

The Thai Anesthesia Incident Monitoring Study (Thai AIMS): An Analysis of Perioperative Complication in Geriatric Patients

Lawan Tuchinda MD*, Isaraya Sukchareon MD**,
Chaiyapruk Kusumaphanyo MD***, Thanarat Suratsunya MD****,
Thanoo Hintong MD*****, Somboon Thienthong MD*****

* Department of Anesthesiology, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand

** Department of Anesthesiology, Bhumibol Adulyadej Hospital, Bangkok, Thailand

*** Department of Anesthesiology, Faculty of Medicine, Srinakharinwirot University, Bangkok, Thailand

**** Department of Anesthesiology, Faculty of Medicine, Thammasat University, Pathumthani, Thailand

***** Department of Anesthesiology, Faculty of Medicine, Chiang Mai University, Chiang Mai, Thailand

***** Department of Anesthesiology, Faculty of Medicine, Khon Kaen University, Khon Kaen, Thailand

Background: The present study was a part of the multi-centered study of model of Anesthesia related adverse events in Thailand by incident report. (The Thai Anesthesia Incident Monitoring Study or Thai AIMS). The objective of the present study was to identify and analyze anesthesia incident in geriatric patients in order to find out the frequency distribution, clinical courses, management of incidents and investigation of model appropriate for possible corrective strategies.

Material and Method: This study was a prospective descriptive multicentered study conducted between January 1, 2007 and June 30, 2007. Incident reports from 51 hospital across Thailand were sent to data management unit on anonymous and voluntary basis. The authors extracted relevant data from the incident reports on geriatric patients (age 65 or more). The cases were reviewed by 3 anesthesiologists. Any disagreement was discussed and judged to achieve a consensus. Descriptive statistics was used.

Results: Among 407 incident reports and 559 incidents, there were more male (52.8%) than female (46.7%) patients with ASA PS 2,3,4 and 5 = 38.6%, 42.8%, 14.5% and 4.2% respectively. Surgical specialties that posed high risk of incidents were general, orthopedic, neurological, urologic and otorhiolaryngological surgery. Common places where incidents occurred were operating room (57.1%), ward (30.9%) and recovery room (12.0%). Common occurred incidents were arrhythmia needing treatment (30.0%), death within 24 hr. (24.6%), desaturation (21.9%), cardiac arrest (16.2%) and reintubation (16.0%). The causes of the incidents were mostly attributed from patients underlying diseases and conditions. Most common outcomes were major physiologic changes with 26.5% fatal outcome at 7 days. The most common contributing factor was human factor (inappropriate decision and inexperience). Vigilance and having more experience could be the minimizing factors.

Conclusion: Incidents in geriatric patients were similar to all age group patients with a higher incidents in death within 24 hr. The outcome were more serious resulting in 26.5% fatal outcome at 7 days. Quality assurance activity, clinical practice guidelines and improved supervision were suggested corrective strategies.

Keywords: Anesthesia, Adverse events, Multicentered study, Complication, Geriatric

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Advances in medical care lead to growing proportion of older populations and an expanding number of elderly patients undergoing surgery. The prevalence of significant co-morbid conditions such

Correspondence to: Tuchinda L, Department of Anesthesiology, King Chulalongkorn Memorial Hospital, Bangkok 10330, Thailand. Phone: 0-2256-4295, Fax: 0-2256-4294. E-mail: tuchnp@hotmail.com

as cardiovascular disease is increased in the elderly. Many studies such as medicare data from the United States indicate that there is increasing postoperative complications associated with increasing age⁽¹⁾. Overall incidence of 24-hr perioperative death from all age groups was 28.3 per 10,000 anesthetics compared to 39.3 per 10,000 anesthetics in aged 65 years and over in the previous THAI Study database^(2,3).

The Thai Anesthesia Incident Monitoring Study (Thai AIMS)⁽⁴⁾ reported frequency distribution, clinical courses, management, outcomes of the adverse events and possible corrective strategies in all age groups. This study was aimed to identify whether all these reported factors are different in elderly patients.

Material and Method

The present prospective multicentered study, a part of the Thai Anesthesia Incident Monitoring Study (Thai AIMS) was conducted by the Royal College of Anesthesiologists of Thailand from January 1, 2007 to the end of June 30, 2007. All anesthesiologists and nurse anesthetists in fifty-one hospitals ranging from district (community) hospitals to tertiary hospitals across Thailand, were invited to report the critical incidents on anonymous and voluntary basis.

