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REGULAR ARTICLE

Perception of anesthesia safety and postoperative symptoms of surgery patients in Ho Chi Minh City, Vietnam: a pioneering trial of postoperative care assessment in a developing nation

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Abstract
Objectives Vietnamese patients' views on healthcare are changing as surgical interventions become more commonplace, but their views on perioperative care have remained largely unstudied during this period of rapid change. This study assesses Vietnamese patients' impression of anesthesia safety and postoperative pain in relation to clinical outcomes with the aim of improving patient-centered perioperative care.
Methods The study cohort consisted of 180 hospitalized patients who were followed for 24 h following abdominal surgery. The assessments of these patients on the use of anesthesia and postoperative pain were measured by means of a 5-point Likert scale survey. Perioperative events were recorded on standardized forms by medical staff. The relationship between relevant factors affecting the patients' perceptions of anesthesia safety, postoperative symptoms, and pain was examined using multiple logistic regression analysis.
Results The perception of a low level of anesthesia safety by 105 patients (59%) was associated with a low satisfaction in terms of preoperative anesthesia education [odds ratio (OR) 15.03], poor interaction with family (OR 21.80), and absence of perioperative adverse effects (OR 6.10). The occurrence of three or more postoperative symptoms (59%) was associated with a surgery $\geq$3 h (OR 2.00). Severe pain at 2 h (25%) post-surgery was associated with male gender (OR 2.08) and open surgery (OR 3.30), no reduction in pain at 24 h (51%) was associated with female gender (OR 2.08), and experiencing as much or more pain than expected (46%) was associated with blood loss $\geq$100 ml (OR 1.04) and low satisfaction with staff communication (OR 1.90).
Conclusion Our results suggest that facilitating patients' communication with staff and families and paying attention to gender differences in pain management are important factors to take into consideration when the aim is to improve perioperative care in the rapidly developing healthcare environment of Vietnam.

Keywords Anesthesia safety · Patient satisfaction · Postoperative pain

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Introduction

The proper use of anesthesia is important for reducing the pain and anxiety of patients undergoing surgery. In order to improve the quality of such care, it is essential to evaluate perioperative services [1]. While quality assessments are becoming increasingly more common in developed nations, data on patient-centered evaluations in developing countries are limited [2, 3]. Patients' perioperative conditions are influenced not only by medical factors, such as disease pathophysiology, anesthetic intervention, and surgical procedures, but also by patients' perception of the care they receive [4]. The relief of symptoms, promotion of satisfaction with the medical experience, and promotion of a feeling of well-being are among the most important goals of care, and are of central concern to patients and doctors alike [5]. Therefore, any evaluation of medical service must involve both clinical factors and the medical experience as perceived by the patient, i.e., the patient's subjective perception of the medical experience.

Patient satisfaction and pain assessment largely depend on cultural norms and individual expectations. Consequently, measurements and/or assessments of patient satisfaction and pain cannot be reliably generalized across cultures. A recent study by Carragee and colleagues [6] demonstrated that Vietnamese and American patients reported different levels of pain even with similar surgical procedures and anesthetic methods, ostensibly due to differences in cultural conditioning. Due to the recent introduction of various modern interventions and methods in resource-limited countries [7, 8], the importance of comprehensive and multifaceted medical service evaluations is increasing.

Similar to much of Asia, Vietnam is not an exception in experiencing rapid economic growth and improvements in healthcare, resulting in dramatic changes in medical practice and views on medical care by both providers and patients. According to hospital statistics of the University Medical Center (UMC), a hospital affiliated with the University of Medicine and Pharmacy, Ho Chi Minh City in Vietnam, the annual number of surgeries performed under anesthesia increased from 5,500 cases in 2003 to 13,400 cases in 2005. The most common type of operation was abdominal surgery, which comprised 48% of all surgeries performed in 2005. Surgical methods are also becoming more advanced; in 2005, 30% of all abdominal surgeries, for example, were done with laparoscopy. In addition, many hospitals with Western facilities and healthcare practices have been established in the last decade, and providers are becoming more aware of patient-centered care nationwide [9].

