

Brief communication

Perioperative and Anesthetic Adverse Events in Thailand (PAAAd Thai) incident reporting study: hospital characteristics and methods

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Background: Safety in anesthesia can be improved through monitoring and analysis of anesthetic complications. We conducted the present Perioperative and Anesthetic Adverse Events in Thailand (PAAAd Thai) incident reporting study to determine the current frequency distribution of incidents related to the anesthetic complications, factors contributing to the incidents, and corrective strategies.

Objective: To describe the characteristics of the hospitals participating in this study and methods used.

Methods: A multicenter prospective observational study was conducted in hospitals across Thailand in 2015. The participating hospitals were asked to anonymously report incidents of anesthesia-related adverse events and management. Three peer reviewers reviewed the completed record forms describing the incidents including possible mechanisms, contributing factors, appropriate management, and preventive strategies to achieve agreement by consensus.

Results: Twenty-two hospitals across Thailand participated in this study. Fourteen (64%) were nonuniversity (service directed) hospitals, while 8 (36%) were university (academic teaching) hospitals. Most hospitals were involved in residency training and teaching medical students (77%), while just more than half (57%) were involved in training nurse anesthetists. The ratio of anesthesiologists to an operating room was 0.67:1 and the ratio of nurse anesthetists to an operating room was 2.03:1.

Conclusion: A critical incident analysis of each reported adverse event is helpful for proposing a corrective or preventive strategy to ameliorate perioperative care and improve patient safety in the Thai health care system.

Keywords: Adverse events, anesthesia, incident report, perioperative

To reduce harm attributed to anesthesia, safety foundations have been established in some major developed countries [1, 2]. It has been accepted that critical incident monitoring and analysis are important tools to improve patient safety in a health care system [3, 4]. Monitoring complications of anesthesia is encouraged to improve anesthesia safety by focusing on specific complications that could be identified, monitored, and treated with specific corrective actions. In 2005, the Thai Anesthesia Incidents study (THAI study) reported quantitative indicators for some interesting adverse incidents related to anesthesia reported in a large database across Thailand [5] followed by a critical incident analysis with some corrective recommendations [6, 7]. Raising awareness of anesthesia-related complications occurred as a result of this study, and strategies were developed to minimize or avoid anesthesia related complications. The Royal College of Anesthesiologists of Thailand created some recommendations and guidelines to provide safe practice in anesthesia [8]. In addition, the Thai Medical Council approved the strategy to

increase the number of personnel trained in this field per year. Moreover, the Ministry of Public Health supported a budget for better availability of monitoring equipment. Despite this, an anesthesia safety incident reporting system has not yet been formally established nationwide. We, therefore, conducted this study, which was supported by the Royal College of Anesthesiologists of Thailand, to determine the current frequency distribution of incidents, factors contributing to the incidents, and corrective strategies in order to establish certain national programs in Thailand to improve safety in anesthesia care.

Methods

A multicenter observational study was prospectively conducted in 22 hospitals across Thailand (**Figure 1**) during a period from January through December, 2015 (**Figure 2**). The hospitals were chosen among hospitals previously involved in the Thai Anesthesia Incident Monitoring Study (Thai AIMS) [6, 7], based on their agreement to participate in reporting the adverse events anonymously.

