

Original article

# Quality and patient safety in anesthesia service: Thai survey

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**Background:** The Royal College of Anesthesiologists of Thailand (RCAT) performed large-scale epidemiologic study of anesthesia-related complications and national incidents study in 2004 and 2007, respectively.

**Objectives:** Evaluate the anesthesia service in Thailand with regard to status of quality and patient safety.

**Material and methods:** A pre-planned structured questionnaire regarding demographic, administrative, preanesthetic, intraoperative postanesthetic variables and complications were requested to be filled in by nurse anesthetists attending the refresher course lecture of RCAT in February 2008. Descriptive statistics was used.

**Results:** Three hundred fifty questionnaires were given and 341 respondents (97%) returned the questionnaires. Most of the respondents (90%) worked in government section. Thirty percent of respondents practiced in hospital without medical doctor anesthesiologist and 58% of nurse anesthetists worked in hospitals that have been accredited. Forty-six percent of respondents reported unavailability of a 24-hour recovery room. The questionnaires revealed of inadequacy of anesthesia personnel (64%), inadequate supervision during emergency condition (53%), inadequacy of patient information regarding anesthesia (57-69%), and low opportunity for patient to choose choice of anesthesia (19%). The commonly used monitoring were pulse oximeter (92% of respondents) and electrocardiography (63%). One-third (32%) of respondents had to provide of anesthesia for patients with insufficient NPO (non per oral) time. Common problems that the respondents experienced were miscommunication (49%), intraoperative cardiac arrest during the past year (35%), error related to infusion pump (24%) and medication error (8%). Fifty-five percent of respondents had to monitor at least one patient per month receiving spinal anesthesia.

**Conclusion:** Suggested strategies for quality and patient safety improvement in anesthesia service are increasing personnel, increasing 24-hour recovery room, improvement of supervision, improvement of communication, compliance to guidelines and improvement of nurse anesthetist's training regarding monitoring patient receiving spinal anesthesia and cardiopulmonary resuscitation.

**Keywords:** Anesthesia, cardiac arrest, guidelines, patient information, quality, safety

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Despite vigorous attention given to quality and safety in healthcare, there has been only modest improvement in medical service including anesthesia service [1-4]. There are several explanations such as failure to adapt successful models from other

industries to our specific requirements, implementation problems and need of suitable indices for quality and safety in healthcare service [4]. Katz-Navon et al. [5] stated that the healthcare system acts as a 'second mover' for implementing practices that achieve their

objectives. McIntosh and Macario [4] suggested that leader of anesthesia organization should be a 'first mover', adopting practices that meet their needs rather than being a 'second mover'.

The Royal College of Anesthesiologists of Thailand (RCAT) focused on quality and safety in anesthesia care in Thailand. In 2004, the RCAT initiated the Thai Anesthesia Incidents Study (THAI Study) [6, 7] with more than 30-substudies of specific anesthesia adverse events. RCAT started the registry of anesthesia services in 20 hospitals, and expanded the study sites to 51 hospitals across Thailand, namely the Thai Anesthesia Incidents Monitoring Study (Thai AIMS) [8, 9]. This multi-center study is based on reporting anesthesia related incident on an anonymous and voluntary basis [8]. The aim of this study is to evaluate current situation regarding anesthesia patient safety in Thailand.

## Methods

The present study is a part of the Thai AIMS that was conducted by the RCAT.

During the refresher course lectures of the 67<sup>th</sup> annual meeting of the RCAT for nurse anesthetists (February 2008), a structured questionnaire was distributed to all participants attending the refresher courses lecture in the morning session. All participants were requested to fill in the questionnaire and send to the registration desk in the afternoon session. The structured questionnaire comprised of demographic, administrative data, and quality/safety profiles in anesthesia service in the respondents' institution. Return of questionnaire was based on voluntary basis.

## Statistical analysis

Descriptive statistics was used for analysis of data using SPSS program version 12.