Despite these meteoric changes in healthcare, very little effort has been expended to evaluate anesthetic care from both the clinical and patients' perspectives in the Vietnamese healthcare environment. In order to gain a better understanding of the factors relevant to improving patient-centered perioperative care, we conducted a study among abdominal surgery patients at UMC in Ho Chi Minh City with the following specific objectives: (1) to assess surgical and anesthesia outcomes and (2) to assess the clinical and sociodemographic factors associated with the perception of anesthesia safety and postoperative symptoms, including pain.

Methods

This was a hospital-based epidemiologic study. Patients undergoing gastrointestinal tract (lower esophagus to rectum) surgery were recruited between October 2006 and February 2007. Patients <15 years of age and emergency cases were excluded. Those who gave informed consent were registered and followed for 24 h post-surgery. The study was approved by the ethics committees of Yamagata University Faculty of Medicine and Fukushima Medical University, and the chancellor of the University of Medicine and Pharmacy, Ho Chi Minh City.

Data were collected using structured questionnaires that consisted of sections answered by anesthesiologists, recovery room staff, and patients, respectively. The selection of questionnaire items was based primarily on the survey tool developed by Morgan et al. [10] for assessing perioperative satisfaction among women undergoing caesarean section. Elements of other previous survey-based studies that aimed to improve patients' perioperative experience were also incorporated into our questionnaires [11–15]. The questionnaires were first developed in English through discussion with local physicians and subsequently translated into Vietnamese and then back-translated into English. The original and back-translated versions were compared to assess the accuracy of the translation. We validated selected questionnaire items by verifying patients' answers with data from the medical chart and comparison with other indicators. Prior to the main survey, we conducted a pilot study for 1 week in August 2006 at UMC with 12 patients to test the quality of the questionnaire, train the survey staff, and confirm the feasibility of the survey protocol. We set an optimal sample size of 180, referring to calculations based on the binomial distribution of a reported occurrence of insufficient postoperative pain control among Vietnamese patients [6] and considering a balance between the tightness of the calculated 95% confidence interval (CI) and the feasibility of the survey.

Eight anesthesiologists recorded patients' baseline medical information, medical procedures performed, and

any treatment for immediate sequelae of anesthesia or surgical interventions, including pain control, on the day of the surgery. All surgical patients were kept in the recovery room for approximately the first 24 h post-surgery prior to their return to the surgical wards; their interaction with their families was limited during this time. The recovery room staff (4 doctors and 8 nurses) recorded each patient's postoperative condition during this period and, at 24 h, data were recorded on each patient's subjective perception of surgical pain, postoperative symptoms, and the care they had received. In terms of objective data, in response to a patient's pain, any changes in dose or frequency of analgesics was recorded by the healthcare staff.

The following baseline patient characteristics were obtained from medical records by the anesthesiologists and recovery room staff: age, sex, American Society of Anesthesiologists (ASA) classification, medical history, smoking status, and alcohol consumption. Anesthetic and surgical factors, including diagnosis, surgical location, surgical procedure, types of anesthesia provided, duration of surgery, amount of blood loss, pharmacotherapy used, perioperative adverse effects, analgesic medication, and resting surgical pain 2 h after surgery, were recorded.

The following information was self-reported by patients: education, occupation, medical insurance status, postoperative symptoms, surgical pain 24 h after surgery, and severity of actual pain compared to expected pain. Using a 5-point Likert scale, the patients were also asked to evaluate their perioperative care in terms of their perception of the safety of receiving anesthesia and their satisfaction with (1) the preoperative education they were given about the anesthesia, (2) their communication with the medical staff, and (3) their interaction with their families before and after surgery. Postoperative symptoms included surgical pain, sore throat, hoarseness, drowsiness, headache, lumbar pain, shoulder pain, dizziness, fever, and nausea or vomiting. Subjective reporting of these types of symptoms has been validated in previous studies [14, 16]. The level of pain was measured using a standard six-level face-scale score using original pictures developed by Wong and Baker [17].

Statistical analysis

All data were recorded using Access database software (Microsoft, Redmond, WA) and analyzed with SPSS standard version software (SPSS Japan, Tokyo, Japan). First, descriptive analyses were conducted to identify the basic background characteristics of the patients and anesthesia outcomes. Key outcome measurements were: complications with epidural anesthesia, perioperative adverse effects, patients' evaluation of care they received, postoperative symptoms, and pain after surgery. Second, logistic regression analyses were conducted to examine factors associated with (1) feeling less safe with the anesthesia, (2) total number of postoperative symptoms, (3) severe pain at 2 h after surgery, (5) no reduction in pain between 2 and 24 h after surgery, and (5) feeling pain approximately equal to or more than expected. Significant variables in bivariate analyses were entered into the multivariate analyses.