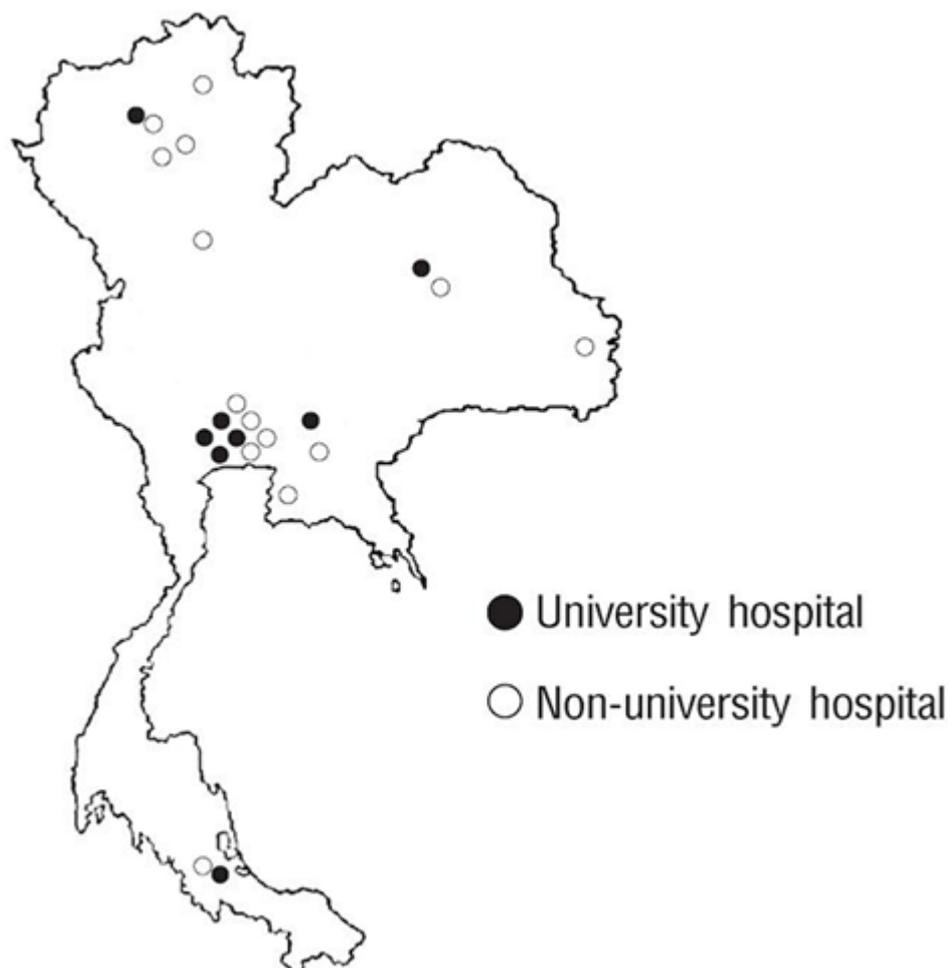


Figure 1. Geographical distribution of 22 hospitals participating in the Perioperative and Anesthetic Adverse Events in Thailand (PAAAd Thai) study

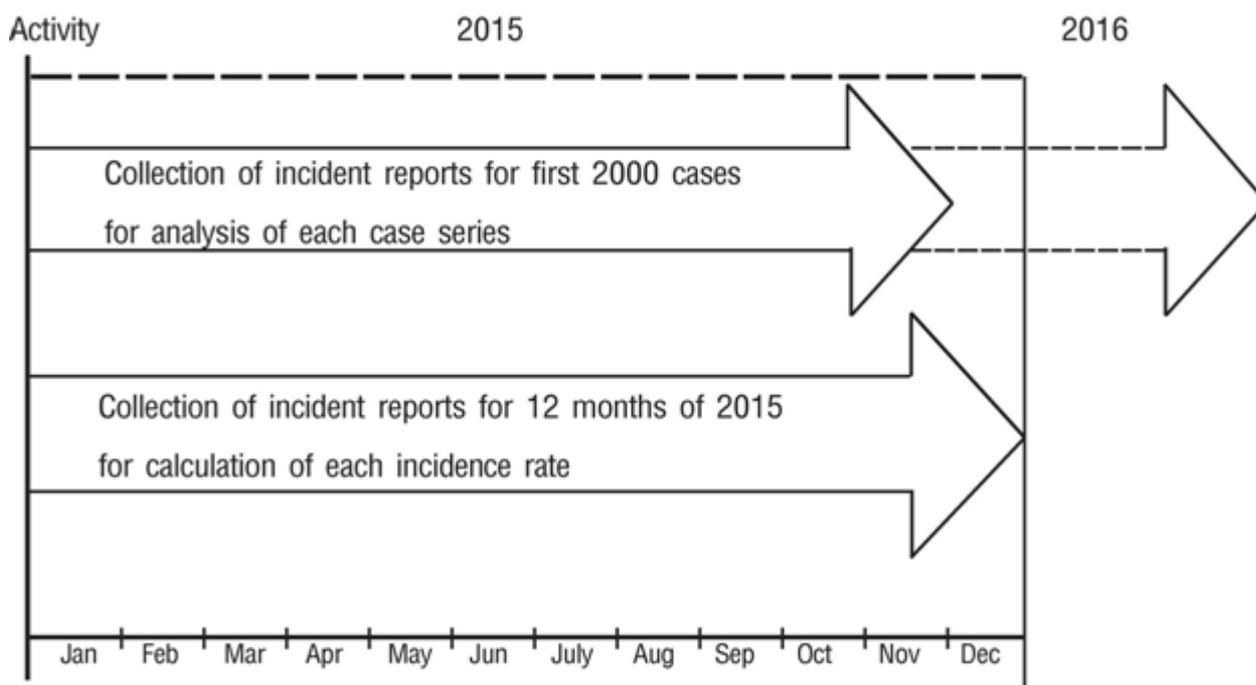


Figure 2. Study flow of the Perioperative and Anesthetic Adverse Events in Thailand (PAAAd Thai) study in the 22 participating hospitals