## Results

Three hundred fifty questionnaires were distributed, and 341 respondents (97.4%). Three hundred and twenty-nine respondents were female (96.5%), whereas 12 respondents were male (3.5%). Minimal and maximal ages of respondents were 24 years and 60 years old with average age of 40.8±7.3 years old. One hundred eighty respondents (52.8%) had experience as anesthesia provider of more than 10 years. Ninety-eight (28.7%) nurse anesthetists worked in tertiary hospitals.

The demographic and administrative data of respondents are shown in **Table 1**.

The responses of questionnaire are demonstrated in **Table 2**.

## Discussion

Quality and safety in anesthesia service is usually monitored by peri-operative mortality, anesthesia-related complication, and critical incidents [10-14]. The safety in anesthesia is also frequently cited as a successful example among different medical specialties. The anesthesia related mortality has been decreasing by tenfold and stabilizing within the last decades in European and North American countries [15]. However, patient safety is not only monitored by measurement of mortality rates. The rates of anesthesia complication remains elevated [7, 9]. Moreover, anesthesia can still be responsible for severe adverse events resulting in permanent damage or for unplanned ICU admission [19]. Therefore, The RCAT performed this survey to evaluate the situation regarding patient safety in anesthesia through experience of nurse anesthetists in Thailand after the THAI Study and Thai AIMS.

The response rate (97.4%) of questionnaire was quite high. Most of respondents (96.5%) were female with mean (±SD) of age of 40.8 (±7.3) years old. Only a small proportion of respondents (1.8%) were nurse anesthetists with experience of less than one year. Ninety percent of respondents worked in government sector, whereas 5.6% of respondents worked in district hospital. Thus, a small proportion of respondents worked in hospitals with less than 60 beds (7.3%). The respondents worked in hospitals from all regions of the country. Therefore, the sample might represent nurse anesthetists providing anesthesia service in Thailand.

According to the structured questionnaires, 58% of respondents worked in hospital that has been accredited by Institute of quality improvement and hospital accreditation. Most of respondents worked in hospital under quality improvement process for hospital accreditation. Two-thirds of respondents stated that there were inadequate anesthesia personnel in their departments of anesthesia. Among all respondents, almost one-third worked in hospital without any medical doctor anesthesiologists and worked with few colleagues in their hospitals.

**Table 1.** Demographic and administrative data of respondents (n=341).

	Number	Percentage
<b>Experience of anesthesia provider (n=341)</b>		
<1 year	6	1.8
1-5 years	81	23.8
6-10 years	74	21.7
>10 years	180	52.8
<b>Types of hospitals</b>		
University hospital	29	8.5
Regional hospital	69	20.2
General / provincial hospital	99	29.0
District hospital	93	27.3
Ministry of defense	13	3.8
Private hospital	19	5.6
Other types of healthcare organization	19	5.6
<b>Hospital accredited</b>	195	58.0
<b>Regions</b>		
Bangkok	56	16.4
North	56	16.4
North-east	82	24.0
East	31	9.1
Central	67	19.6
South	49	14.4
<b>Presence of 24-hour recovery room</b>	157	46.0
<b>Number of beds</b>		
<60 beds	25	7.3
60-120 beds	78	22.9
121-200 beds	28	8.2
201-500 beds	99	29.0
>500 beds	111	32.6
<b>Number of patients receiving anesthesia per year</b>		
<500 patients	75	22.0
500-1000 patients	65	19.1
1001-5000 patients	72	21.1
5001-10000 patients	57	16.7
>10000 patients	72	21.1
<b>Number of anesthesiologists in hospital</b>		
None	105	30.8
1 anesthesiologist	32	9.4
2-5 anesthesiologists	147	43.1
6-10 anesthesiologists	32	9.4
11-20 anesthesiologists	15	4.4
>20 anesthesiologists	10	2.9
<b>Number of nurse anesthetists in hospital</b>		
1 nurse anesthetist	14	4.1
2-5 nurse anesthetists	104	30.5
6-10 nurse anesthetists	41	12.0
11-20 nurse anesthetists	92	27.0
>20 nurse anesthetists	90	26.4