All dependent variables were dichotomized as follows after confirming their distributions: the total number of postoperative symptoms ($\leq$2 vs. $\geq$3), pain at 2 h [mild-moderate pain (levels 1–3) vs. severe pain (levels 4–6)], recovery from pain (recovered vs. not recovered, worsened, or no change), and pain expectation (less than expected vs. equal to or more than expected). Recovery from pain was defined as the difference between pain scale scores at 2 and 24 h. In terms of a feeling of safety with anesthesia, only the two highest levels (agree vs. strongly agree) were compared as due to the overall high scoring rate, exclusion of the three lowest levels resulted in the exclusion of only three of 178 subjects from the analysis.

With respect to dichotomized independent variables, 15 items were entered into the analysis of postoperative symptoms: sociodemographic characteristics (age, sex, medical insurance coverage, current smoking and drinking status) and surgical and anesthetic factors (ASA classification, surgical location, surgical procedure, types of anesthesia, evidence of malignancy, duration of surgery, amount of blood loss, complications with epidural anesthesia, perioperative adverse events, and opioid use). In the analyses of the other four outcomes, five additional variables were entered: sociodemographic characteristics (education, occupation) and patients' views (satisfaction with preoperative anesthesia information, communication with medical staff, interaction with family).

Results

In total, 180 consecutive patients were enrolled in this study. There were no refusals, but two patients did not complete the survey due to coma and death, respectively; the available data for these patients were included in the final analyses. The baseline characteristics of the patient cohort are shown in Table 1. Table 2 presents the data on anesthesia and surgical outcomes, patients' attitudes towards anesthesia, and postoperative symptoms, respectively. Complications with epidural anesthesia and perioperative adverse effects were reported by the medical staff for 17 and 67% of the patients, respectively. Notably, 98% of patients agreed with the statement that they felt safe regarding anesthesia. In terms of symptoms, 59% of

Table 1 Baseline characteristics of patient cohort

Baseline characteristics	*n* (%)[a]	Median (minimum, maximum)
Sociodemographic characteristics		
Age (years)		57 (16, 86)
16–39	14 (7.8)	
40–64	105 (58.3)	
≧65	61 (33.9)	
Sex		
Male	100 (55.6)	
Female	80 (44.4)	
Education		
None up to primary school	69 (38.3)	
Higher than primary school	109 (61.7)	
Occupation		
Work with stable income[b]	25 (14.0)	
Work with unstable income	153 (86.0)	
Medical insurance coverage		
Yes	21 (11.8)	
No	157 (88.2)	
Surgical and anesthetic characteristics		
American Society of Anesthesiologists (ASA) classification		
I–II	149 (82.8)	
III or higher	31 (17.2)	
Malignancy		
Malignant	149 (82.8)	
Benign	31 (17.2)	
Medical history		
Cardiovascular disease		
Yes	53 (29.4)	
No	127 (70.6)	
Pulmonary disease		
Yes	28 (15.6)	
No	152 (84.4)	
Endocrine disease		
Yes	13 (7.2)	
No	167 (92.8)	
Surgical area		
Upper gastro-intestinal (GI) tract ± lower GI tract	93 (51.7)	
Lower GI tract	87 (48.3)	
Types of surgical procedures		
Laparoscopic surgery	45 (25.0)	
Open surgery	135 (75.0)	
Types of anesthesia		
General (inhalational) anesthesia	47 (26.1)	
General (inhalational) + epidural anesthesia	133 (73.9)	
Duration of surgery (min)		180 (15, 470)
Amount of blood loss (ml)		100 (5, 1000)

[a] Total patient cohort (*n*) = 180 patients. Discrepancy in the number of patients in some categories is due to two patients being unable to complete the survey as a result of poor postoperative condition

[b] Stable income defined as salaried employees: government employee, office worker, and others. Unstable income includes non-salaried occupations, such as housewife, unemployed, farmer, fisherman, blue collar worker, self-employed worker, and others

patients reported three or more postoperative symptoms, and 12% reported experiencing more pain than expected, with 25 and 9% of these reporting moderate/severe pain at 2 and 24 h post-surgery, respectively. At 24 h, approximately 50% of the patients reported that their pain was unchanged or had worsened.

