

# Anesthesia : Safety initiatives in Thailand



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# Thailand

## Anesthesia Profile (2015)

1,600 M.D. Anesthesiologists

3,000 Nurse anesthetists

Regional anesthesia is legally performed by physician (M.D.)



สมิตีเวชจ่าย8.3ล

ศาลสั่ง

หมอช่วยแม่-ลูกตัว

ฎีกาพ.สมิตีเวช  
จ่าย18ล้าน  
ค่าชีวิต'เมียเสีย'

ทำคลอดเด็ก  
เกิดผิดพลาด  
สิ้นใจทั้งกลม

ผู้คดีนาน 16 ปี ศาลฎีกาสั่ง  
รพ.ตั้ง "สมิตีเวช-หมอ" ร่วมกัน  
จ่ายค่าเสียหายทั้งต้นทั้งดอก  
ราว 18.26 ล้านให้กับเสียขาย  
อวน เหตุทำ

◆ อ่านต่อหน้า 14



▶ นวัตกรรม...ภาพเหตุการณ์ล่าสุด "ไฟโรเทค  
นิค ปัมมกรทองสวรรค์ช่วยชีพพร" ระเบิดใน  
งานฉลองตรุษจีนที่อุทยานมังกรสวรรค์ อ.เมือง  
จ.สุพรรณบุรี ทำให้เปลวไฟลุกลามไหม้เรือนโกดัง  
เสียหายไปด้วยนับ 100 หลังคาเรือน มีผู้  
เสียชีวิตและบาดเจ็บเป็นจำนวนมาก

▲ ค่าชีวิต...นายสุรินทร์ ศรีโยธิน ออกจากศาลแพ่งกรุงเทพใต้ หลังเข้าฟังศาลฎีกาพิพากษาให้ รพ.สมิตีเวช  
จ่ายชดเชย 18 ล้านบาท คดีฟ้องแพทย์ทำคลอด นางจรรีรัตน์ ศรีโยธิน ผิดพลาดตายทั้งกลม ซึ่งต่อสู้นาน 16 ปี

ตราบ  
ไฟ

News of tragedy after neuraxial anesthesia  
through mass media in Thailand



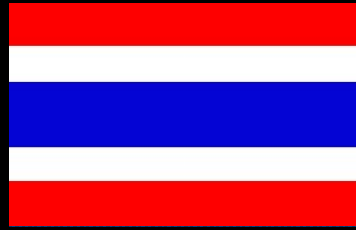
# From registry to incident reports:

## Lessons learned in Thailand



**SOMRAT CHARULUXANANAN**  
**CHULALONGKORN UNIVERSITY**

**The Royal College of Anesthesiologists of Thailand**



# THAI ANESTHESIA STUDY GROUP





Gathering of investigators from 7 medical schools

# 20 Hospitals



Chiangmai University

Chulalongkorn University

Khon Kaen University

Mahidol University

(Siriraj H., Ramathibodi H.)

Prince of Songkla University

Pramongkutklao College

Ministry of Public Health

# METHODS

**STRUCTURED DATA COLLECTION FORM (FORM 1)**

**PREOPERATIVE DATA**

**ANESTHESIA + SURGICAL DATA**

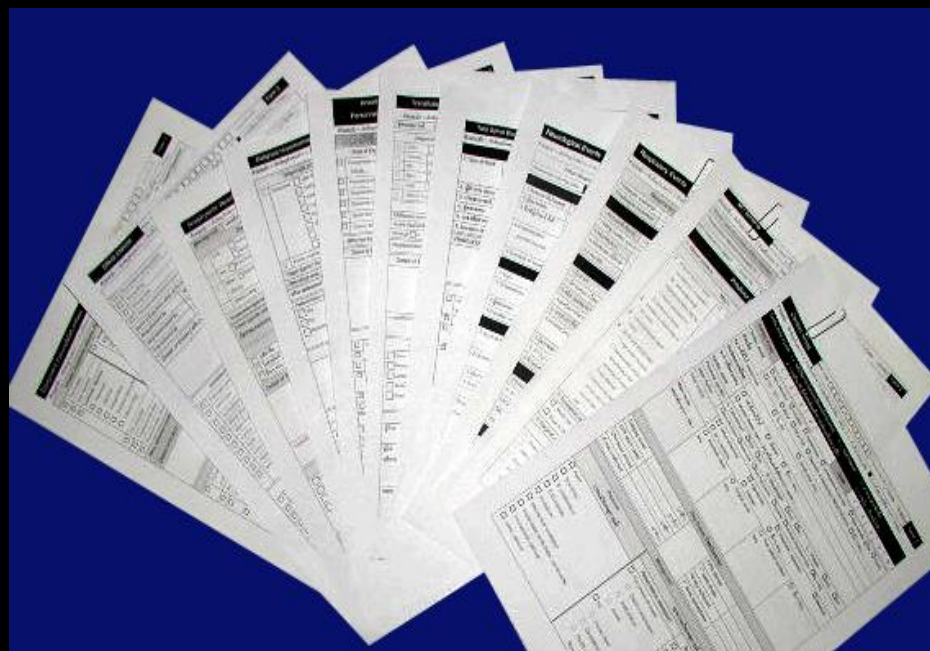
**POSTOPERATIVE DATA (24 HOURS POSTOP)**

**INTERESTING COMPLICATIONS**



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## Adverse events specific form



# Form 1

# Form 2

# Adverse events of interest

aspiration,  
esophageal intubation,  
oxygen desaturation,  
re-intubation,  
difficult intubation,

awareness,  
total spinal block,  
neurologic  
    complication,  
mismatch transfusion

# Adverse events of interest

cardiac arrest,  
death (within 24 hr),  
suspected myocardial infarction/ ischemia  
suspected malignant hyperthermia,  
drug error,  
anaphylaxis/anaphylactoid reaction,  
equipment failure  
personnel hazard