After being approved by each institutional ethical committee, the specific anesthesia related adverse events detected during anesthesia and during 24 hours postoperative period were reported by filling out a standardized incident reporting form⁽⁵⁾ as soon as possible after occurring adverse or undesirable events. These include pulmonary aspiration, pulmonary embolism, esophageal intubation, endobronchial intubation, oxygen desaturation, reintubation, difficult intubation, failed intubation, total spinal block, awareness during general anesthesia, coma/cerebrovascular accident/convulsion, nerve injuries, transfusion mismatch, suspected myocardial infarction/ischemia, cardiac arrest, death, suspected malignant hyperthermia, anaphylaxis, drug error, equipment malfunction and cardiac arrhythmia requiring treatment.

Of these 1996 incidents reported, subgroup analysis was done in geriatric patients which were defined as patients age 65 or more. The descriptive statistics: (frequency tables with number and percentage) were used to analyze data by using SPSS for Windows, version 12. Each critical incident was reviewed by anesthesiologists. Discrepancies among the 3 reviewers were resolved by discussion to achieve a consensus. Descriptive statistics was used to summarize the results.

Results

Four hundred and seven reports with 559 incidents in geriatric patients were extracted from 2,537 incidents in 1,996 reports.

Age of patients varied from 65 to 96 years. Distribution of age, American society of Anesthesiologists physical status (ASA PS), sex, emergency or

elective conditions, types of surgery and anesthetic techniques are shown in Table 1

Five hundred fifty nine critical incidents were reported in 407 geriatric patients as shown in Table 2. Among 407 patients, 189 patients (46.44%) were diagnosed by clinical diagnosis before detection by monitoring of which 70 patients (17.2%) were only detected by clinical diagnosis. The most common monitoring that firstly detected the incidents were electrocardiography [164 (40.3%)] pulse oximeter [93 (22.9%)], non invasive blood pressure [62 (15.2%)],

Table 1. Characteristic of the patients, types of surgery and techniques of anesthesia (n = 407)

Variable	n (%)
Age	
65-70	149 (36.6%)
71-80	190 (46.7%)
81-90	60 (14.7%)
> 90	8 (2.0%)
Sex	
Male	215 (52.8%)
Female	190 (46.7%)
Not defined	2 (0.5%)
ASA	
2	157 (38.6%)
3	174 (42.8%)
4	59 (14.5%)
5	17 (4.2%)
Emergency	146 (35.9%)
Elective	261 (64.1%)
Main anesthetic technique	
General anesthesia	331 (81.3%)
General anesthesia (TIVA)	12 (3.0%)
Monitored anesthetic care	7 (1.7%)
Spinal anesthesia	56 (13.8%)
Brachial plexus block	1 (0.2%)
Type of surgery	
General surgery	169 (41.5%)
Orthopedic surgery	77 (18.9%)
Neurosurgery	41 (10.1%)
Urological surgery	31 (7.6%)
Otorhinolaryngological surgery	15 (3.7%)
Major vascular surgery	14 (3.4%)
Endoscopic procedure	13 (3.2%)
Gynecological surgery	12 (3.0%)
Ophthalmic surgery	9 (2.2%)
Cardiac surgery	8 (2.0%)
Plastic surgery	7 (1.7%)
Thoracic surgery	5 (1.2%)
Dental surgery	1 (0.3%)
Diagnosis (x-ray)	1 (0.3%)
Intervention	1 (0.3%)
Other	3 (0.7%)

Table 2. Critical incidents classified by the perioperative period (n = 407)

	Operative period n (%)	PACU n (%)	Post-op 24 hr n (%)	Total n (%)
Pulmonary aspiration	2 (0.5)	1 (0.3)	1 (0.3)	4 (1.0)
Pulmonary embolism (suspected)	3 (0.8)	0 (0)	3 (0.8)	6 (1.5)
Esophageal intubation	14 (3.4)	0 (0)	0 (0)	14 (3.4)
Endobronchial intubation	2 (0.5)	0 (0)	0 (0)	2 (0.5)
Desaturation	62 (15.2)	19 (4.7)	8 (2.0)	89 (21.9)
Reintubation	11 (2.7)	38 (9.3)	16 (3.9)	65 (16.0)
Difficult intubation	30 (7.4)	0 (0)	0 (0)	30 (7.4)
Failed intubation	3 (0.8)	0 (0)	0 (0)	3 (0.8)
Total spinal block	1 (0.2)	0 (0)	0 (0)	1 (0.2)
Awareness during GA	0 (0)	0 (0)	2 (0.5)	2 (0.5)
Coma / CVA / Convulsion	2 (0.5)	1 (0.3)	2 (0.5)	5 (1.2)
Nerve injuries	1 (0.3)	0 (0)	2 (0.5)	3 (0.8)
Transfusion mismatch	0 (0)	0 (0)	0 (0)	0 (0)
Suspected MI / ischemia	6 (1.5)	3 (0.8)	6 (1.5)	15 (3.7)
Cardiac arrest	27 (6.6)	2 (0.5)	37 (9.1)	66 (16.2)
Death within 24 hr.	6 (1.5)	0 (0)	94 (22.4)	100 (24.6)
Suspected malignant hyperthermia	0 (0)	0 (0)	0 (0)	0 (0)
Anaphylaxis / Anaphylactoid reaction	1 (0.3)	0 (0)	1 (0.3)	2 (0.5)
Drug error	12 (3.0)	1 (0.3)	0 (0)	13 (3.2)
Equipment malfunction / failure	17 (4.2)	0 (0)	0 (0)	17 (4.2)
Arrhythmia need treatment	119 (29.2)	2 (0.5)	1 (0.3)	122 (30.0)

