Anesthesia: Safety initiatives in Thailand

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Faculty of Medicine, Chulalongkorn University, Thailand
Thailand
Anesthesia Profile (2015)

1,600 M.D. Anesthesiologists
3,000 Nurse anesthetists

Regional anesthesia is legally performed by physician (M.D.)
News of tragedy after neuraxial anesthesia through mass media in Thailand
From registry to incident reports:

Lessons learned in Thailand

SOMRAT CHARULUXANANANANANAN
CHULALONGKORN UNIVERSITY
The Royal College of Anesthesiologists of Thailand
มาตรา 52
ชนชาวไทยย่อมมีสิทธิเสมอกันในการรับบริการสาธารณสุขที่ได้มาตรฐาน

มาตรา 82
รัฐต้องจัดและส่งเสริมการสาธารณสุขให้ประชาชนได้รับบริการที่ได้มาตรฐานและมีประสิทธิภาพอย่างทั่วถึง

รัฐธรรมนูญแห่งราชอาณาจักรไทย
Gathering of investigators from 7 medical schools
Chiangmai University
Chulalongkorn University
Khon Kaen University
Mahidol University
  (Sriraj 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
### Adverse events specific form

**Form 1**

<table>
<thead>
<tr>
<th>Patient ID</th>
<th>Name</th>
<th>Date of Birth</th>
<th>Sex</th>
<th>Race</th>
<th>Address</th>
<th>Phone</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>123456</td>
<td>John Doe</td>
<td>1990-01-01</td>
<td>Male</td>
<td>White</td>
<td>123 Main St</td>
<td>555-1234</td>
<td><a href="mailto:john.doe@email.com">john.doe@email.com</a></td>
</tr>
</tbody>
</table>

**Form 2**

<table>
<thead>
<tr>
<th>Event Type</th>
<th>Description</th>
<th>Severity</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allergic Reaction</td>
<td>Anaphylaxis</td>
<td>Severe</td>
<td>2023-01-01</td>
</tr>
<tr>
<td>DVT</td>
<td>Deep Vein Thrombosis</td>
<td>Moderate</td>
<td>2023-02-01</td>
</tr>
</tbody>
</table>

**Notes**

- Patient 123456 had a known history of allergies and was prescribed medications accordingly.
- The patient was monitored closely for any adverse reactions after surgery.
**Adverse events of interest**

<table>
<thead>
<tr>
<th>aspiration,</th>
<th>awareness,</th>
</tr>
</thead>
<tbody>
<tr>
<td>esophageal intubation,</td>
<td>total spinal block,</td>
</tr>
<tr>
<td>oxygen desaturation,</td>
<td>neurologic</td>
</tr>
<tr>
<td>re-intubation,</td>
<td>complication,</td>
</tr>
<tr>
<td>difficult intubation,</td>
<td>mismatch transfusion</td>
</tr>
</tbody>
</table>
Adverse events of interest

cardiac arrest,
death (within 24 hr),
suspected myocardial infarction/ ischemia
suspected malignant hyperthermia,
drug error,
anaphylaxis/analphylactoid 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

81820 (50.8%)
58487 (36.3%)
17248 (10.7%)
3210 (2.0%)
370 (0.2%)
# ANESTHESIA RELATED ADVERSE EVENTS

<table>
<thead>
<tr>
<th>Event</th>
<th>Incidence</th>
<th>Rate per 10,000</th>
<th>Other Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulmonary Aspiration</td>
<td>29</td>
<td>2.7</td>
<td>0.01-0.11%</td>
</tr>
<tr>
<td>Esophageal Intubation</td>
<td>44</td>
<td>4.1</td>
<td>6.7% AIMS</td>
</tr>
<tr>
<td>Desaturation</td>
<td>521</td>
<td>31.9</td>
<td>1.75%</td>
</tr>
<tr>
<td>Reintubation</td>
<td>209</td>
<td>19.4</td>
<td>0.09-0.19%</td>
</tr>
<tr>
<td>Dif Intubation</td>
<td>243</td>
<td>22.9</td>
<td>4%</td>
</tr>
<tr>
<td>Failed Intubation</td>
<td>3.4</td>
<td>3.1</td>
<td>1.5-8.5%</td>
</tr>
<tr>
<td>Failed Intubation</td>
<td>3.4</td>
<td>3.1</td>
<td>0.13-0.5%</td>
</tr>
</tbody>
</table>
## ANESTHESIA RELATED ADVERSE EVENTS