# WORKSHOP AND RUN-IN PERIOD

**Start 1** ▶ All medical schools

▶ Regional hospitals





**Start 2** ► **General hospital**

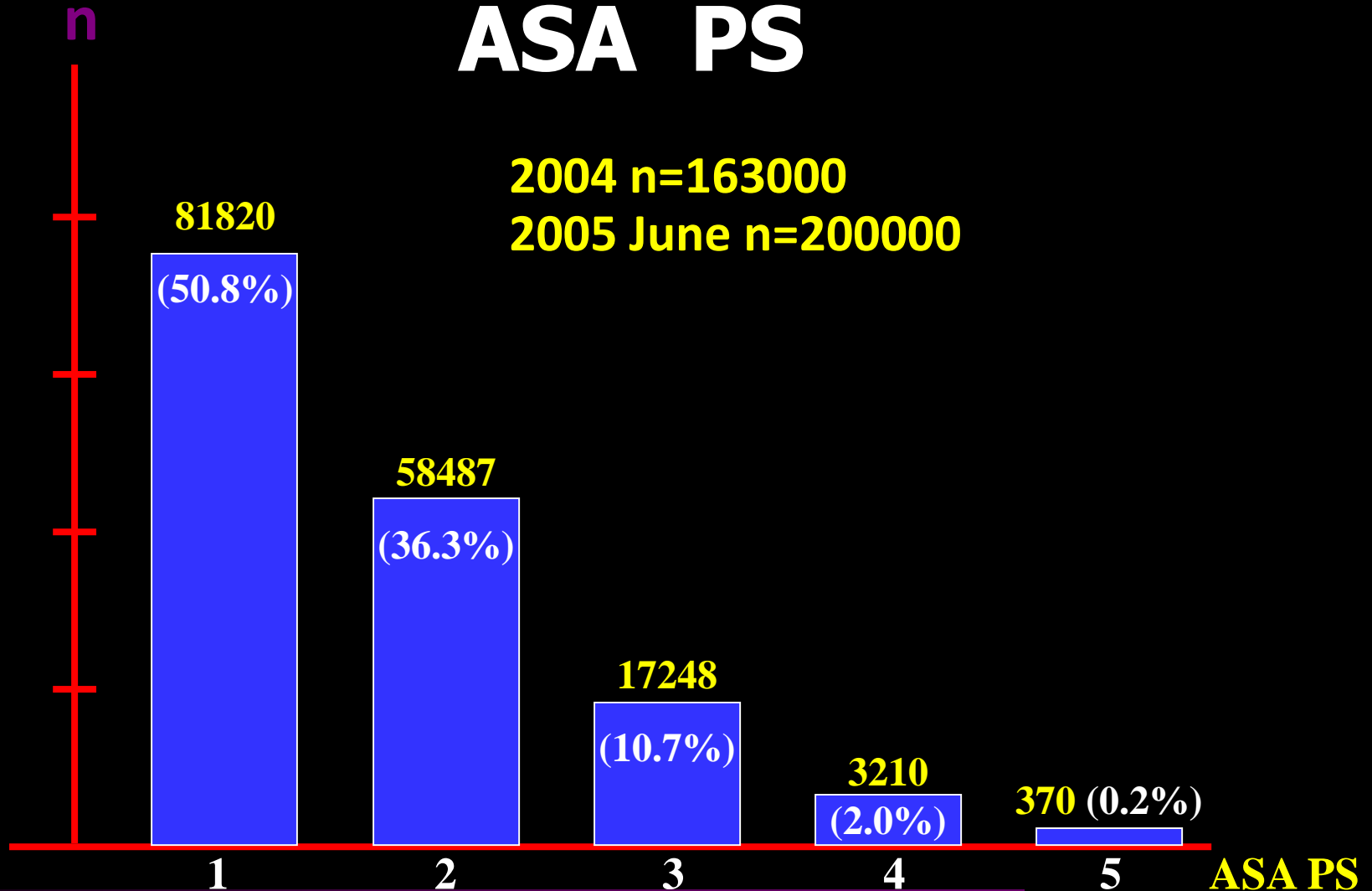
► **District hospital**



# RESULTS

**ASA PS**

**2004 n=163000**  
**2005 June n=200000**



# ANESTHESIA RELATED ADVERSE EVENTS

			Other countries
PULMONARY ASPIRATION	29	2.7 : 10000	0.01-0.11% 6.7% AIMS
ESOPHAGEAL INTUBATION	44	4.1 : 10000	1.75%
DESATURATION	521	31.9 : 10000	
REINTUBATION	209	19.4 : 10000	0.09-0.19%
DIF INTUBATION	243	22.9 : 10000	4% 1.5-8.5%
FAILED INTUBATION	3.4	3.1 : 10000	0.13-0.5%

# ANESTHESIA RELATED ADVERSE EVENTS

				Other countries
TOTAL SPINAL	5	1.3 : 10000		
AWARENESS	41	3.8 : 10000		0.2-1.5%
COMA / CVA / CONVULSION	78	4.8 : 10000		0.5-4:10000
NERVE INJURY	32	2.0 : 10000		16%(ASAacc)
SUSPECTED MI/ISCHEMIA	44	2.7 : 10000		1:50000
				1:150000