**Table 2.** Responses to questionnaires.

Questions	Yes/Agree number (%)	No / Disagree number (%)	No response number (%)
1 There is inadequate anesthesia personnel in your department	219 (64.2)	122 (35.8)	0 (0)
2 Continuous education activity in your department is insufficient	175 (51.3)	166 (48.7)	0 (0)
3 Supervision in your department is inadequate	156 (45.7)	184 (54.0)	1 (0.3)
4 Supervision in your department regarding emergency condition is inadequate	182 (53.4)	159 (46.6)	0 (0)
5 You can catch up with new anesthesia technology	198 (58.1)	139 (40.8)	4 (1.2)
6 More than 50% of your patients receiving anesthesia were firstly evaluated in the operating room	145 (42.5)	195 (57.2)	1 (0.3)
7 You perform preanesthetic evaluation in all cases	326 (95.6)	15 (4.4)	0 (0)
8 You perform preanesthetic evaluation for difficult airway in all cases	301 (88.3)	15 (4.4)	25 (7.3)
9 You sometimes do not perform preanesthetic checking of anesthetic machine and circuit	52 (15.2)	265 (77.7)	24 (7.0)
10 You always check patient's preoperative informed consent	273 (80.1)	68 (19.9)	0 (0)
11 You always inform choice of anesthesia and its alternative	236 (69.2)	81 (23.8)	24 (7.0)
12 You sometime forget informing about anesthesia related complication	196 (57.5)	121 (35.5)	24 (7.0)
13 Your patients always choose the anesthetic technique	68 (19.9)	249 (73.0)	24 (7.0)
14 You always check patient's identification and type of surgery	301 (88.3)	15 (4.4)	25 (7.3)
15 You monitor patient with electrocardiography (EKG) in every case	217 (63.6)	99 (29.0)	25 (7.3)
16 You monitor patient with pulse oximeter in every case	314 (92.1)	3 (0.9)	24 (7.0)
17 Anesthesia practice must strictly comply to clinical practice guidelines	289 (84.8)	23 (6.7)	29 (8.5)
18 Your patients are always taken care of for at least half an hour during postoperative period	256 (75.1)	61 (17.9)	24 (7.0)
19 All of your patients are taken care of in the recovery room	194 (56.9)	121 (35.5)	26 (7.6)
20 In the past year, you experienced at least a case of dental injury	148 (43.4)	168 (49.3)	25 (7.3)
21 In the past year at least one of your patients had intraoperative cardiac arrest	122 (35.8)	194 (56.9)	25 (7.3)
22 Surgeon frequently orders inadequate NPO (non per oral) time for your patient	109 (32.0)	207 (60.7)	25 (7.3)
23 You frequently experience incidents of infusion pump error	85 (24.9)	228 (66.9)	28 (8.2)
24 In the past 3 months, you experienced medication error	30 (8.8)	286 (83.9)	25 (7.3)
25 You often experience mis-communication during anesthetic practice	169 (49.6)	148 (43.4)	24 (7.0)
26 You have to monitor at least one patient receiving spinal anesthesia per month	188 (55.1)	127 (37.2)	26 (7.6)

According to the database of the Thai Ministry of Public Health in 2009, 20 provincial or general hospitals have no medical doctor anesthesiologists. Policy-maker should initiate strategies to solve the problem of shortage of anesthesia personnel in Thailand. Regarding education perspective, nearly half of respondents revealed that continuous education activity and supervision system were insufficient. This was in accordance with previous studies in the

Thai AIMS [9, 18-20]. Improvement of supervision in anesthesia department particularly during emergency anesthesia service might reduce anesthesia related complications. Moreover, forty percentages of respondents accepted that they could not catch up with new technology in anesthesia. This means that the promotion of continuing anesthesia education both in departmental and national levels must continue.

Forty-two percents of respondents stated that more than half of their patients were firstly evaluated just before providing anesthesia. This result was similar to the rate of pre-anesthetic visit of 38% in the THAI Study [6]. The rate of preanesthetic evaluation for difficult airway in this survey (88%) was higher than that of the Thai Study (70%) in 2005 [6]. Fifteen percent and 19% of nurse anesthetists accepted that they could not comply with the pre-anesthetic check of the anesthetic machine/circuit and patient's informed consent, respectively. However, 88% of respondents usually check for patient's identification and type of surgery. The surgical safety checklist has been proven to reduce mortality rate from 1.5% to 0.8% and reduce in-patient complication rate from 11 to 7% [21]. This surgical safety checklist, introduced in Thailand since 2008, should be promoted in all surgical workplaces.