<table>
<thead>
<tr>
<th>Condition</th>
<th>Incidence</th>
<th>Incidence per 10,000</th>
<th>Other countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL SPINAL</td>
<td>5</td>
<td>1.3 : 10000</td>
<td></td>
</tr>
<tr>
<td>AWARENESS</td>
<td>41</td>
<td>3.8 : 10000</td>
<td>0.2-1.5%</td>
</tr>
<tr>
<td>COMA / CVA / CONVULSION</td>
<td>78</td>
<td>4.8 : 10000</td>
<td>0.5-4:10000</td>
</tr>
<tr>
<td>NERVE INJURY</td>
<td>32</td>
<td>2.0 : 10000</td>
<td>16%(ASAcc)</td>
</tr>
<tr>
<td>SUSPECTED MI/ISCHEMIA</td>
<td>44</td>
<td>2.7 : 10000</td>
<td>1:50000</td>
</tr>
</tbody>
</table>
<pre><code>                            |           |                      | 1:150000        |
</code></pre>
<table>
<thead>
<tr>
<th>Adverse Event</th>
<th>Frequency</th>
<th>Incidence per 10,000</th>
<th>Other countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNPLANNED ICU</td>
<td>117</td>
<td>7.2</td>
<td></td>
</tr>
<tr>
<td>UNPLANNED HOSPITAL</td>
<td>16</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>PERSONNEL HAZARD</td>
<td>24</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>EQUIPMENT MALFUNCTION</td>
<td>56</td>
<td>3.4</td>
<td>2% (cc)</td>
</tr>
<tr>
<td>DRUG ERROR</td>
<td>22</td>
<td>1.3</td>
<td>7% (AIMS)</td>
</tr>
<tr>
<td>ANAPHYLAXIS/ANAPHYLACTOID</td>
<td>34</td>
<td>2.1</td>
<td>1:25000-40000</td>
</tr>
</tbody>
</table>

3% (AIMS)
## LEADING CAUSE OF ARREST OR DEATH (n=524)

<table>
<thead>
<tr>
<th>Rank</th>
<th>Condition</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BLEEDING</td>
<td>200</td>
<td>(38.2%)</td>
</tr>
<tr>
<td>2</td>
<td>CNS TRAUMA</td>
<td>66</td>
<td>(12.6%)</td>
</tr>
<tr>
<td>3</td>
<td>SEPSIS</td>
<td>66</td>
<td>(12.6%)</td>
</tr>
<tr>
<td>4</td>
<td>HYPOXIA</td>
<td>38</td>
<td>(7.3%)</td>
</tr>
<tr>
<td>5</td>
<td>HEART FAILURE</td>
<td>27</td>
<td>(5.2%)</td>
</tr>
<tr>
<td>6</td>
<td>CNS NONTRAUMA</td>
<td>20</td>
<td>(3.8%)</td>
</tr>
<tr>
<td>7</td>
<td>SURGICAL ERROR</td>
<td>14</td>
<td>(2.7%)</td>
</tr>
<tr>
<td>8</td>
<td>SUSP MI</td>
<td>13</td>
<td>(2.5%)</td>
</tr>
</tbody>
</table>
LEADING CAUSE OF ARREST OR DEATH (n=524)