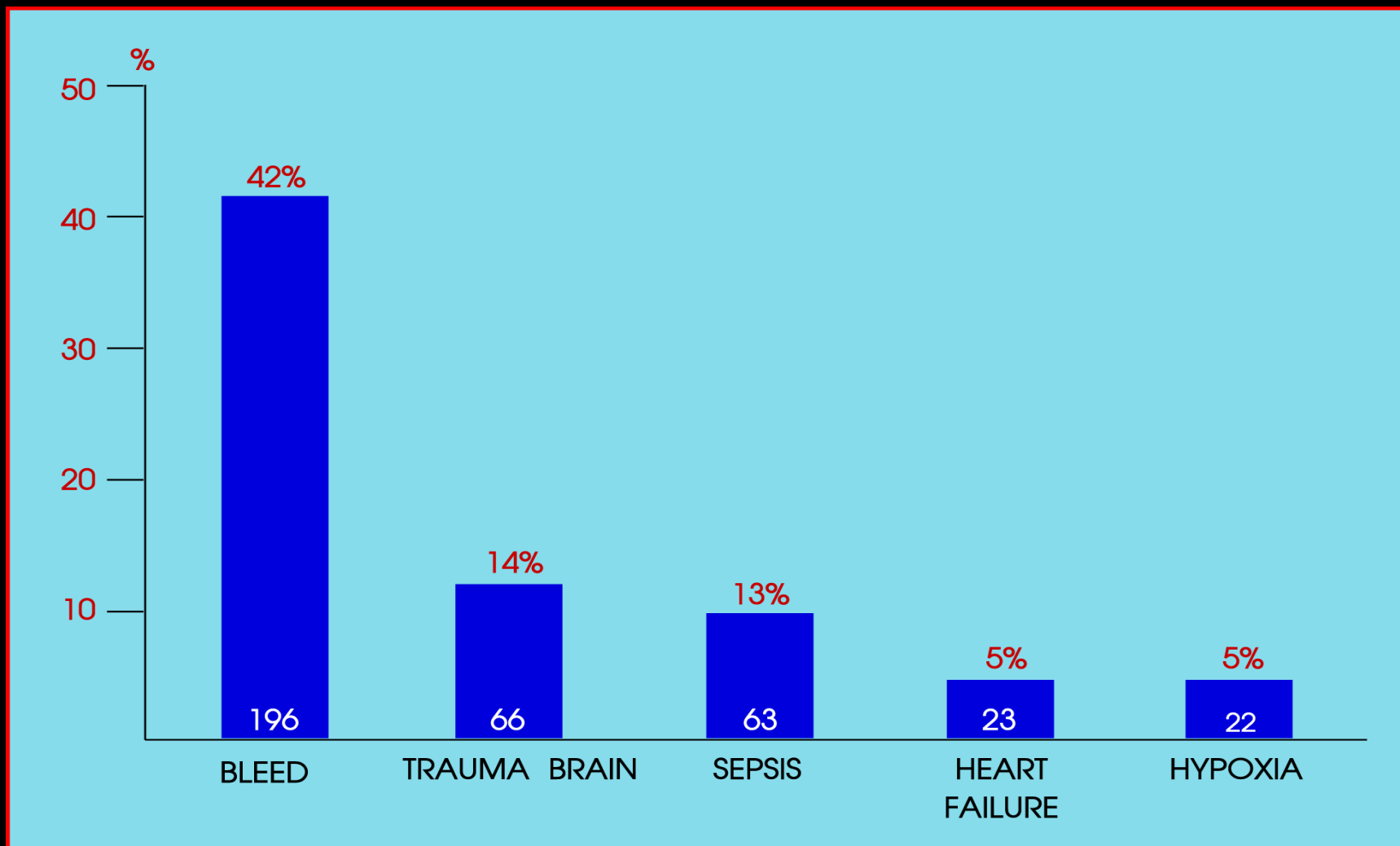
# ANESTHESIA RELATED ADVERSE EVENTS

Other countries

UNPLANNED ICU	117	7.2 : 10000	
UNPLANNED HOSPITAL	16	1.0 : 10000	
PERSONNEL HAZARD	24	1.5 : 10000	
EQUIPMENT MALFUNCTION	56	3.4 : 10000	2% (cc)
DRUG ERROR	22	1.3 : 10000	7% (AIMS)
ANAPHYLAXIS/ANAPHYLACTOID	34	2.1 : 10000	1:25000-40000 3% (AIMS)

# LEADING CAUSE OF ARREST OR DEATH (n=524)

1	BLEEDING	200	(38.2%)
2	CNS TRAUMA	66	(12.6%)
3	SEPSIS	66	(12.6%)
4	HYPOXIA	38	(7.3%)
5	HEART FAILURE	27	(5.2%)
6	CNS NONTRAUMA	20	(3.8%)
7	SURGICAL ERROR	14	(2.7%)
8	SUSP MI	13	(2.5%)



**LEADING CAUSE OF ARREST OR DEATH (n=524)**

## **ANESTHESIA RELATED ADVERSE EVENTS (24hr)**

<b>CARDIAC ARREST</b>	<b>504</b>	<b>31:10000</b> <b>1:325</b>
<b>DEATH</b>	<b>462</b>	<b>28:10000</b> <b>1:355</b>



# PERIOPERATIVE DEATH (24hr)

**NETHERLAND**

**8.8/10000**

**(ANAESTHESIA 2001, 56:1141-53)**

**THAILAND**

**28/10000**

**ARREST DEATH**

**Type of hospitals**

**$P < 0.001$**

**\*ASA PS**

**$P = 0.001$**

# MORTALITY RATE : THAILAND

Other countries

ASA PS	1	5	0.006%	0-0.3%
ASA PS	2	34	0.06%	0.3-1.4%
ASA PS	3	98	0.6%	1.8-5.4%
ASA PS	4	184	5.7%	7.8-25.9%
ASA PS	5	141	38.1%	9.4-57.8%

**Risk factors of perioperative  
death  
at a university hospital in  
Thailand :  
a registry of 50,409 anesthetics**



**Chulalongkorn University**

# Results

**50409 Database of surgery under anesthesia**

**108 patients with 24 hr-perioperative arrest**

**80 patients with 24 hr-perioperative death (74.0%)**



# Chulalongkorn Hospital

Intraoperative cardiac arrest 10:10000  
24-hr perioperative cardiac arrest 21:10000

Anesthesia related MR 0.2: 10000

Asian Biomed J, 2008

Asian Biomedicine Vol. 2 No. 1 February 2008;51-58

## Original article

### Risk factors of perioperative death at a university hospital in Thailand: a registry of 50,409 anesthetics

Oranuch Kyokong, Somrat Charuluxananan, Thewarug Werawatganon,  
Nuchnapang Termsombatborworn, Fontip Leelachiewchankul  
*Department of Anesthesiology, Faculty of Medicine, Chulalongkorn University, Bangkok 10330, Thailand*

**Background:** As a site of the Thai Anesthesia Incidents Study (THAI Study) of anesthetic adverse outcome, we continued the institutional data collection to determine incidence of cardiac arrest, mortality rate and risk factors representing a Thai University hospital.

**Methods:** Between July 2003 and December 2006, an anesthesia registry was conducted at King Chulalongkorn Memorial Hospital. Anesthesiologists were requested to record perioperative variables and adverse outcomes including perioperative mortality (i.e., event of death since the conduction of anesthesia until the end of 24-hour postoperative period) on a structured data-record form. Details of events were reviewed by three independent anesthesiologists who determined the causes by consensus. Logistic regression identified characteristics associated with mortality within 24-hr  $P < 0.05$  that were considered significant.

**Results:** Among 50,409 cases in the registry, 108 patients experienced perioperative cardiac arrest with 80 fatalities. The incidences of intraoperative, and 24-hr perioperative cardiac arrest were 10.32 and 21.42 per 10000 anesthetics with mortality rate of 48.1 % and 74.0 % respectively. Factors related to perioperative mortality were; higher ASA physical status [OR 5.92 (95 %, CI 4.41-7.95)], emergency surgery [OR 2.48 (95 %, CI 1.31-4.70)], intracranial surgery [OR 10.01 (95 %, CI 3.35-29.9)] and use of desflurane [OR 6.64 (95 %, CI 2.68-16.4)]. Factors related to lower risk of mortality were: lower abdominal surgery [OR 0.32 (95 %, CI 0.13-0.78)], and the use of nitrous oxide [OR 0.38 (95 %, CI 0.003-0.19)]. Common characteristic of intraoperative death were: male gender, emergency traumatic condition, upper abdominal surgery. The most common cause of intraoperative death was exsanguination (60%). The incidence of anesthesia related mortality was 0.198 per 10,000.

**Conclusion:** The incidence of intraoperative and 24-hr perioperative cardiac arrest was 10.3 and 21.4 per 10000 anesthetics with mortality rate of 48.1 % and 74.0 % respectively. Improving emergency trauma facility may increase survival rates.

**Keywords:** Anesthesia, cardiac arrest, mortality, registry, the death, trauma.

# THAI Study : Awareness, case-control study

81 cases : 324 controls

Risk factors :

**Cesarean delivery** OR 6.4 (95% CI 2-20.7)  $P < 0.001$

**Cardiac surgery** OR 10.4 (95% CI 3.3-31.8)  $P < 0.001$

**nitrous oxide** OR 0.4 (95% CI 0.2-0.8)  $P = 0.02$

# Cardiac Arrest After Spinal Anesthesia in Thailand: A Prospective Multicenter Registry of 40,271 Anesthetics

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Somboon Thienthong, MD†

Mali Rungreungvanich, MD‡

Thavat Chanchayanon, MD§

Thitima Chinachoti, MD||

Oranuch Kyokong, MD\*

Yodying Punjasawadwong, MD¶

**BACKGROUND AND OBJECTIVES:** As part of the Thai Anesthesia Incidents Study of anesthetic adverse outcomes, we evaluated the incidence and factors related to cardiac arrest during spinal anesthesia.