The protocol for this study was adapted from the previous study protocol [6] and approved by each institutional ethics committee (institutional review board) before starting data collection. An incident reporting form (a case record form) was revised and its content was validated by an expert committee, which included experienced anesthesiologists from the participating hospitals. A standardized incident reporting form was completed by anesthesiologists or nurse anesthetists from each participating hospital as soon as possible after episodes of adverse or undesirable events, as defined on the last page of the form, occurring within 24 h of anesthesia and operation. Details of the adverse events were described regarding “what happened”, “where it happened”, “when it happened”, “how it was detected”, “why it happened”, “how it was managed”, and “what were the results” in both closed-ended and open-ended questionnaires. Data regarding patient factors (such as age, sex, body weight, and height, American Society of Anesthesiologists physical status), surgical factors (such as types and sites of operation), anesthetic factors (such as types of anesthetics, airways, and monitors), and systematic factors (such as elective vs emergency conditions, out patients vs in patients, official vs nonofficial working hours, level and experience of anesthesia care providers, and

information regarding participation in surgical safety checklists) were recorded. Moreover, subsections for “factors contributing to the incident”, “factors minimizing the incident”, and “suggested corrective strategies” were addressed. Several workshops were organized for participants in the study. The workshops provided instructions regarding how to detect and report the incident. The site managers played a role in “ensuring that the report forms were available in convenient locations”, “encouraging people to fill out the forms”, “providing a local forum for discussion of the incidents”, and “forwarding the completed forms to the data management center”. The completed forms were sent to the data management center at regular intervals. The name of patients and hospitals were confidentially kept in the logbook at each hospital involved. The completeness of each form was checked by the data management manager. The participating site was contacted directly by the data management center to complete and correct any missing or incorrect data. Despite the amendments, the original text and the alterations remained apparent to any future assessor. After checking and organizing, the data from the form was put onto the central computerized database for further retrieval and analyses.

In addition, each participating hospital submitted a cover letter along with the hospital characteristics regarding type (university or academic directed vs nonuniversity or medical service directed hospitals), size (number of beds), and location of the hospital. Details about the number of operating theaters (rooms) and number of anesthesia providers and assistants were noted.

Subsequently, the completed record forms of each interesting adverse event were distributed to at least 3 peer reviewers to independently identify the incident mechanism, contributory factors, and appropriate management and preventive strategies. Any disagreement was critically discussed and judged to achieve a consensus. The descriptive statistics were used to summarize the data by using SPSS for Windows, version 22 (IBM Corp, Armonk, NY, USA).

Characteristics of the involved hospitals

Twenty-two hospitals participated in this multicenter study. **Table 1** shows the characteristics of each hospital categorized by location within

Thailand and level of training involvement. Eight hospitals were university or academic directed hospitals: 5 were in central Thailand, the others were in the northern, northeastern, and the southern parts of Thailand. The other 14 hospitals were nonuniversity or medical service directed hospitals: 4 were in central Thailand, 5 in the northern, 3 in the northeastern, 1 in the eastern, and 1 in the southern parts of Thailand. **Table 2** shows the distribution of the characteristics of the hospitals based on type, size, number of operating theaters, and number of anesthesia providers and assistants. Most of the hospitals had about 500–1000 (46%) beds and about 11–30 (55%) operating rooms/theaters. Seventeen hospitals (77%) were involved in residency and medical student training while 12 (55%) were involved in training nurse anesthetists.

Table 3 shows the distribution of the ratio of anesthesia providers. On average, the ratio of anesthesiologists to operating rooms was 0.67:1. The ratio of nurse anesthetists to operating room was 2.03:1.

Table 1. Participating hospitals categorized by location in Thailand and level of teaching involvement

Participating hospitals by location in Thailand (N = 22)	Level of teaching involvement		
	Resident	Medical student	Nurse anesthetist
North 6 (27%)			
Buddhachinaraj Hospital	yes	yes	yes
Chiang Rai Hospital	yes	yes	yes
Lampang Hospital	no	yes	no
Lamphun Hospital	no	no	no
Maharaj Nakorn Chiang Mai Hospital	yes	yes	no
Nakorn Ping Hospital	yes	yes	yes
Northeast 4 (18%)			
Khon Kaen Hospital	yes	yes	yes
Maharaj Nakorn Rachasima Hospital	yes	yes	yes
Srinagarind Hospital	yes	yes	yes
Sunpasithiprasong Hospital	no	yes	yes
Middle 9 (41%)			
Bangkok Metropolitan Administration General Hospital	no	yes	no
Buddhasothorn Hospital	yes	no	no
Charoenkrung Pracharak Hospital	no	no	no
HRH Princess Maha Chakri Sirindhorn Medical Center	yes	yes	no
King Chulalongkorn Memorial Hospital	yes	yes	no
Phramongkutklao Hospital	yes	yes	no
Prasat Neurological Institute	yes	no	no
Ramathibodi Hospital	yes	yes	yes
Siriraj Hospital	yes	yes	yes
East 1 (5%)			
Chonburi Hospital	yes	yes	yes
South 2 (9%)			
Hatyai Hospital	yes	no	yes
Songklanagarind Hospital	yes	yes	yes