PACU = post anesthetic care unit, Post-op = post operative period

capnometry [11 (2.7%)] and airway pressure [4 (1.0%)] respectively.

The immediate outcomes and long term outcomes after incidents are shown in Table 3. The causes of the incidents were classified into patient, anesthetic, surgical and system management factors as shown in Table 4.

Contributing factors, factors minimizing outcomes and suggested corrective strategies in all incident report are shown in Table 5.

The five most common incidents were arrhythmia, death within 24 hr, desaturation, cardiac arrest and reintubation. The causes of each incident were shown in Table 6-9.

Discussion

Five hundred fifty nine incidents from 407 incident reports were reported in patients age 65 and more. The five most common critical incidents were arrhythmia, death within 24 hours, desaturation, cardiac arrest and reintubation. These critical incidents were similar to those of the Thai AIMS except that death within 24 hours was more common than desaturation in the elderly. The higher mortality in those older age patients were due to the higher severity of surgical

diseases and decreasing organ function and reserve^(2,3) When compare to the Thai Anesthesia Incidents Study (Thai study)⁽⁶⁾ the five most common incidents were desaturation, cardiac arrest, death within 24 hour, difficult intubation and reintubation.

For demographic characteristic, the gender ratio of female: male in the elderly was 46.7%: 52.8% compared to 45%: 55% in Thai AIMS. The adverse event also occurred more frequently in males than females in the previous THAI studies^(2,3,7-9). Kojima et al identified factors that were significantly associated with decreased survival rates among elderly patients after general anesthesia: male sex, dependency in daily living and abdominal surgery⁽¹⁰⁾. ASA physical status 3 contained the highest percentage of patients (42.8%) as compare to ASA physical status 2 (35.6%) in Thai AIMS study⁽⁴⁾ and ASA physical status 1 (50.8%) in THAI study⁽⁶⁾ due to the co-existing diseases in elderly.

The five most common types of surgery among 407 incident reports were general surgery (41.5%), orthopedic surgery (18.9%), neurosurgery (10.1%), urologic surgery (7.6%) and otorhinolaryngological surgery (3.7%). This is similar to Thai AIMS Study except that urologic surgery replace gynecologic surgery because patients in older age undergo urologic

Table 3. Immediate outcomes and long term outcomes after the incidents (n = 407)

	n (%)
Immediate outcomes (within 24 hr)	
Unplanned ICU admission	50 (12.3)
Unplanned hospital admission	0 (0)
Prolonged emergence / apnea	1 (0.3)
Awareness	2 (0.5)
Cancellation / postponement of surgery	4 (1.0)
Minor physiologic change	37 (9.1)
Bradycardia	6 (1.5)
Tachycardia	6 (1.5)
Hypotension	21 (5.2)
Hypertension	3 (0.8)
Wheezing	4 (1.0)
Major physiologic change	147 (36.1)
Respiratory	73 (17.9)
Cardiovascular	81 (19.9)
Neurological	7 (1.7)
Other	2 (0.5)
Cardiac arrest	80 (19.7)
Death	94 (23.1)
Complete recovery	114 (28.0)
None	60 (14.7)
Other	7 (1.7)
Long term outcomes (within 7 days)	
Prolonged ventilatory support	55 (13.5)
Hospital stay after event > 7 days	17 (4.2)
Psychic trauma	1 (0.3)
Disability	1 (0.3)
Vegetative / brain death	3 (0.7)
Death	108 (26.5)
Complete recovery	103 (25.3)
None	162 (39.8)

surgery more than younger age patients. In the THAI Study, neurological, otorhinolaryngological and cardiac surgery posed a high risk to experience incidents⁽⁶⁾.