**METHODS:** During a 12-mo period (March 1, 2003, to February 28, 2004), a prospective, multicenter registry of patients receiving anesthesia was initiated in 20 hospitals (7 university, 5 tertiary, 4 general, and 4 district hospitals) across Thailand. Anesthesia personnel reported patient-, surgery-, and anesthetic-related variables and adverse outcomes, including cardiac arrest during spinal anesthesia (defined as the time period from induction of spinal anesthesia until the end of operation). Adverse event specific forms were recorded within 24 h of an anesthetic procedure whenever a specific adverse event occurred. Univariate and multivariate analysis were used to identify factors related to cardiac arrest during spinal anesthesia. A  $P$  value  $<0.05$  was considered significant.

**RESULTS:** In the registry of 40,271 cases of spinal anesthesia, there were 11 cardiac arrests, corresponding to an incidence of 2.73 (95% CI: 1.12–4.34) per 10,000 anesthetics. The mortality rate was 90.9% among patients who arrested. Among 11 patients who arrested, there were 5 cases of cesarean delivery and 6 cases of extremity surgery, including hip surgery. In 4 patients (36.3%), the anesthetic contributed directly to the arrest (high sympathectomy, local anesthetic overdose, or lack of electrocardiography monitoring), whereas some arrests were associated with specific events (cementing of prosthesis, massive bleeding, suspected pulmonary embolism, and suspected myocardial infarction). From multivariate analysis, the risks of cardiac arrest during anesthesia were shorter stature (odds ratio 0.944 [95% CI: 0.938–0.951],  $P < 0.001$ ), longer duration of surgery (odds ratio 1.003 [95% CI: 1.001–1.005],  $P = 0.002$ ), and spinal anesthesia administered by the surgeon (odds ratio 23.508 [95% CI: 6.112–90.415],  $P < 0.001$ ), respectively.

**CONCLUSION:** The incidence of cardiac arrest during spinal anesthesia was infrequent, but was associated with a high mortality rate. If the surgeon performed the spinal anesthetic, this was a significant factor associated with cardiac arrest. Increasing the number of anesthesiologists, improving monitoring guidelines for spinal anesthesia and improving the nurse-anesthetist training program may decrease the frequency of arrest and/or improve patient outcome.

(Anesth Analg 2008;X:●●●-●●●)

# Cardiac arrest during spinal anesthesia : Thailand

- 12 months period
- 40,271 consecutive spinal anesthesia
- Cardiac arrest **2.73 (95% CI 1.12-4.34) per 10000**
- High mortality rate of **81.8%** (9 out of 11 cases)

# Cardiac arrest during spinal anesthesia : Thailand

- Two groups : obstetric (5 cases)  
and extremity surgery (6 cases)
- 4 out of 11 (36.3%) anesthesia related :  
high sympathectomy  
local anesthetic overdose

# Cardiac arrest during spinal anesthesia : Thailand

The 7 of 11 ( 60.6%) cardiac arrest received spinal anesthesia conducted by surgeons.

**Lack of board** – anesthesia certification was associated with **worse outcomes**

(Silber JH et al. Anesthesiology 2002; 96:1044-52)

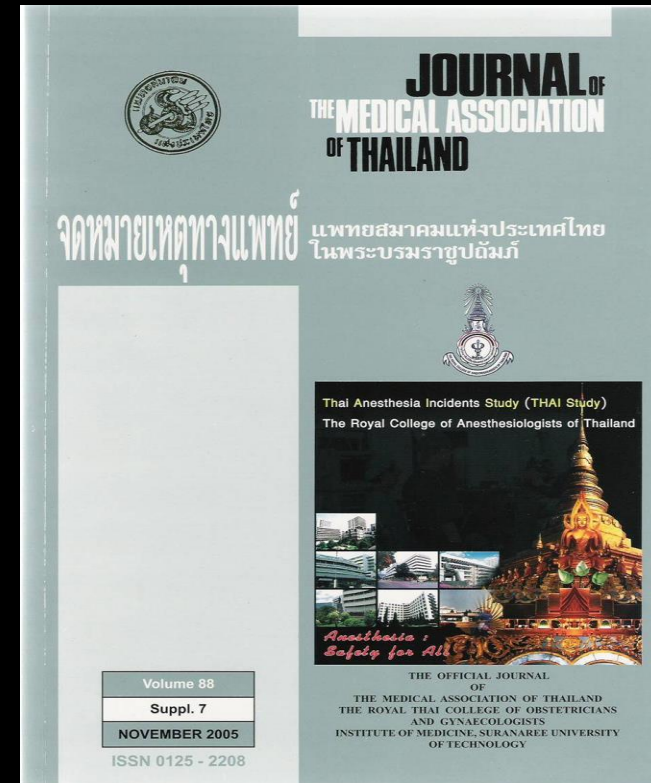
**Anesthesiologist - directed anesthesia** can have a **lower mortality rate**

(Silber JH et al. Anesthesiology 2000; 93: 152-63)



# THAI Study I,II 200000 cases

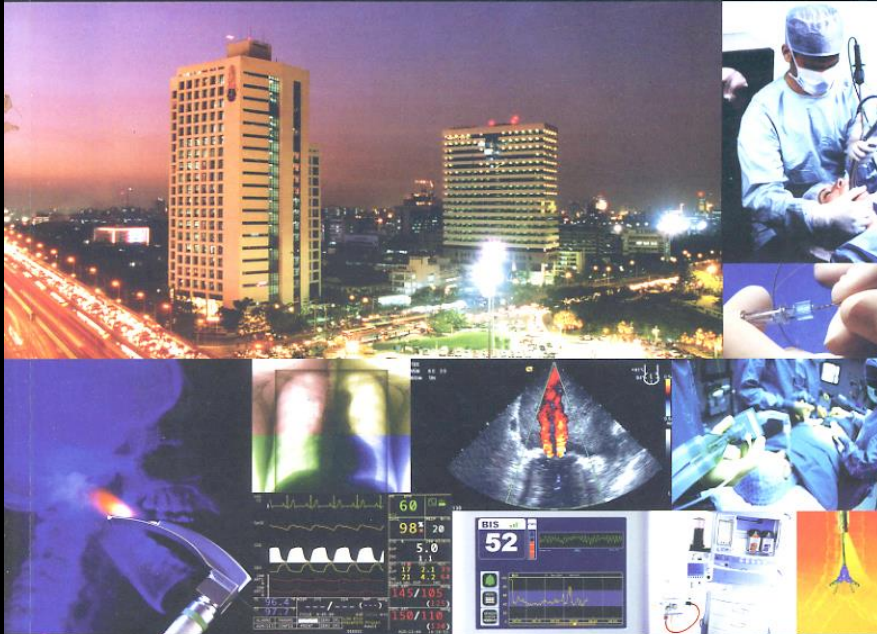
- 32 articles,165 citation, 3 text books
- CPG
- Increase position for MD anesthesiologists
- Monitor..pulse oximeter,
- Statistician, research-coordinator
- THAI Study phase III