Table 2 Sequelae of anesthesia, attitudes to perioperative care, and postoperative symptoms

	n (%)[a]
Surgical and anesthetic outcomes	
Complications with epidural anesthesia (yes)	31 (17.2)
Needling >3 times (yes)	24 (13.3)
Dural puncture (yes)	4 (2.2)
Bleeding from epidural space (yes)	7 (3.9)
Perioperative adverse effects (yes)	121 (67.2)
Respiratory events (yes)	17 (9.4)
Cardiac events (yes)	106 (58.9)
Neurological events (yes)	5 (2.8)
Patients' views	
"Feeling safe regarding anesthesia"	
Strongly agree	70 (39.3)
Agree	105 (59.0)
Neutral	3 (1.7)
Disagree	0 (0.0)
Strongly disagree	0 (0.0)
"Satisfaction with the preoperative anesthesia education"	
Strongly agree	76 (42.7)
Agree	100 (56.2)
Neutral	1 (0.6)
Disagree	1 (0.6)
Strongly disagree	0 (0.0)
"Having good communication with medical staff"	
Strongly agree	86 (48.3)
Agree	91 (51.1)
Neutral	1 (0.6)
Disagree	0 (0.0)
Strongly disagree	0 (0.0)
"Having good interactions with family before operation"	
Strongly agree	91 (51.1)
Agree	86 (48.3)
Neutral	0 (0.0)
Disagree	0 (0.0)
Strongly disagree	1 (0.6)
"Having good interactions with family after operation"	
Strongly agree	59 (33.1)
Agree	114 (64.0)
Neutral	4 (2.2)
Disagree	1 (0.6)
Strongly disagree	0 (0.0)
Postoperative symptoms	
Experienced postoperative symptoms	
Dry lips/throat (yes)	130 (73.0)
Drowsiness (yes)	78 (43.8)
Sore throat (yes)	57 (32.0)
Lumbar pain (yes)	53 (29.8)
Hoarseness (yes)	40 (22.5)
Nausea (yes)	32 (18.0)
Shoulder pain (yes)	27 (15.2)
Vomiting (yes)	25 (14.0)
Headache (yes)	21 (11.8)
Change in mood (yes)	16 (9.0)
Shivering (yes)	13 (7.3)
Fever (yes)	11 (6.2)
Total number of postoperative symptoms	
≤2	73 (41.1)
≥3	105 (58.9)
Pain	
Pain expectation	
Less than expected	96 (53.9)
About as expected	60 (33.7)
More than expected	22 (12.4)
Level of pain at 2 h[b]	
0	6 (3.3)
1	54 (30.0)
2	75 (41.7)
3	40 (22.2)
4	5 (2.8)
5	0 (0)
Level of pain at 24 h[b]	
0	19 (10.7)
1	97 (54.5)
2	47 (26.4)
3	14 (7.9)
4	0 (0)
5	1 (0.6)
Pain reduction between 2 and 24 h	
Reduced	88 (49.4)
Not changed	66 (37.1)
Worsened	24 (13.5)

[a] Total patient cohort (*n*) = 180 patients. Discrepancy in the number of patients in some categories is due to two patients being unable to complete the survey as a result of poor postoperative condition

[b] Pain was measured by a six-level face-scale score. Higher score indicates more severe pain

The bivariate analyses revealed four factors to be associated with the feeling of being less safe with anesthesia; of these, three remained significant when entered together into a multivariate analysis (Table 3): the lack of perioperative adverse effects [odds ratio (OR) 6.10, 95% CI 1.43–26.04], low satisfaction with preoperative anesthesia education (OR 15.03, 95% CI 4.65–48.55), and low satisfaction with family interactions before and after surgery (OR 21.80, 95% CI 5.15–92.42). For example, the absence of an adverse effect raises the risk of feeling less safe in

Table 3 Factors associated with the five main outcomes according to the logistic regression analysis