The common phases where critical incidents occurred were intraoperative period, postoperative period and post anesthetic care unit (PACU) respectively. Arrhythmias were the most common incidents occurred in the intraoperative period while death within 24 hours and reintubation were the incidents in the postoperative period and PACU, respectively.

Nearly half of the incidents (46.4%) were diagnosed by clinical diagnosis before detecting by monitoring and 17.2% incidents could not be diagnosed by monitoring. The three most common monitorings to detect the incidents were electrocardiogram, pulse oximeter and non invasive blood pressure which were

correlated to the incidents (arrhythmias, death and desaturation)

The main factors related to the incidents were patient factors. Age (47.9%), cardiovascular disease (33.2%) and sepsis (13.5%) were the three most common patient factors. Anesthetic agents (17.4%), anesthetic techniques (13.8%) and anesthesiologists (10.1%) were the common anesthetic factors related to the incidents. Surgical diseases (7.9%), surgical bleeding (6.4%) and surgical techniques (4.4%) were the common surgical factors related to the incidents while drug error (2.7%) was the most common management factor.

For immediate outcome within 24 hours, there were 19.7% cardiac arrest, 23.1% death, 9.1% minor physiologic changes, 36.1% major physiologic changes 12.3% unplanned ICU admission and 28% complete recovery compared to 9.2% cardiac arrest, 26.1% death, 11.4% minor physiologic changes, 14.4% major physiologic changes, 0.3% unplanned ICU admission and 40% complete recovery in Thai AIMS⁽⁴⁾. For long term outcome (within 7 days) after incidents, there were 13.5% prolonged ventilatory support, 4.2% prolonged hospital stay, 0.7% vegetative state and brain death, 26.5% death and 25.3% complete recovery compared to 6.2% prolonged ventilatory support, 2.2% prolonged hospital stay, 0.5% vegetative state and brain death 7.1% death and 16.9% complete recovery in Thai AIMS. Therefore incidents in elderly patients resulted in more serious insults than all age group patients

Among 407 incident reports, inappropriate decision (22.1%), emergency condition (19.9%), inadequate preoperative evaluation (17.9%), inexperience (14.7%) and inadequate preparation (14.2%) were common contributing factors of incident reports. While inexperience (25.6%), inadequate preoperative evaluation (21.6%), emergency condition (21.1%), inappropriate decision (20.3%) and haste (16.5%) were common contribution factors in Thai AIMS.

Factors minimizing the occurrence of incidences were vigilance (78.9%), having experience (58.9%), adequate monitoring equipment (34.1%), comply to guidelines (26.8%) and none (10.8%). While having experience (60%), vigilance (59.8%), experienced assistant (34.1%), adequate monitoring equipment (9.4%) and comply to guidelines (9.4%) were factors minimizing the occurrence of adverse events in Thai AIMS.

Suggested corrective strategies were quality assurance activity (42.3%), clinical practice guidelines (41.3%), improvement of supervision (29.2%), additional

Table 4. Factors related to the incidents (n = 407)

Variables	n (%)	Variables	n (%)
Patient factors		System management factors	
Age	195 (47.9)	Intensive care unit	6 (1.5)
Cardiovascular diseases	135 (33.2)	Operating room	1 (0.3)
Respiratory diseases	19 (4.7)	Personnel	1 (0.3)
Diabetes	33 (8.1)	Supervision	3 (0.8)
Sepsis	55 (13.5)	Transfer	6 (1.5)
Kidney diseases	19 (4.7)	Equipment maintenance	6 (1.5)
Obesity	4 (1.0)	Blood	3 (0.8)
Neurological diseases	16 (3.9)	Drug error	11 (2.7)
Fluid/electrolyte	22 (5.4)	Human error	3 (0.8)
Coagulopathy	8 (2.0)	Postoperative care	6 (1.5)
Airway problems	46 (11.3)		
Other	41 (10.1)		
Anesthetic factors		Surgical factors	
Anesthetic techniques	56 (13.8)	Surgery techniques	18 (4.4)
Anesthesiologists	41 (10.1)	Surgical diseases	32 (7.9)
Anesthetic equipments	12 (3.0)	Bleeding	26 (6.4)
Preoperative evaluation	8 (2.0)	Prolonged surgery	4 (1.0)
Drugs	71 (17.4)	Site	24 (5.9)
Pain management	6 (1.5)	Surgeons	9 (2.2)
High spinal anesthesia	18 (4.4)		
Early extubation	36 (8.8)		

training (16.7%) and none (13.3%). While quality assurance activity (36.4%), improvement of supervision (30.0%), additional training (22.4%) and more manpower (8.1%) were suggested corrective strategies in Thai AIMS.