# ตำรา วิชา วิสัญญีวิทยา

: การให้ยาระงับความรู้สึกเพื่อ  
คุณภาพและความปลอดภัย

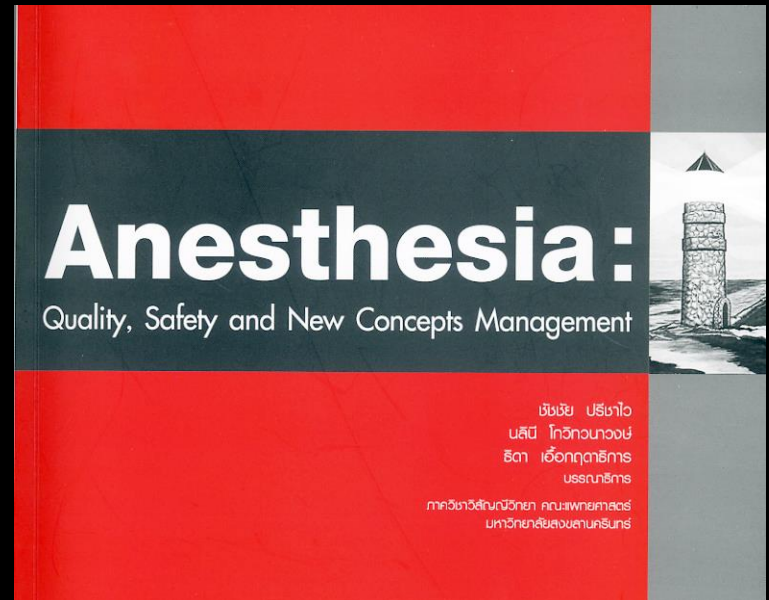


Anesthesiology  
: Quality & Safety

สมรัตน์ จารุลักษณะนันท์  
บรรณาธิการ  
คณะแพทยศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย  
โรงพยาบาลจุฬาลงกรณ์ สภากาชาดไทย

Chulalongkorn University

Prince of Songkla U.



Mahidol University

**TEXT BOOKS**

# Chronology

## Research Policy: THAI Study, Thai AIMS

- 2004 Initiation of **THAI Study I**
- 2005-2006 200,000 cases in **THAI Study I, II**  
among 20 hospitals (18 months)
- 2007 **CPG**: pulse oximeter in all  
anesthesia cases
- 2007-2008 **Thai AIMS** (Thai Anesthesia  
Incidents **M**onitoring Study)  
2,000 sentinel incidents among 51  
hospitals (6 months)

# Chronology

## Research Policy: THAI Study, Thai AIMS

- 2008 Thai AIMS publication
- 2008 Cardiac arrest after spinal anesthesia  
CPG: Spinal anesthesia (Thai Study)
- 2009 Endobroncheal intubation, equipment malfunction etc.
- 2010 Model of anesthesia adverse events  
KCMH
- 2009 Suspected pulmonary embolism
- 2010 Drug error  
CPG: Color labelling



[illegible]

# What happened?

## Monitoring... CPG

	2004	2007
NIBP	98.2%	98.7%
MAP	5.6%	10.6%
SPO <sub>2</sub>	97.4%	99.4%
EKG	64.3%	97.8%
ETCO <sub>2</sub>	19.4%	45.7%
ETGAS	4.0%	11.9%



# **Anesthesia-related Complications of Caesarean Delivery in Thailand: 16,697 cases from The Thai Anaesthesia Incidents Study**

Waraporn Chau-in<sup>1</sup>,  
Thanoo Hintong<sup>2</sup>, Oraluxna Rodanant<sup>3</sup>,  
Varinee Lekprasert<sup>4</sup>, Yodying Punjasawadwong<sup>2</sup>,  
Somrat Charuluxananan<sup>3</sup>, Surasak tanudsintum<sup>5</sup>

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*\*\*\*\* Department of Anesthesiology, Faculty of Medicine, Ramathibodi Hospital, Mahidol University, Bangkok, Thailand*

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# Anesthesia-related Complications of Caesarean Delivery in Thailand

Among 16697 cases of caesarean delivery  
(9.7% of registry)

## Anesthesia

General anesthesia	27%
Spinal anesthesia	66%
Epidural anesthesia	4%

J med Assoc Thai 2010;93(10)

# Anesthesia-related Complications of Caesarean Delivery in Thailand

Cardiac arrest 10.2(95% CI 5.9,16.3): 10000

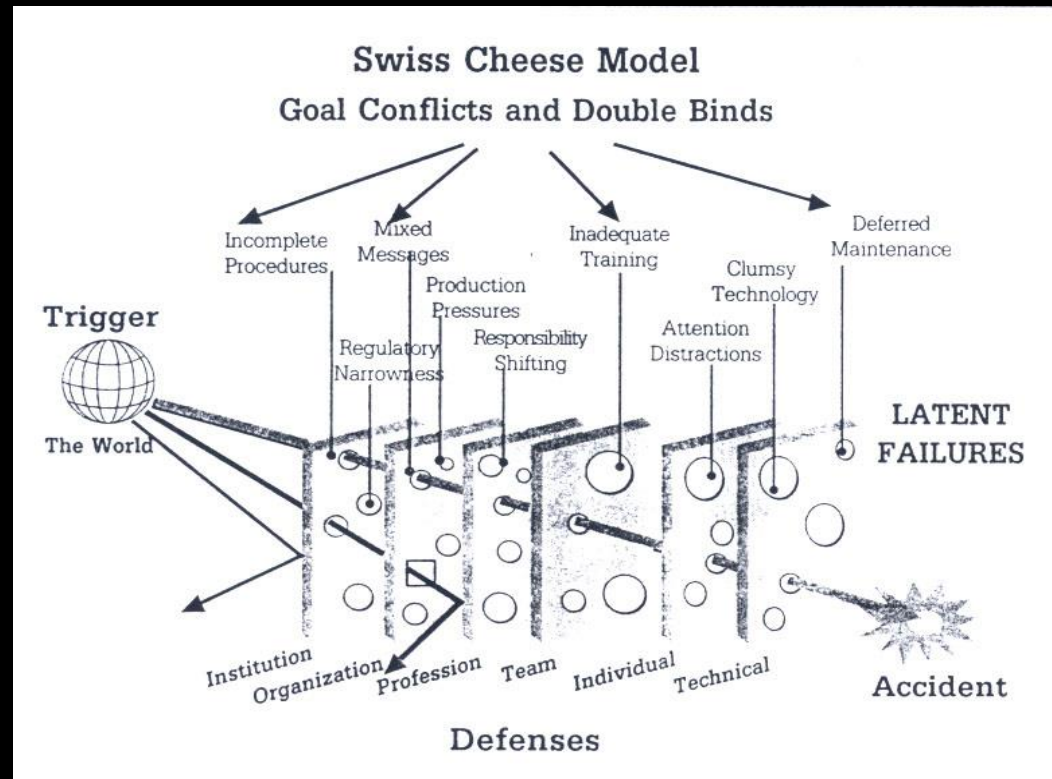
Death 4.8(95% CI 2.1,9.4): 10000

8 Fatal cases : 5 (intraoperative arrest)  
1 (PACU)  
1 (Postop 24 hr)  
1 (ICU)

# THAI STUDY PHASE II

RCAT... AIMS

2000 Incident Reports  
40-50 Hospitals  
Voluntary  
Anonymous



## Perspective

# Multicentered Study of Model of Anesthesia related Adverse Events in Thailand by Incident Report (The Thai Anesthesia Incident Monitoring Study): Methodology