- BLEED: 42%, 196 cases
- TRAUMA: 14%, 66 cases
- BRAIN: 13%, 63 cases
- SEPSIS: 5%, 23 cases
- HEART FAILURE: 5%, 22 cases
- HYPOXIA: 5%, 22 cases
**ANESTHESIA RELATED ADVERSE EVENTS (24hr)**

<table>
<thead>
<tr>
<th>Event</th>
<th>Count</th>
<th>Incidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac Arrest</td>
<td>504</td>
<td>31:10000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1:325</td>
</tr>
<tr>
<td>Death</td>
<td>462</td>
<td>28:10000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1:355</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>ASA PS</th>
<th>Count</th>
<th>Mortality Rate (%)</th>
<th>Other Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5</td>
<td>0.006%</td>
<td>0.0-0.3%</td>
</tr>
<tr>
<td>2</td>
<td>34</td>
<td>0.06%</td>
<td>0.3-1.4%</td>
</tr>
<tr>
<td>3</td>
<td>98</td>
<td>0.6%</td>
<td>1.8-5.4%</td>
</tr>
<tr>
<td>4</td>
<td>184</td>
<td>5.7%</td>
<td>7.8-25.9%</td>
</tr>
<tr>
<td>5</td>
<td>141</td>
<td>38.1%</td>
<td>9.4-57.8%</td>
</tr>
</tbody>
</table>
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%)
Intraoperative cardiac arrest 10:10000
24-hr perioperative cardiac arrest 21:10000

Anesthesia related MR 0.2: 10000

Asian Biomed J, 2008

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

Oranut Kyokong, Somrat Charuluxananan, Thewarung Jerawatganon, Nuchnapang Termsoomthobworw, Fontip Leelaichiewchankul
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 conduct of anesthetics 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, 106 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 2.68-16.41)]. 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 exanguination (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

Somrat Charuluxananan, MD*
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.
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 had 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
Chulalongkorn University

Anesthesiology: Quality & Safety

Prince of Songkla U.

Anesthesia: Quality, Safety and New Concepts Management

Mahidol University
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 Monitoring 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 intulation, equipment malfunction etc.
2010  Model of anesthesia adverse events  
KCMH
2009  Suspected pulmonary embolism
2010  Drug error
       CPG: Color labelling
### What happened?

#### Monitoring… CPG

<table>
<thead>
<tr>
<th></th>
<th>2004</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>NIBP</td>
<td>98.2%</td>
<td>98.7%</td>
</tr>
<tr>
<td>MAP</td>
<td>5.6%</td>
<td>10.6%</td>
</tr>
<tr>
<td>SPO$_2$</td>
<td>97.4%</td>
<td>99.4%</td>
</tr>
<tr>
<td>EKG</td>
<td>64.3%</td>
<td>97.8%</td>
</tr>
<tr>
<td>ETCO$_2$</td>
<td>19.4%</td>
<td>45.7%</td>
</tr>
<tr>
<td>ETGAS</td>
<td>4.0%</td>
<td>11.9%</td>
</tr>
</tbody>
</table>

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

Waraporn Chau-in¹,
Thanoo Hintong², Oraluxna Rodanant³,
Varinee Lekprasert⁴, Yodying Punjasawadwong²,
Somrat Charuluxananan³, Surasak Tanudsintum⁵

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*** Department of Anaesthesiology, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand
**** Department of Anaesthesiology, Faculty of Medicine, Ramathibodi Hospital, Mahidol University, Bangkok, Thailand
***** Department of Anaesthesiology, Faculty of Medicine, Phramongkutkla College of Medicine, Bangkok, Thailand
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)

J med Assoc Thai 2010:93(10)
THAI STUDY PHASE II
RCAT... AIMS

2000 Incident Reports
40-50 Hospitals
Voluntary
Anonymous
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
** Siriraj Hospital, Mahidol University, Bangkok
*** Chulalongkorn University, Bangkok
**** Ramathibodi Hospital, Bangkok
***** Khon Kaen University, Khon Kaen
****** Prince of Songkla University, Songkhla
******* Phramongkutklao College of Medicine, Bangkok