Arrhythmias that need treatment were the most common incidents in Thai AIMS⁽⁴⁾ and this study. The most common arrhythmia was sinus bradycardia in both Thai AIMS (88.8%)⁽¹¹⁾ and this study (77.9%). Two most common underlying diseases were preoperative arrhythmia (18.9%) and hypertension (14.8%) while hypertension (26.2%) and preoperative bradycardia (21.9%) were two common underlying diseases in Thai AIMS⁽¹¹⁾. This study also found that diabetes and preoperative beta-blockers were common in those patients. Suspected causes of arrhythmias were anesthetic agents (41.0%), spinal anesthesia (23.8%) and surgical manipulation (9.0%) which were similar to Thai AIMS. Yorozu T et al revealed that the absence of atropine premedication, males, surgical procedures with an epidural or subarachnoid blockade, propofol induction, general anesthesia with no endotracheal intubation and vecuronium were the potential risk factors for bradycardia⁽¹²⁾.

Deaths within 24 hours were the second common incidents. Patients disease and conditions

(sepsis, multiple organ failure, myocardial infarction) were the most common etiologic factors of perioperative death. Surgical bleeding and surgical condition were the common etiology of surgical causes of death. There were 2 cases of aspiration, 1 case of respiratory depression from spinal morphine, 1 case of spinal anesthesia and 1 case of over sedation comprised anesthetic causes. There were two cases of poor postoperative care which lead to postoperative death.

The incidence of perioperative death in THAI Study per 10,000 anesthetics was 28.2⁽²⁾. The common causes of death were exsanguination (42.4%), traumatic brain injury (14.3%) and sepsis (13.6%) which were patient diseases and conditions as in this study. The anesthesia related problems were anesthetic overdose, uncontrolled hemodynamic status, uncontrolled hypoxia (loss of airway control and unable to ventilate), too early extubation and inappropriate postanesthesia care. The mortality rate was higher in geriatric patients in THAI study (39.3: 10,000 anesthetics)⁽³⁾. Higher ASA physical status grading, emergency operation, current medications were factors related to 24 hours perioperative death in geriatric. The incidence of 24 hr perioperative death among overall anesthesia at King Chulalongkorn Memorial Hospital was 21.4:10,000 (mortality rate of 70%)⁽¹³⁾. The incidence of 24-hour

Table 5. Contributing factors, factors minimizing and suggested corrective strategies of the incident reports (n = 407)

	n (%)		n (%)
Contributing factors		Contributing factors	
Inappropriate decision	90 (22.1)	Inadequate preparation	58 (14.2)
Inexperience	60 (14.7)	Inadequate equipment	3 (0.7)
Inadequate knowledge	6 (1.5)	Ineffective equipment	8 (2.0)
Haste	30 (7.4)	No monitor	2 (0.5)
Tiredness	4 (1.0)	Ineffective monitor	2 (0.5)
Personnel's illness	0 (0)	Error in drug label	2 (0.5)
Inadequate personnel	5 (1.2)	No recovery room	0 (0)
Communication defect	2 (0.5)	No bed in intensive care unit	13 (3.2)
Unfamiliar to environment	2 (0.5)	Long waiting for blood transfusion	4 (1.0)
Emergency condition	81 (19.9)	Others	266 (65.4)
Inadequate preoperative evaluation	73 (17.9)		
Factors minimizing incidents		Factors minimizing incidents	
Having experience	240 (58.9)	Equipment check up	8 (2.0)
Experienced assistant	44 (10.8)	Adequate monitoring equipment	139 (34.1)
Vigilance	321 (78.9)	Comply to guidelines	109 (26.8)
Adequate personnel	5 (1.2)	Other	11 (2.7)
Good supervision	23 (5.7)	Presence of anesthesiologist	1 (0.3)
Effective communication	15 (3.7)	Improvement of ICU care	1 (0.3)
Training	7 (1.7)	Improvement of postoperative care	5 (1.2)
Adequate equipment	11 (2.7)	Improvement of surgical techniques	4 (1.0)
Equipment maintenance	7 (1.7)		
Suggested corrective strategies		Suggested corrective strategies	
Clinical practice guidelines	168 (41.3)	Quality assurance activity	172 (42.3)
Additional training	68 (16.7)	Good referral system	2 (0.5)
More manpower	15 (3.7)	Improvement of postoperative care	8 (2.0)
Improvement of supervision	119 (29.2)	Improvement of ICU care	3 (0.7)
Improvement of communication	20 (4.9)		
More equipment	8 (2.0)		
Equipment maintenance	12 (3.0)		

* Data are not mutually exclusive

perioperative cardiac arrest in geriatric patients at King Chulalongkorn Memorial Hospital were 40.4:10,000 anesthetic (mortality rate of 90%)⁽¹⁴⁾. Age more than 76, recent respiratory failure, ASA physical status 3-5, emergency surgery, intrathoracic surgery, upper abdominal surgery and administration of ketamine were factors related to 24-hour perioperative cardiac arrest⁽¹⁴⁾.