Yodying Punjasawadwong MD\*,  
Suwanee Suraseranivongse MD\*\*, Somrat Charuluxananan MD\*\*\*,  
Prasatnee Jantorn MD\*\*\*\*, Somboon Thienthong MD\*\*\*\*\*,  
Thavat Chanchayanon MD\*\*\*\*\*, Surasak Tanudsintum MD\*\*\*\*\*

\* Chiang Mai University, Chiang Mai

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\*\*\* Chulalongkorn University, Bangkok

\*\*\*\* Ramathibodi Hospital, Bangkok

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\*\*\*\*\* Prince of Songkla University, Songkhla

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**Objective:** Determine the appropriate model for incident study of adverse or undesirable events in more extensive levels from primary to tertiary hospitals across Thailand.

**Material and Method:** The present study was mainly a qualitative research design. Participating anesthesia providers are asked to report, on anonymous and voluntary basis, by completing the standardized incident report form as soon as they find a predetermined adverse or undesirable event during anesthesia, and until 24 hours after the operation. Data from the incident report will be reviewed by three peer reviewers and analyzed to identify contributing factors by consensus.

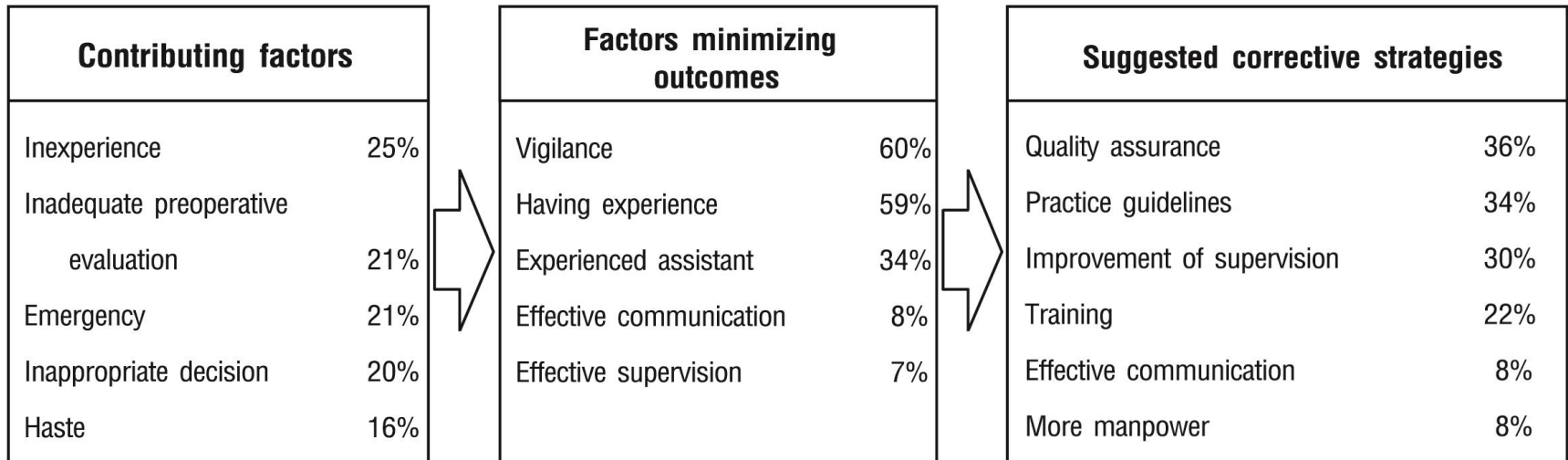
**Conclusion:** The THAI anesthesia incidents monitoring study can be used as a model for the development of a local system to provide review and feedback information. This should help generate real improvement in the patient care.

**Keywords:** Incident monitoring, Complications, Anesthesia, Adverse events

*J Med Assoc Thai* 2007; 90 (11): 2529-37

Full text. e-Journal: <http://www.medassocthai.org/journal>

# Thai AIMS



**Figure 3 :** Model of anesthesia related adverse events

J Med Assoc Thai 2008;91(7):1011-9

# Adverse events after spinal anesthesia: Thai AIMS

Detection

88% EKG

64% by pulse oximeter

71% by NIBP

Anesthetic factors: high spinal block,  
inadequate prehydration, delayed resuscitation

Preventable 58%



# Chronology

## Research Policy: Thai Study, thai AIMS

- 2008 Thai AIMS publication
- 2008 Cardiac arrest after spinal anesthesia  
CPG: Spinal anesthesia (Thai Study)
- 2009 Endobroncheal intubation, equipment malfunction etc.
- 2010 Model of anesthesia adverse events KMCH
- 2011 Suspected pulmonary embolism
- 2012 Drug error  
CPG: Color labelling