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

Full text e-Journal: http://www.medassocthai.org/journal
**Figure 3**: Model of anesthesia related adverse events

<table>
<thead>
<tr>
<th>Contributing factors</th>
<th>Factors minimizing outcomes</th>
<th>Suggested corrective strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inexperience</td>
<td>Vigilance</td>
<td>Quality assurance</td>
</tr>
<tr>
<td></td>
<td>25%</td>
<td>36%</td>
</tr>
<tr>
<td>Inadequate preoperative</td>
<td>Having experience</td>
<td>Practice guidelines</td>
</tr>
<tr>
<td>evaluation</td>
<td>21%</td>
<td>34%</td>
</tr>
<tr>
<td>Emergency</td>
<td>Experienced assistant</td>
<td>Improvement of supervision</td>
</tr>
<tr>
<td></td>
<td>21%</td>
<td>30%</td>
</tr>
<tr>
<td>Inappropriate decision</td>
<td>Effective communication</td>
<td>Training</td>
</tr>
<tr>
<td></td>
<td>20%</td>
<td>22%</td>
</tr>
<tr>
<td>Haste</td>
<td>Effective supervision</td>
<td>Effective communication</td>
</tr>
<tr>
<td></td>
<td>16%</td>
<td>8%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>More manpower</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8%</td>
</tr>
</tbody>
</table>
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%
<table>
<thead>
<tr>
<th>Year</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>Thai AIMS publication</td>
</tr>
<tr>
<td>2008</td>
<td>Cardiac arrest after spinal anesthesia</td>
</tr>
<tr>
<td></td>
<td>CPG: Spinal anesthesia (Thai Study)</td>
</tr>
<tr>
<td>2009</td>
<td>Endobronchial intubation, equipment malfunction etc.</td>
</tr>
<tr>
<td>2010</td>
<td>Model of anesthesia adverse events KMCH</td>
</tr>
<tr>
<td>2011</td>
<td>Suspected pulmonary embolism</td>
</tr>
<tr>
<td>2012</td>
<td>Drug error</td>
</tr>
<tr>
<td></td>
<td>CPG: Color labelling</td>
</tr>
</tbody>
</table>
Diagnosis of incident..CU hospital

Fig. 1 Detection of incidents by clinical diagnosis and monitoring (n=191 incidents)
Model: Anesthesia Related Complication

Contributing factors

Factors minimizing outcomes

Suggested corrective strategy
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
- Name marked (not applicable)
- Pulse check on patient and functioning
- Does patient have:
  - Known allergy
  - Difficult airway (e.g., Mallampati 3 or 4)
  - NO = YES, and assistance available
- Risk of >1000 C fluid loss (for colon surgery)
  - 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 count
  - Specimen labelling (including patient name)
  - Important intra-operative events/recovery plan

SIGNATURE

DATE
### Surgical Safety Checklist

<table>
<thead>
<tr>
<th>Sign in</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient identification</td>
<td>84 %</td>
</tr>
<tr>
<td>Mark site</td>
<td>41 %</td>
</tr>
<tr>
<td>Evaluation for difficult airway</td>
<td>73 %</td>
</tr>
<tr>
<td>Anticipate for pulmonary aspiration</td>
<td>64 %</td>
</tr>
<tr>
<td>Anticipate blood loss ( &gt; 500 cc)</td>
<td>56 %</td>
</tr>
<tr>
<td>Ask for drug allergy</td>
<td>81 %</td>
</tr>
<tr>
<td>Preanesthetic pulse oximeter</td>
<td>94 %</td>
</tr>
<tr>
<td>Complete anesthesia checklists</td>
<td>96 %</td>
</tr>
</tbody>
</table>
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