Braz et al studied perioperative cardiac arrest and death in Brazil from 1996-2005. They found 186 cardiac arrest (34.6:10,000) and 118 deaths (21.97:10,000)⁽¹⁵⁾. Patient diseases/conditions were the major causes of cardiac arrest and death. There were 18 anesthesia-related cardiac arrests and 4 patients aged more than 65. All anesthesia-related cardiac arrest were related to airway management and medication administration. Therefore the causes of perioperative death in all age groups from most studies were patient diseases and conditions and age was one of the risk

factors. However, anesthesia related death mostly resulted from airway and ventilation management, medication-related events and cardiovascular management⁽¹⁵⁻¹⁷⁾. Most anesthesia related cardiac arrests were preventable and could occur in any age group.

Desaturation was the third common incidents in this study and the second common incidents in the Thai AIMS⁽⁴⁾. Anesthesia related events were the most common causes and airway obstruction, residual paralysis and too early extubation were the three most common anesthesia causes. Difficult intubation, sepsis and pulmonary congestion were the three common patients factors. These were 3 cases of surgical causes: 1 case of tumor dislodged in trachea causing airway obstruction and 2 cases of improper ICD placement. Desaturation occurred more often in children under 5 years old in Thai AIMS⁽¹⁸⁾. Anesthesia was the most

Table 6. Types, causes and factors contributing to arrhythmia (n = 122)

	n (%)
Types of arrhythmia	
Sinus bradycardia	95 (77.9)
Atrial fibrillation	8 (6.6)
Supraventricular tachycardia	6 (4.9)
Ventricular tachycardia	7 (5.7)
Premature ventricular contraction	6 (4.9)
Causes of arrhythmia	
Anesthetic agents	50 (41.0)
Spinal anesthesia	29 (23.8)
Surgical manipulation	11 (9.0)
Light anesthesia	3 (2.5)
Intubation	4 (3.3)
Sepsis	5 (4.1)
Pulmonary embolism	4 (3.3)
Brain condition	3 (2.5)
Cardiac diseases	3 (2.5)
Massive bleeding	3 (2.5)
Reversal drugs	2 (1.6)
Metabolic/electrolyte	4 (3.3)
Vasopressor	1 (0.8)
Factors contributing to arrhythmia	
Hypertension	18 (14.8)
Diabetes	10 (8.2)
Preoperative arrhythmia	23 (18.9)
Preoperative heart disease	5 (4.1)
Preoperative beta blocker	9 (7.4)

* Data are not mutually exclusive

common causes, laryngospasm, delayed emergence from drug and muscle relaxant and inexperienced personnel in airway management were the common anesthetic causes. While difficult intubation, lung pathology and obesity were common patient factors for desaturation. Anesthesia related was also the most common causes of desaturation in the THAI Study⁽⁷⁾. The causes were mostly from airway management and anesthetic agents. The predictive factor of desaturation in geriatric patients in King Chulalongkorn Memorial Hospital were ASA physical status 3-5, difficult airway, recent respiratory failure and anesthetic agents⁽¹⁹⁾. Despite the advance in respiration monitoring such as pulse oximetry, oxygen desaturation is still a perioperative problem, the main causes were anesthesia which were considered to be from anesthetic agents and airway management.

Reintubation was the fifth common incidents in this study (69 incidents), Thai AIMS⁽²⁰⁾ and THAI Study⁽²¹⁾. Patient factors were the most common cause. Sepsis (7 patients), vocal cord edema (7 patients) and

Table 7. Causes of perioperative death (n = 100)

	n (%)
Surgical factors	
Bleeding	16 (16)
Surgical complications	2 (2)
Surgical conditions	10 (10)
Severe trauma	2 (2)
Bone cement	2 (2)
Severe brain conditions	7 (7)
Patient factors	
Sepsis	35 (36)
Multiple organ failure	11 (11)
Myocardial infarction	5 (5)
DKA	1 (1)
Pulmonary embolism	1 (1)
Anesthetic factors	
Spinal morphine	1 (1)
Spinal anesthesia	1 (1)
Aspiration	2 (2)
Over sedation	1 (1)
System management factors	
Poor postoperative care	2 (2)