# Diagnosis of incident..CU hospital

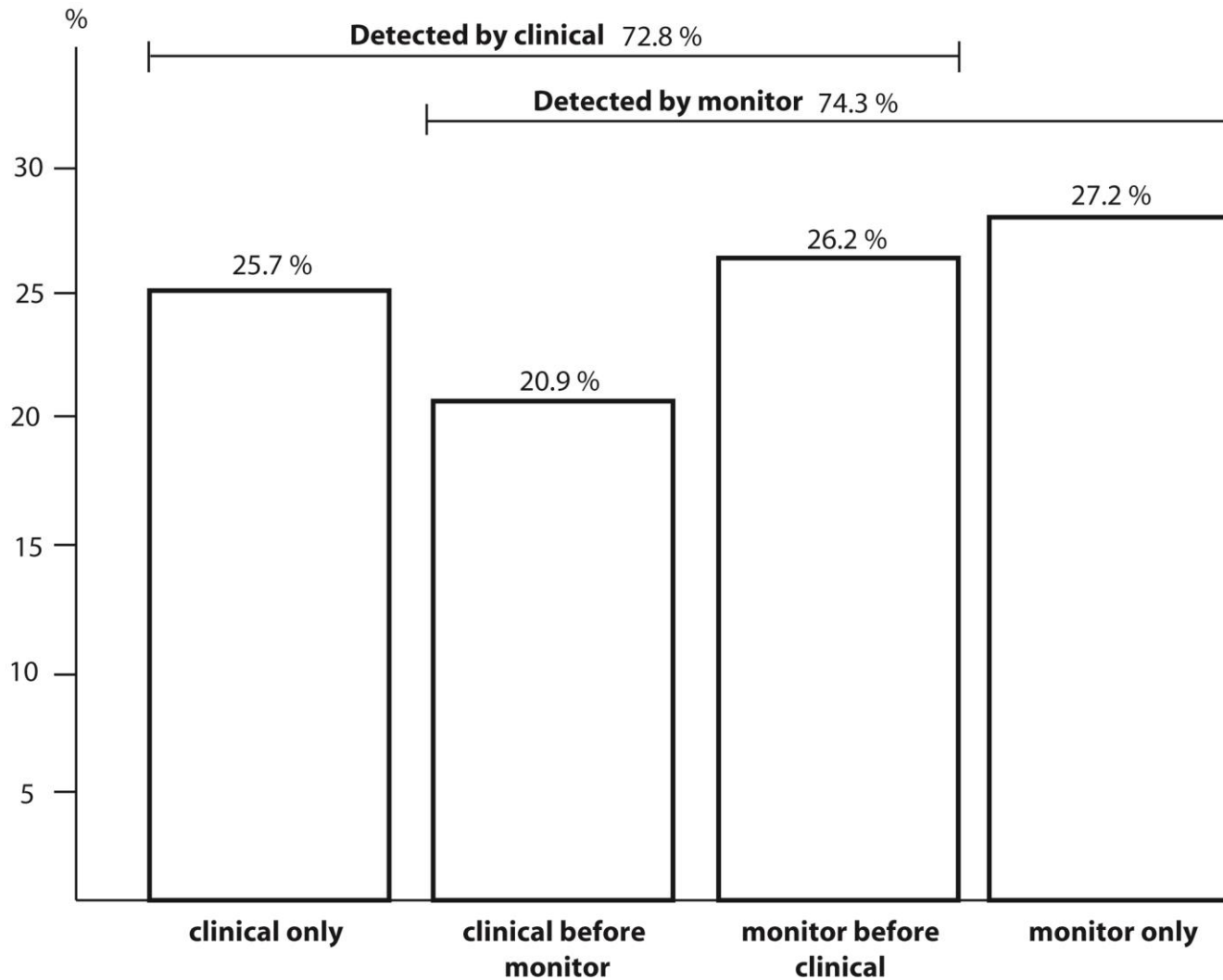


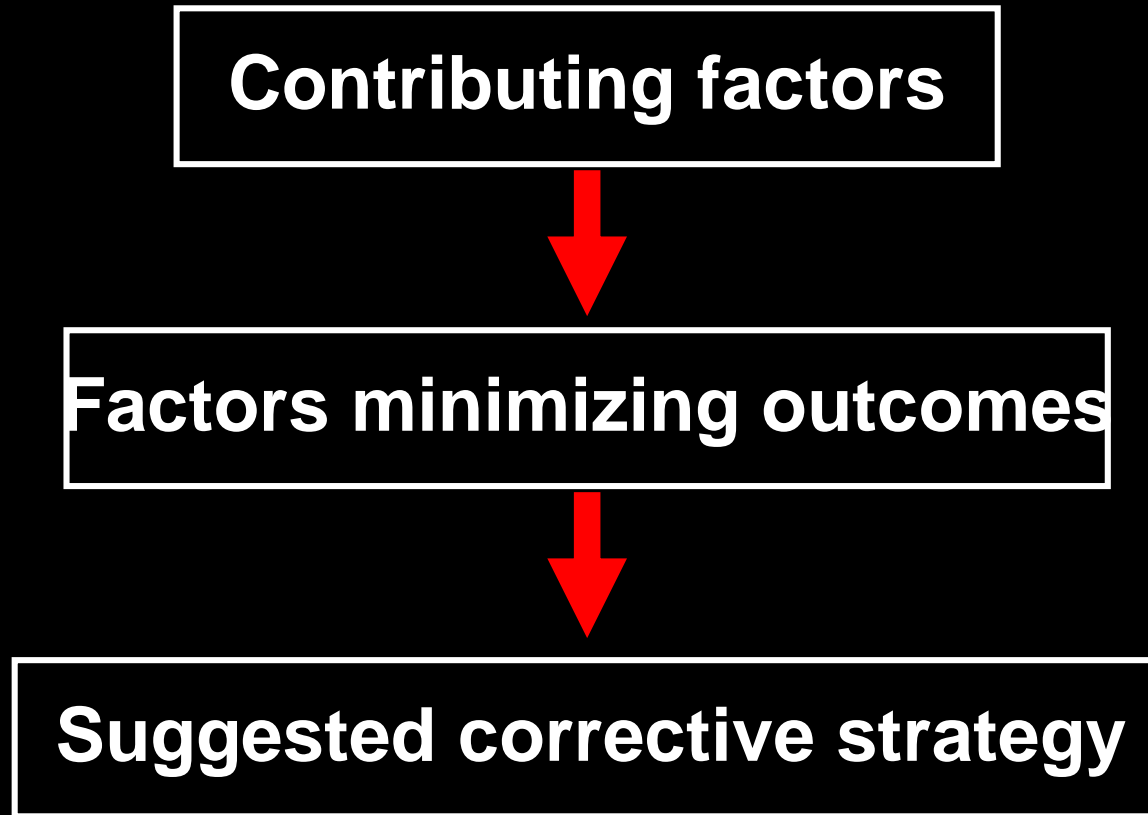
Fig.1 Detection of incidents by clinical diagnosis and monitoring (n=191 incidents)



# THAI Study (2004) to Thai AIMS (2015)



# **Model : Anesthesia Related Complication**









# SURGICAL SAFETY CHECKLIST



## SURGICAL SAFETY CHECKLIST (DRAFT)

SAFE SURGERY SAVES LIVES  
GLOBAL PATIENT SAFETY CHALLENGE  
WORLD HEALTH ORGANIZATION

### *SIGN IN - PRIOR TO INDUCTION OF ANAESTHESIA, THE FOLLOWING ITEMS MUST BE COMPLETED:*

- ☐ CONSENT OBTAINED
- ☐ SITE MARKED/NOT APPLICABLE
- ☐ PULSE OXIMETER ON PATIENT AND FUNCTIONING
- ☐ PATIENT CONFIRMED IDENTITY, SITE AND PROCEDURE
- ☐ ANAESTHESIA SAFETY CHECK COMPLETED

#### DOES PATIENT HAVE A:

- KNOWN ALLERGY ☐ NO ☐ YES
- DIFFICULT AIRWAY (E.G. MALLAMPATI 3 OR 4) ☐ NO ☐ YES, AND ASSISTANCE AVAILABLE
- RISK OF >1000CC BLOOD LOSS (15CC/KG IN CHILDREN) ☐ NO ☐ YES, AND ADEQUATE IV ACCESS ESTABLISHED

