery	Incision	57 (76%)	18 (24%)	.277 ^a	1	.599
	Laparoscopy	134 (72.8%)	50 (27.2%)			
Gender	Male	82 (63.6%)	47 (36.4%)	13.754 ^a	1	.000
	Female	109 (83.8%)	21 (16.2%)			
History of Motion sickness	No	172 (85.6%)	29 (14.4%)	35.514 ^a	1	.000
	Yes	19 (32.8%)	39 (67.2%)			
Smoking	No	130 (76.9%)	39 (23.1%)	2.537 ^a	1	.111
	Yes	61 (67.8%)	29 (32.2%)			
Type of Anesthesia	General	173 (71.8%)	68 (28.2%)	6.887 ^a	1	.009
	Combination	18 (100%)	0 (0%)			
Type of FMV	By hand	15 (46.9%)	17 (53.1%)	13.615 ^a	1	.000
	By machine	176 (77.5%)	51 (22.5%)			
Using opioids in post operation	No	142 (82.6%)	30 (17.4%)	8.064 ^a	1	.005
	Yes	49 (56.3%)	38 (43.7%)			

IV. Discussion

4.1 The demographic data in this study

The result showed that the average of participant's age is from 9 to 74 years old with ASA 1,2,3. It is nearly like Dash & Sridhar's study with range 8 to 60 years old with ASA 1,2 in 2017. The pressure of facemask ventilation was from 15.64±4.61 to 25.58±6.66, which is higher than the theory of nurse anesthesia and higher than the research of Xiaowei Qian (2017). The oxygen volume of facemask ventilation was 7.02±1.19 and end tidal CO₂ (EtCO₂) was from 29.16±4.43 to 37.26±4.51, which higher than EtCO₂ of Orbey's study in 2009. The mean of nausea was 3.45±2.6, which showed that feeling of nausea was middle and the range was quite wide. The percentage of FMV's type was 87.6% by hand and 12.4% by machine with reason that the nurse anesthetist is familiar with FMV by hand. There were 67.4% participants were used opioid in post operation and 32.6% participants were not used opioid in post operation. 73.7% participants were not vomiting, and 26.3% participants were vomiting. The relationship between and using opioid in post operation, which was suitable to many studies.

4.2 The FMV and anesthesia factors related to PONV

This result indicated that the gender, history of motion sickness, type of anesthesia, type of facemask ventilation and using opioid in post operation effected to the nausea in post operation. Besides, nausea was correlated to ASA, BMI, lowest pressure of FMV, high pressure of FMV, highest oxygen supplement of FMV,

highest EtCO₂, age. The vomiting in post operation affected by age, BMI, the highest pressure of FMV, highest oxygen of FMV, value of EtCO₂ gender, history of motion sickness, type of anesthesia, type of facemask ventilation and using opioid in post-operation. Based on the following, the predictors for nausea and vomiting to help nurse anesthetist to evaluate and care the patients well. The predictor of nausea and vomiting in post operation which related to the facemask ventilation was type of facemask ventilation. The result indicated that using facemask ventilation by hand increased 2.013 points in nausea score in post operation and helped predict 5.81-fold higher risk than those who used facemask ventilation by machine. This result was similar to the result in children facemask ventilation that summarized that incidence of gastric insufflation was higher in the manual ventilation than pressure-controlled ventilation [7]. In Lee's study, OR of gastric insufflation by manual ventilation 7.78 (3.38-17.9) while this study showed that OR of vomiting which cause to gastric insufflation in facemask ventilation by hand was 5.81 (1.02-33.02).

The Apfel predict model described for risk of PONV effectively with 4 factors: female, history of motion sickness, smoking and using opioid in post operation [8]. This study contributed one more factor to evaluate the PONV for patient was facemask ventilation by hand or manual facemask ventilation.

V. Conclusion

This study achieved stronger evidence for the predictor of PONV which is facemask ventilation by hand or manual facemask ventilation. Nurse anesthetist focuses more in history of motion sickness while examining the premedication. In conducting periods, nurse anesthetist attentions to volume of oxygen, pressure of facemask ventilation and nurse anesthetists use FMV by machine or using by hand softly and regularly, as FMV by hand lead to PONV. In post-operating period, nurse anesthetist attention more whenever patients use opioids.

References

- [1] S. S. Imtiaz, Nagarekha, H. Ganapati, and Marutheesh, "Postoperative nausea and vomiting: A simple yet complex problem," *Anesthesia, Essays and Researches*, vol. 10, no. 3, pp. 388-396, Sep-Dec 2016.
- [2] Clendenen, Shine, Sitzman, Feinglass, and Marshall, "Mask ventilation at anesthesia induction does not increase the incidence of PONV" *Anesthesia & Analgesia*, vol. 88, no. 2S, p. 4S, 1999.
- [3] X. Qian *et al.*, "Determination of the optimal inspiratory pressure providing adequate ventilation while minimizing gastric insufflation using real-time ultrasonography in Chinese children: a prospective, randomized, double-blind study," *MBC Anesthesiology*, vol. 17, no. 126, 2017.
- [4] H. V. Huân, T. X. Thinh, and H. K. Cảnh, "Evaluate some factors which effect to PONV in general anesthesia," *Ho Chi Minh Medical Journal*, 2010.
- [5] K. M. Knuf, C. V. Maani, and A. K. Cummings, "Clinical agreement in the American Society of Anesthesiologists physical status classification," (in eng), *Perioperative Medicine*, vol. 7, p. 14, 2018.
- [6] N. T. Tu and N. H. Tu, "RISK FACTORS FOR POSTOPERATIVE NAUSEA AND VOMITING," *Medical Journal*, vol. 87, no. 2, pp. 74-82, 2014.
- [7] J. H. Lee *et al.*, "Manual versus pressure-controlled facemask ventilation during the induction of general anaesthesia in children: a prospective randomised controlled study," (in eng), *Paediatric Anaesthesia*, Feb 3 2019.
- [8] C. C. Apfel, P. Kranke, L. H. Eberhart, A. Roos, and N. Roewer, "Comparison of predictive models for postoperative nausea and vomiting," (in eng), *British Journal Anaesthesia*, vol. 88, no. 2, pp. 234-40, Feb 2002.

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