* Data are not mutually exclusive

hypoventilation from electrolyte, thoracotomy and abdominal distention (4 patients) were three common patient causes. Anesthetic factors were the causes in 30 patients. Residual paralysis and hypoventilation from anesthetic agents were 2 common causes. However, combined causes from patients, surgical and anesthetic factors may be responsible for the causes in patient factors such as hypoventilation from thoracotomy. There were 184 reintubation incidents in Thai AIMS⁽²⁰⁾ and 70% was directly related to anesthesia. Hypoventilation was the most common cause related to anesthesia and lack of experience and inappropriate decision-making were considered to be the contributing factors. The incidence of reintubation in THAI Study was 27:10,000⁽²¹⁾. The two primary causes were upper airway obstruction and hypoventilation from residual effect of neuromuscular blocking and anesthetic agents. Lee et al⁽²²⁾ analyzed the causes of 191 reintubations. Respiratory problems and residual neuromuscular blocking drugs were the causes in 112 and 11 patients respectively. Therefore the causes of reintubation in geriatric patients mostly resulted from patient condition and diseases. However, residual neuromuscular blocking effects attributed to the anesthetic causes in all reintubation studies and this could be prevented by appropriate use of drugs, monitoring and patient assessment.

Table 8. Causes of oxygen desaturation (n = 89)

	n (%)
Surgical factors	
Tumor dislodged in trachea	1 (1.1)
Improper ICD	2 (2.2)
Patient factors	
Sepsis	7 (7.9)
Poor perfusion	4 (4.5)
Pulmonary congestion	5 (5.6)
Difficult intubation	8 (9.0)
Pulmonary embolism	4 (4.5)
Secretion obstruction	1 (1.1)
Bronchospasm	3 (3.4)
Anaphylactoid reaction	1 (1.1)
Vocal cord edema	3 (3.4)
Abdominal distention	1 (1.1)
Myocardial infarction	2 (2.2)
Anesthetic factors	
Airway obstruction	12 (13.5)
Aspiration	4 (4.5)
Spinal morphine	2 (2.2)
Negative pressure pulmonary edema	1 (1.1)
Laryngospasm	2 (2.2)
Endotracheal tube problems	3 (3.4)
Esophageal intubation	3 (3.4)
Too early extubation	6 (6.7)
Residual paralysis	11 (12.4)
System management factors	
Equipment check	2 (2.2)
Tracheostomy dislodge	1 (1.1)

* Data are not mutually exclusive

Conclusion

The five most common incidents in geriatric patients were arrhythmia, death within 24 hours, desaturation, cardiac arrest and reintubation. Those incidents were similar to the incidents in all age group patients except that death was more common in geriatric patients. Patients diseases and conditions themselves were the main causes of the incidents and the outcome after the incidents were more serious resulting in higher mortality rate.

In addition to inappropriate decision, inexperience and emergency condition, inadequate preoperative evaluation and preparation were contributed to the factors for the incidents. Therefore quality assurance activity, clinical practice guidelines, improvement of supervision and addition training may be the corrective strategies and the leading factors for improvement in outcomes by proper evaluate and prepare the patients.

Table 9. Causes of reintubation (n = 65)

	n (%)
Surgical factors	
Postoperative bleeding	2 (3.1)
Inproper ICD	1 (1.5)
Patient factors	
Sepsis	7 (10.8)
Severe metabolic acidosis	1 (1.5)
Bronchospasm	3 (4.6)
Inadequate cough	1 (1.5)
Pulmonary congestion	3 (4.6)
Vocal cord edema	7 (10.8)
Convulsion	1 (1.5)
Brain infarction	2 (3.1)
Myocardial infarction	1 (1.5)
Pulmonary embolism	2 (3.1)
Hypoventilation (electrolyte, abdominal distention)	4 (6.2)
Anesthetic factors	
Residual paralysis	18 (27.7)
Hypoventilation (anesthetic agents)	11 (16.9)
Negative pressure pulmonary edema	1 (1.5)

* Data are not mutually exclusive

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การวิจัยสหสถาบันเพื่อศึกษาการเกิดภาวะแทรกซ้อนทางวิสัญญีในประเทศไทย โครงการรายงานอุบัติการณ์ (Thai AIMS): ภาวะแทรกซ้อนในผู้ป่วยสูงอายุ