Main outcomes	Significant factors	Proportion of the outcome (%)	Odds ratios (95% confidence intervals)	
			Bivariate	Multivariate[a]
Perception of anesthesia as being less safe[b]	Perioperative adverse effects[e]			
	Yes	63/117 (53.8)	1.00	1.00
	No	42/58 (72.4)	2.25 (1.14–4.45)	6.10 (1.43–26.04)*
	Satisfaction with preoperative anesthesia education			
	Strongly agree	13/75 (17.3)	1.00	1.00
	Do not strongly agree[f]	92/100 (92.0)	54.8 (21.47–140.08)	15.03 (4.65–48.55)*
	Having good communication with medical staff			
	Strongly agree	25/85 (29.4)	1.00	1.00
	Do not strongly agree[f]	80/90 (88.9)	19.20 (8.57–43.00)	2.61 (0.76–8.93)
	Having good interaction with family before and after surgery			
	Strongly agree	6/56 (10.7)	1.00	1.00
	Do not strongly agree[f]	99/119 (83.2)	41.25 (15.58–109.21)	21.80 (5.15–92.42)*
Having ≥3 postoperative symptoms	Duration of surgery			
	<3 h	44/87 (50.6)	1.00	–
	≧3 h	61/91 (67.0)	2.00 (1.08–3.64)	–
Severe pain[c] at 2 h post-surgery	Sex			
	Female	14/80 (17.5)	1.00	1.00
	Male	31/100 (31.0)	2.12 (1.04–4.33)	2.08 (1.00–4.29)*
	Type of surgical procedures			
	Laparoscopic surgery	5/45 (11.1)	1.00	1.00
	Open surgery	40/135 (29.6)	3.39 (1.24–9.16)	3.30 (1.21–9.05)*
No reduction[d] in pain after surgery	Sex			
	Female	48/79 (60.8)	1.00	–
	Male	42/99 (42.4)	0.48 (0.26–0.87)	–
Feeling pain equal to or more than expected	Amount of blood loss			
	<100 ml	23/66 (34.8)	1.00	1.00
	≧100 ml	59/112 (52.7)	1.04 (1.01–1.07)	1.04 (1.01–1.07)*
	Having good communication with medical staff			
	Strongly agree	33/86 (38.4)	1.00	1.00
	Do not strongly agree[f]	49/92 (53.3)	1.83 (1.01–3.33)	1.90 (1.03–3.49)*

Fifteen items of sociodemographic characteristics and surgical and anesthetic factors were entered into the analysis of having three or more postoperative symptoms. In the analyses of the other four outcomes, five additional variables of sociodemographic characteristics and patients' views were entered

OR Odds ratio, *CI* confidence interval

* $p < 0.05$

[a] Multiple logistic regression analysis entering all significant factors in the bivariate logistic regression analysis

[b] "Agree" was categorized as 'feeling less safe' as opposed to "strongly agree", and the other three categories of "neutral", "disagree", and "strongly disagree" were excluded

[c] "Severe pain" includes the upper three scores out of six-level face scale scores

[d] "No reduction" includes worsened and no change in pain between 2 and 24 h post-surgery

[e] Perioperative adverse effects include cardiovascular, respiratory, neurological, and other adverse effects

[f] Category includes "agree", "neutral", "disagree", and "strongly disagree"

anesthesia by 6.1-fold compared to a reference group of patients with adverse effects. Based on the multivariate analysis, good communication with staff did not have a significant effect on patients' perceptions of anesthesia safety (OR 2.61, 95% CI 0.76–8.93).

With respect to postoperative symptoms, surgery >3 h was associated with having three or more postoperative symptoms (OR 2.00, 95% CI 1.08–3.64). Factors significantly associated with severe pain at 2 h were male sex (OR 2.08, 95% CI 1.00–4.29) and open surgery (OR 3.30,

95% CI 1.21–9.05). Likewise, male sex was associated with no reduction in pain between 2 and 24 h post-surgery (OR 0.48, 95% CI 0.26–0.87). In terms of feeling pain equal to or more than expected, blood loss >100 ml (OR 1.04, 95% CI 1.01–1.07) and low satisfaction with communication with medical staff (OR 1.90, 95% CI 1.03–3.49) were shown to be significant associations. In pain-related subanalyses by gender, open surgery was significantly associated with severe pain at 2 h (OR 6.34, 95% CI 1.39–29.06), and evidence of benign disease was associated with no reduction in pain between 2 and 24 h after surgery (OR 0.27, 95% CI 0.086–0.8) among males.