Table 2. Hospital characteristics based on type of hospital (university/nonuniversity), size, number of operating rooms/theaters, number of anesthesiologists, nurse anesthetists, assistants, and trainees (residents/medical students/nurses)

Characteristic	N = 22 (%)
Type of hospital	
University	8 (36)
Nonuniversity	14 (64)
Number of beds	
>2000	1 (5)
1001–2000	6 (27)
500–1000	10 (46)
<500	5 (23)
No. of operating rooms/theaters	
51–70	2 (9)
31–50	3 (14)
11–30	12 (55)
≤10	5 (23)
No. of anesthesiologists (MD)	
51–70	3 (14)
31–50	0 (0)
11–30	8 (36)
≤10	11 (50)
No. of nurse anesthetists (CRNA)	
51–70	1 (5)
31–50	7 (32)
11–30	9 (41)
≤10	5 (23)
No. of anesthetist assistants	
51–70	0 (0)
31–50	3 (14)
11–30	11 (50)
≤10	8 (36)

Data expressed as number of hospitals, n (%)

Table 3. Distribution of ratio of anesthesia providers

Ratio of anesthesia providers: operating room	Frequency, n (%)
Anesthesiologists (MD): operating room	
2.5 – <3	0 (0)
2.0 – <2.5	0 (0)
1.5 – <2	0 (0)
1.0 – <1.5	4 (18)
0.5 – <1	12 (55)
<0.5	6 (28)
Nurse anesthetists: operating room	
2.5 – <3	6 (27)
2.0 – <2.5	8 (36)
1.5 – <2	4 (18)
1.0 – <1.5	2 (9)
0.5 – <1	2 (9)
<0.5	0 (0)

Discussion

In an effort to improve patient safety, hospitals have been encouraged to report a “patient safety incident”, which is defined as “an event during an episode of patient care that has the potential to or causes injury or harm to patients” [4]. Anesthesiology is a medical specialty that aims to provide anesthetic care in a safe environment for surgical and medical procedures. Based on a previous model of incident reporting of anesthetic adverse events in Thailand [6], we developed an incident report form to encourage the participating hospitals across Thailand to capture and report perioperative adverse events related to either anesthesia or surgery in order to create an open environment among hospitals for learning together regarding the anonymously reported incidents that may be either harmful or potentially harmful. This approach can enable an organization to learn from failures in the delivery of care for feedback of recommended actions to complete the loop of patient safety in a health care system [9]. A critical incident is a human error or an equipment failure that can lead to undesirable outcomes if it is uncorrected. Furthermore, an incident can also be related to failure in other nontechnical skills such as processes of communication, coordination between teams, and documentation [10].

According to George Bernard Shaw, “a life spent making mistakes is not only more honorable, but more useful than a life spent doing nothing.” We should accept that studying error is a normal process in order to establish systems to manage the risks. One should keep in mind that studying error is not to blame, but to ask “why” in order to ascertain causality for prevention [11].

Twenty-two hospitals including university or academic directed and nonuniversity or service-directed hospitals, participated in this multicenter study. Most of them were training hospitals for residents, medical students and nurses which may predispose to cause training associated adverse incidents. The subsequent study of training-associated adverse incidents will be meaningful to provide lessons that can be learned to provide patient safety in a training program.

Most of the service directed hospitals (11/13) had less than the desired number of anesthesiologists according to manpower management measures recommended by the Thai Ministry of Health. The shortage of qualified manpower could be a predisposing factor causing adverse incidents.

Recently, performing surgical safety checklists has been encouraged across Thailand. Whether or not this strategy affects the adverse events has yet to be evaluated.

A critical incident analysis of each reported event will be performed and reported in subsequent sections of this study. Ultimately, a corrective or preventive strategy will be proposed to ameliorate perioperative care and improve patient safety in the Thai health care system.

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Conflicts of interest statement

The authors have no conflicts of interest to declare.

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