In 2002, a study regarding quality in anesthesia service in a Thai university hospital revealed that majority of patients undergoing anesthesia and surgery did not know about choice of anesthesia and anesthesia related complications [22]. In the present study, high proportion of respondents provided pre-anesthetic information for their patients. However, a number of respondents were not informed about choice of anesthesia, alternative techniques, and anesthesia related adverse events. These subjects were interesting topics for quality improvement in anesthesia service. It is recommended that patients should be told what they will experience in the peri-operative period.

Pulse oximeter has been recommended as mandatory in clinical practice guidelines of the RCAT since 2003. The present survey confirmed high compliance rate of using pulse oximeter. This is in accordance with previous national survey of knowledge and opinions concerning quality in anesthesia service among Thai anesthesia personnel that there must be pulse oximeter in every operating room [23]. However, only two-thirds of respondents in the present surveys monitored all of their patients with electrocardiography. In this study, 75% of respondents always took care of their patients for at least half an hour during post-anesthetic period. However, only 56% of respondents took care of their patients in the post-anesthetic care unit or recovery room. This was in accordant to demographic data that 54% of respondents worked in hospitals without 24-hour recovery room. Presence of 24-hour recovery

room should be a quality index of hospital for quality improvement program. Eighty-four percent of respondents stated that their practices should strictly comply to the clinical practice guidelines. This was in contrast to previous survey of awareness and reported use of clinical practice guidelines of the RCAT in 2007 that there was low level of awareness and reported use of existing guidelines [24]. Moreover, one-third of respondents in this study had to give anesthesia for patient with insufficient NPO (non per oral) time.

Chen et al. [25] found that the incidence of dental damage was 12.1%, while Lochart et al. [26] reported an average incidence of 1:1000 dental injuries. In the present survey, 43% of respondents had experience with perioperative dental injury. Half of respondents stated of miscommunication or communication failure whereas one-third also had patients with intra-operative cardiac arrest. These suggested corrective strategies regarding promoting effective communication and cardiopulmonary resuscitation as system approach. Despite only 8% of respondents stating medication error, the RCAT initiated guidelines using color-coding for prevention of drug error in 2009. According to advance technology in anesthesia service, this survey also revealed that one-fourth of respondent also confronted with infusion pump error, which is similar to developed countries. The average incidences of 24-hour peri-operative cardiac arrest in the Thailand was 21 to 39:10000 anesthetics [7, 27, 28], whereas incidence of intra-operative cardiac arrest among geriatric patients in a Thai university hospital was 18:10000 [29]. In the present study, more than half of nurse anesthetist had to monitor at least one patient receiving spinal anesthesia. This also confirmed a suggestion in the THAI Study of spinal anesthesia that improvement of training of nurse anesthetists regarding monitoring of patient receiving spinal anesthesia was crucial [30].

There are few limitations in the present report. Firstly, the present study was a survey of experienced nurse anesthetists. The participants of refresher course lectures of the RCAT comprised of one or two nurse anesthetists from various types of hospitals across Thailand. However, this also represented government hospital of Thailand according to geographic distribution including the hospital without medical doctor anesthesiologist. Secondly, the present survey provided information as a retrospective fashion. The effect of recall bias and passage of time should be considered. However, the authors believe that respondents may

be able to recall their usual experience or practice. Thirdly, there were some missing data due to either incompleteness or reluctance to answer some sensitive questions in the questionnaires.

In summary, the present survey revealed several opportunities for improvement of quality and safety in Thailand. The global oximetry (pulse oximeter for all anesthetics) policy in Thailand is achieved. Suggested strategies for quality and safety were increasing personnel (both medical doctor anesthesiologists and nurse anesthetists), improvement of patient information, increasing number of 24-hour recovery room, compliance to guidelines, improvement of communication, prevention of error related to medication and infusion pump and more training for nurse anesthetists regarding monitoring of patients receiving spinal anesthesia and cardiopulmonary resuscitation.

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