Discussion

Clinical assessments and international comparison

This study was performed in Vietnam and is the first study in a developing Southeast Asian country to comprehensively evaluate perioperative care from both the clinical and patient perspective. Through service assessments, analyses of collected data, and the presentation of scientific evidence, health professionals and health policy-makers are able to comprehend, prioritize, and address a country's public health problems [18]. However, a recent systematic review of questionnaires measuring patient satisfaction with anesthesia care [19] shows that a standardized, valid, or reliable survey has yet to be perfected in developed countries [20, 21].

To provide additional insight into the interpretation of our results, we compared hospital statistics on surgery and anesthesia from Vietnam with those reported from other East Asian, Southeast Asian, and non-Asian countries (Table 4). Two reports from Italy—one in which classic medical indicators were used [22] and another in which more comprehensive assessment tools were applied, including patient satisfaction and staff mental state [3]—and one each from Hong Kong [11], Thailand [23, 24], and Japan [25] are reported. The proportion of major surgical cases at UMC was approximately the same as that in Italy. Moreover, based on our data, general anesthesia was used at a similar frequency in gastro-intestinal (GI) tract surgeries among developed and newly developed countries, demonstrating the rapidity with which modern anesthesia techniques have been introduced and adopted at a university hospital in Vietnam.

The frequency of perioperative adverse effects and postoperative symptoms identified in our study was nearly the same as that reported in previous studies of developed countries, notably Italy and Canada [16, 22]. Also, significant differences in pain due to different types of anesthesia or analgesia, which may suggest inadequate pain management, were not observed. For sufficient postoperative analgesia, patients without epidural anesthesia (26.1%) were given morphine intravenously or other painkillers more often than those with epidural anesthesia (73.9%) (chi-square test, $p < 0.01$). Moreover, anesthesiologists gave epidural anesthesia more frequently to open surgery patients (75.0%), who were expected to have severe post-operative surgical pain, than to laparoscopic surgery patients (25.0%) (chi-square test, $p = 0.05$).

On the negative side, the number of epidural anesthesia complications revealed in our study seems to be relatively high, and the incidence of critical complications (2/180) is higher than that in developed countries [22, 25]. Despite this, one distinct characteristic of this survey was Vietnamese patients' high satisfaction with the services they received, which mostly likely reflects an overall high quality of care. However, this discrepancy is a warning that our results should be interpreted with caution; as has been noted by other authors, patients may be biased by the desire to please staff and to avoid repercussions for appraising care negatively [26]. We therefore explored differences between groups of patients who were "very satisfied" versus "satisfied" with the care they received. A detailed analysis revealed that negative outcomes regarding anesthesia satisfaction and pain were associated with clinical backgrounds, gender, and patients' views on medical care. In the following sections, we explore the relevant clinical and sociodemographic factors that influence perioperative care and patients' perceptions of this care. Based on our findings, we propose specific recommendations for improving not only the quality of clinical care but the two-way communication between staff and patients.

Communication and perception of anesthesia safety

In terms of the patients' perceptions of anesthesia safety, we found that an insufficient preoperative provision of anesthesia information and a less-than-satisfactory interaction with family before and after surgery were significantly associated with a low sense of safety. These findings suggest that the relationship with both the healthcare staff and family members have a strong influence on a patient's perception of physical well-being, in this case regarding anesthesia care. The results of a previous study showed that patients reported greater satisfaction with care when they perceived the medical staff as showing concern for how much pain they were feeling [27]. Interestingly, the lack of perioperative adverse effects was another factor significantly associated with feeling less safe. It may be possible that a higher level of staff attentiveness towards patients with adverse effects could make them feel more secure. Supporting this hypothesis, Street et al. [28] reported that physicians seeing patients with critical diseases used more partnership-building and supportive talk than physicians seeing patients with less severe conditions.