ลาวัลย์ ตูจันดา, อิศรญา สุขเจริญ, ชัยพฤกษ์ กุสุมาพรรณโย, ธนรัตน์ สุรัตน์สัญญา, ธนู หินทอง, สมบูรณ์ เทียนทอง

วัตถุประสงค์: เพื่อศึกษาการเกิดภาวะแทรกซ้อนทางวิสัญญีในผู้ป่วยสูงอายุในประเทศไทยโดยการรายงานอุบัติการณ์ มีจุดประสงค์เพื่อวิเคราะห์ความถี่และการกระจายของการเกิดอุบัติการณ์ อาการทางคลินิก การจัดการเพื่อหาแบบจำลองที่เหมาะสมในการลดปัญหา หรือบรรเทาความเสียหายจากการเกิดภาวะแทรกซ้อนทางวิสัญญีในประเทศไทย

วัสดุและวิธีการ: เป็นการศึกษาสหสถาบันแบบพรรณนาชนิดเก็บข้อมูลไปข้างหน้า ระหว่างวันที่ 1 มกราคม ถึง 30 มิถุนายน พ.ศ. 2550 รายงานอุบัติการณ์จากโรงพยาบาล 51 แห่งในประเทศไทย ซึ่งเก็บข้อมูลภายใต้เงื่อนไข “นิรนาม” และ “สมัครใจ” ถูกส่งมายังศูนย์จัดการข้อมูล ข้อมูลภาวะแทรกซ้อนในผู้ป่วยสูงอายุ (อายุมากกว่า หรือเท่ากับ 65 ปี) ได้รับการทบทวนและวิเคราะห์โดยวิสัญญีแพทย์ 3 คน โดยความคิดเห็นที่ขัดแย้งจะผ่านการอภิปรายจนได้ข้อสรุป

ผลการศึกษา: จากรายงานอุบัติการณ์ 407 ฉบับ และจำนวนอุบัติการณ์ 559 อุบัติการณ์พบว่าเป็นของเพศชาย (52.8%) มากกว่าเพศหญิง (46.7%) ซึ่งมี ASA PS 2, 3, 4 และ 5 เท่ากับ 38.6%, 42.8%, 14.5% และ 4.2% ตามลำดับ ผู้ป่วยสาขาศัลยกรรมทั่วไป, ศัลยกรรมกระดูก, ศัลยกรรมประสาท, ศัลยศาสตร์ระบบปัสสาวะ และ ศัลยกรรมหู คอ จมูก มีโอกาสเสี่ยงค่อนข้างสูงในการเกิดอุบัติการณ์ 57.1% ของรายงานอุบัติการณ์เกิดในห้องผ่าตัด, 30.9% เกิดที่เตียงผู้ป่วย และ 12.0% เกิดที่ห้องพักรักษา อุบัติการณ์ภาวะแทรกซ้อนที่พบบ่อย ได้แก่ หัวใจเต้นผิดจังหวะ (30%), เสียชีวิตภายใน 24 ชั่วโมง (24.6%), ความอึดตัวของออกซิเจนต่ำ (21.9%), ภาวะหัวใจหยุดเต้น (16.2%) และใส่ท่อหายใจซ้ำ (16.0%) สาเหตุส่วนใหญ่ของอุบัติการณ์เกิดจากโรคและสภาพของผู้ป่วยเอง ผลกระทบที่เกิดขึ้นส่วนใหญ่ทำให้เกิดการเปลี่ยนแปลงทางสรีรวิทยาอย่างมาก ทำให้ผู้ป่วยเสียชีวิตภายใน 7 วันหลังการผ่าตัดถึง 26.5% วิเคราะห์สาเหตุส่วนใหญ่เกิดจากมนุษย์ โดยเฉพาะการตัดสินใจที่เหมาะสม และการขาดประสบการณ์ ปัจจัยที่ทำให้อุบัติการณ์ลดลงจึงต้องใช้ความระมัดระวัง และการมีประสบการณ์ที่มากขึ้น

สรุป: อุบัติการณ์ภาวะแทรกซ้อนในผู้ป่วยสูงอายุคล้ายคลึงกับผู้ป่วยทุกกลุ่มอายุ ยกเว้นว่ามีอุบัติการณ์เสียชีวิตภายใน 24 ชั่วโมงสูงกว่า ผลกระทบที่เกิดขึ้นรุนแรงกว่าทำให้เสียชีวิต 26.5% ภายใน 7 วันหลังการผ่าตัด มาตรการที่แนะนำเพื่อลดอุบัติการณ์ ได้แก่ กิจกรรมประกันคุณภาพ การสร้างแนวทางเวชปฏิบัติ และการปรับปรุงระบบให้คำปรึกษา