### *TIME OUT - PRIOR TO SKIN INCISION, THE FOLLOWING ITEMS MUST BE COMPLETED:*

- ☐ SURGEON, NURSE, AND ANAESTHESIA PROFESSIONAL VERBALLY CONFIRM PATIENT, SITE, PROCEDURE, POSITION
- ☐ ANTIBIOTIC PROPHYLAXIS GIVEN IN LAST 60 MIN ☐ NOT APPLICABLE
- ☐ ESSENTIAL IMAGING DISPLAYED ☐ NOT APPLICABLE

#### ANTICIPATED CRITICAL EVENTS

- ☐ SURGEON REVIEWS: WHAT ARE THE CRITICAL OR UNEXPECTED STEPS, OPERATIVE DURATION, ANTICIPATED BLOOD LOSS?
- ☐ ANAESTHESIA TEAM REVIEWS: WHAT ARE CRITICAL RESUSCITATION PLANS, PATIENT-SPECIFIC CONCERNS, IF ANY?
- ☐ NURSING TEAM REVIEWS: WHAT ARE THE STERILITY INDICATOR RESULTS, EQUIPMENT ISSUES, OTHER PATIENT CONCERNS?
- ☐ OTHER CHECKS: \_\_\_\_\_

### *SIGN OUT - PRIOR TO REMOVAL OF SURGICAL DRAPES, THE FOLLOWING ITEMS MUST BE COMPLETED:*

- ☐ SURGEON REVIEWS WITH ENTIRE TEAM:
  - WHAT PROCEDURE WAS DONE
  - IMPORTANT INTRA-OPERATIVE EVENTS
  - MANAGEMENT PLAN
- ☐ ANAESTHESIA PROFESSIONAL REVIEWS WITH ENTIRE TEAM:
  - IMPORTANT INTRA-OPERATIVE EVENTS
  - RECOVERY PLAN
- ☐ NURSE REVIEWS WITH ENTIRE TEAM:
  - INSTRUMENT AND SPONGE COUNTS
  - SPECIMEN LABELLING (INCLUDING PATIENT NAME)
  - IMPORTANT INTRA-OPERATIVE EVENTS/RECOVERY PLAN

SIGNATURE \_\_\_\_\_

DATE \_\_\_\_\_

## Surgical Safety Checklist ..... 434

Sign in	
Patient identification	84 %
Mark site	41 %
Evaluation for difficult airway	73 %
Anticipate for pulmonary aspiration	64 %
Anticipate blood loss ( > 500 cc)	56 %
Ask for drug allergy	81 %
Preanesthetic pulse oximeter	94 %
Complete anesthesia checklists	96 %

# **Improvement of Safety in Anesthesia**

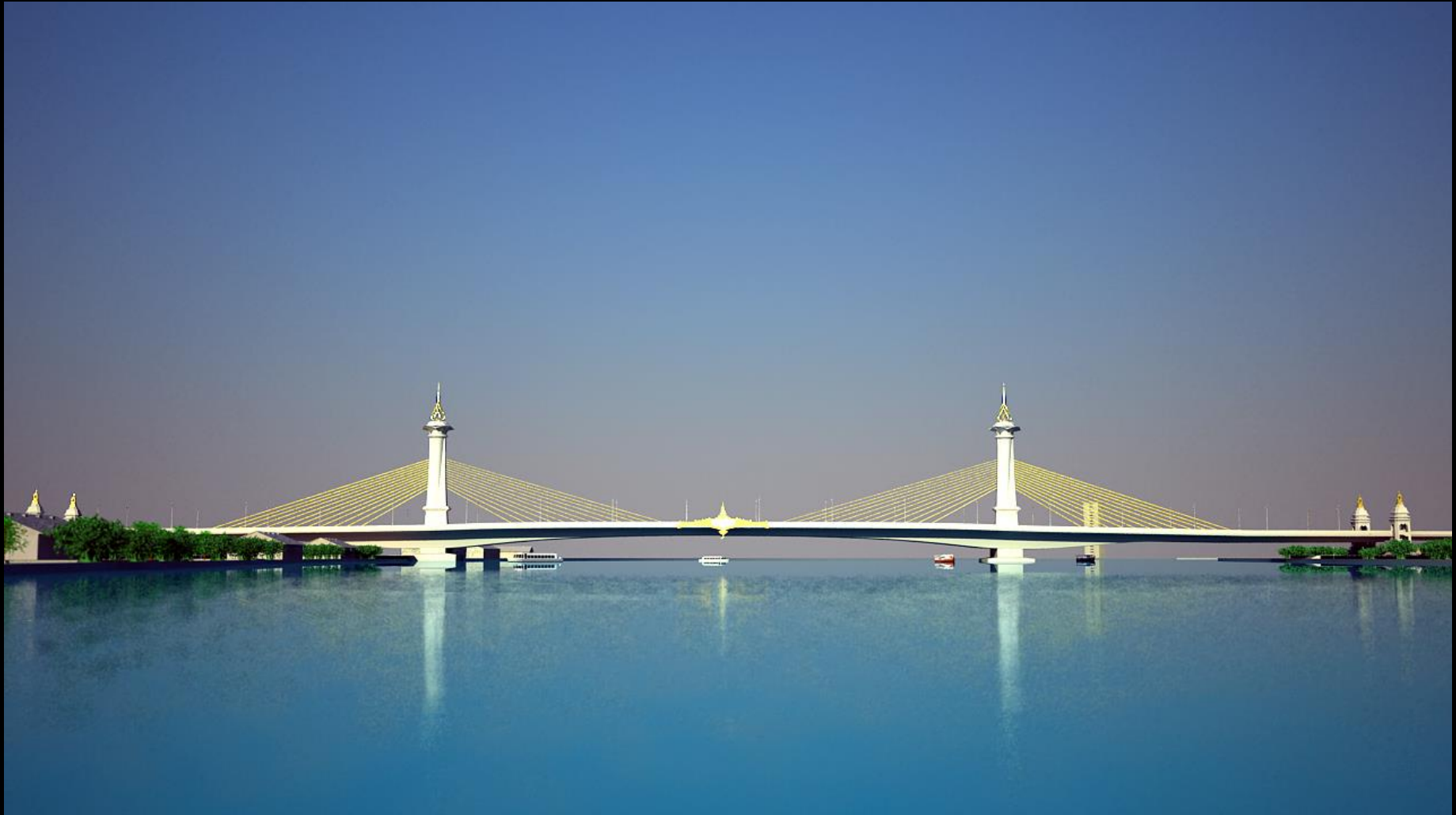
- **Improved monitoring techniques**
- **Clinical practice guidelines**
- **Other systematic approaches to reduce errors**



# What's next?

- Promote using of capnometer
- Thai Anesthesia Quality and Safety Indices
  - number of anesthesiologists
  - number of nurse anesthetists
  - use of capnometer
  - 24 hr PACU
  - Intraoperative cardiac arrest (ASA12)
  - 24 hr mortality rate





*Thank you*