Table 4 Comparison of anesthesia assessments at the international level: data collected from the surveyed university hospital in Vietnam and examples of multi-center studies in other countries

Studies compared	1. Country 2. Subjects 3. Study duration	Category of operations	Types of anesthesia	Assessment indicators
Data from study site	1. Vietnam (hospital statistics) 2. 13,429 subjects aged ≥15 years 3. One year in 2005	Abdominal 48% ENT 18% Urological 15% Others 19% (laparoscopic surgery 30%)	General anesthesia (GA) 57% Major regional anesthesia (MRA) 22% Others 21%	
Examples of multi-center studies	1. Italy (162 hospitals) (Peduto et al. 2004) [22] 2. 12,263 subjects of all ages 3. One week	Abdominal and urological 29% Obstetric-gynecological 20% Orthopedic 14% ENT 10% Others 27%	Proportion of GA ENT 95% Gynecological 86% Abdominal 76% Urological 55%	1. Demographic items 2. Medical conditions including ASA 3. Perioperative complications and adverse effects
	1. Italy (6 hospitals) (Capuzzo et al. 2007) [3] 2. 1,290 subjects aged >18 years 3. Three months	Minor surgery 38% Moderate surgery 35% Major surgery 27%	GA 53% MRA 33% GA and MRA 14%	1. Sociodemographic items 2. Medical condition including ASA 3. Provision of anesthesia service 4. Mental condition of staff 5. Patient satisfaction
	1. Thailand (20 hospitals) (Charuluxananan et al. 2005) [23, 24] 2. 163,403 subjects of all ages 3. One year	Abdominal 25% Extremities 22% Cesarean section 10% Perineal-anal 6% Others 37%	GA 68% MRA 28% Others 4% (97% of GA is not combined with other anesthesia)	1. Demographic items 2. Medical conditions including ASA 3. Perioperative complications and adverse effects 4. Types of staffs and equipments
	1. Hong Kong (6 hospitals) (Lau et al. 2001) [11] 2. 18,759 subjects of all ages 3. Two months	Major surgery 45% Intermediate surgery 29%, Minor surgery 26%	GA 72% MRA 19% GA and MRA 7% Others 2%	1. Demographic items 2. Medical condition including ASA 3. Perioperative complications and adverse effects
	1. Japan (467 hospitals) (Kawashima et. al. 1999) [25] 2. 793,847 subjects of all ages 3. One year	Laparotomy 32% Extremities 16% Head–neck–ENT 14% Others 38%	GA 51% GA and MRA 31% MRA 17% Others 1%	Anesthesia related mortality and morbidity by 1. Principle cause 2. Demographic items 3. Medical condition including ASA 4. Surgical site and anesthetic methods

ENT Ear, nose, throat

In our study, satisfaction with the quality and degree of communication with the medical staff, which was significant in the bivariate analysis, became non-significant when examined in the multivariate analysis. In contrast, the significance of an absence of perioperative adverse effects demonstrated a manifold increase on the multivariate analysis. These results imply that the occurrence of adverse effects may have actively decreased the strength of the association between patient–staff communication and the feeling of safety with anesthesia—essentially making communication less important in the setting of adverse events. They may also imply that, in the setting of

postoperative adverse events, patients value medical care via physician attentiveness, rather than more generalized education or staff communication. While these dynamics may have occurred in the postoperative setting, communication with medical staff should ideally be optimized for all patients during the perioperative period from a patient safety and quality-of-care perspective.

For continued improvement in patient-centered perioperative care in developing Southeast Asian countries, medical workers should provide the same degree of perioperative care that is regarded as "standard of care" in the developed nations: sufficient education regarding anesthetic procedures and adequate communication with every patient, despite the presence of cultural barriers that may make transparent and patient-centered communication less common [29, 30]. Moreover, healthcare providers should be cognizant of the increased importance of the family environment for Vietnamese patients, with special attention to its influence on perceptions of perioperative care.

Surgical procedure and patient satisfaction

In addition to the above communication-related items, three clinical indicators of the invasiveness of the surgery remained significant in the analyses of factors associated with patient satisfaction and pain: duration of surgery, type of surgical procedures, and amount of blood loss were related to postoperative pain and symptoms. Generally, a shortened postoperative hospital stay and faster recovery [31, 32] as well as reduced pain [33, 34] are the main advantages of laparoscopic surgery. In this study, there was no significant difference in operating times between patients undergoing open and laparoscopic surgery. As advances continue in medical technology in Vietnam, efforts to shorten surgical duration, minimize blood loss, and reduce invasive surgical methods could improve not only clinical outcomes but also overall patient satisfaction.

Ethnic and gender differences in postoperative pain

We also investigated various aspects of pain in the perioperative clinical setting: immediate postoperative pain, reduction in pain over a 24-h postoperative period, and actual pain compared to expected pain. In particular, the proportion of those complaining that their pain was more severe than expected was as low as 12%. Previous cross-national studies [6, 35] indicate that ethnically Asian patients, including Vietnamese and Japanese, tended to be more stoic than Caucasians in terms of their perception of pain. A multi-ethnic study in the USA examining analgesic use for 5 days after cholecystectomy reported that milligram equivalents of meperidine were significantly higher in Caucasians (730 mg) versus Japanese (460 mg), Chinese (450 mg), or Filipinos (480 mg) [35]. Another cross-cultural study reported that Vietnamese patients with femoral shaft fractures reported lower levels of pain than American patients after a similar operation [6].

Among our participants, male patients reported feeling more pain immediately after surgery, but they recovered better over the following 24 h compared to female patients. Sex differences in pain perception and response to opioids have been described in previous studies from North America, Europe, and Japan [36–41]. Although a variety of cultural and societal factors contribute to sex differences in reporting pain, women are at particular risk for chronic pain and have been shown to detect pain more easily and to attenuate it less than men [42, 43]. In addition, physiological sex differences contribute to pain perception, as gonadal steroid hormone production may influence pain intensity and sensitivity to opioid analgesia [41, 44]. The National Institutes of Health Pain Research Consortium emphasizes that the experience of pain for women is distinct from that of men [42]. Our study indicates the need to pay closer attention to treating immediate postoperative pain among male patients while reducing the factors that may lead to chronic pain among female patients. In the stratified analyses by gender, male patients with benign disease had a higher risk of experiencing no reduction in pain between 2 and 24 h after surgery, corroborating that the aforementioned lack of postoperative adverse effects may be an important factor in diminishing patient satisfaction with perioperative care and feelings of safety.

Although we found no age difference in pain among our subjects, it has been reported in developed countries that younger people tend to report pain more than their elders [44], perhaps due to stoicism that affects the (lack of) willingness of more elderly people to report pain, usage of coping strategies, and adjustment to persistent pain [45]. The markedly skewed age distribution in our sample (92.2% of the patients were $\geq$40 years of age) must be taken into account when interpreting our data and may have affected the reporting rates of the variables investigated.

Limitations and conclusions

There are four major methodological limitations to the study reported here. First, the patients were recruited at a single university hospital preferred by clients with a higher than average socioeconomic status compared to the Vietnamese population in general. Despite this inherent economic bias, however, the majority of patients in this study had no stable source of income and no medical insurance coverage, a rough marker of socioeconomic status. More than one-third of the patients had less than a primary school

education. In addition, as a first-of-kind study in developing Southeast Asia, the university hospital setting, with its relatively advanced infrastructure, enabled the survey to be carried out with sufficient collaboration among hospital staff and local co-researchers. Furthermore, the limited generalizability does not affect the validity of the results from internal comparisons between groups of patients with different degrees of the five main outcomes. Second, subgroup analysis was difficult due to the small sample size of 180 patients and the rough categorization of diagnosis and surgical procedures. Third, the observation period in this study was only for the first 24 h after surgery. Multicentered surveys with a larger sample size and longer observation period are required to minimize selection bias, conduct disease- and surgical procedure-specific analyses, and to examine long-term perioperative care, clinical outcomes, and patient satisfaction. Fourth, just by conducting this study we may have exerted an interventional influence over daily practices in operation and recovery rooms. Either intentionally or unintentionally, local staff might have treated patients more attentively during the study, thus resulting in an underestimation of the frequencies of negative anesthesia outcomes. While the results of this study may have played a significant role in raising awareness among medical staff about patient-centered perioperative care, future studies with blinded evaluators and objective pain assessments will enhance the validity of the current findings.

In conclusion, we found that, in the context of developing Southeast Asian healthcare, patients' interactions with their families and medical staff may strongly influence their feelings regarding the safety of anesthesia and postoperative pain, the invasiveness of the surgical intervention influences postoperative pain and symptoms, and the sex of the patient is related to postoperative pain. In terms of being able to improve patient-centered perioperative care among Vietnamese patients, our results indicate that it is important to facilitate preoperative education-oriented communication between staff and patients and to incorporate families into this positive process. Postoperatively, providers should manage patients' pain with an awareness of the importance of gender differences. Our comparison of perioperative care at the international level revealed a rapid movement in Southeast Asia towards medical care at a level on par with that provided in the developed world—as well as a need to obtain and address country-specific factors for further improvement.

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