The Thai Anesthesia Incident Monitoring Study (Thai AIMS) of Endobronchial Intubation: An Analysis of 1996 Incident Reports

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Objective: *To analyze the clinical course, outcomes, contributing factor, corrective and preventive strategies of accidental endobroncheal intubation (EBI) in the Thai Anesthesia Incident Monitoring Study (Thai AIMS).*
Material and Method: *This was a prospective descriptive multicenter study of anesthesia-related adverse incidents from 51 hospitals across Thailand from January to June 2007. Possible accidental EBI data were extracted and analyzed using descriptive statistics by 3 reviewers.*
Results: *Thirty-two cases (1.6%) of EBI were reported from a total of 1,996 Thai AIMS incidents. EBI occurred more often in females (71.9%). Most of the incidents happened in the operating theater (93.8%) and the most common surgical specialties were general and gynecological surgery (20.6% each). Two cases had hypoxemia and 1 case required respiratory supported postoperatively. Most incidents (65.6%) were first recognized via monitoring equipment which was detected by pulse oximeter (71.4%) and airway pressure measurement (4.8%). Ninety six percent of cases were considered preventable. Anesthetic factors and system factors were found to involve in 62.5% and 11.8% of incidents respectively. The major contributing factors were inexperience of the performers (84.4%), lack of knowledge (40.6%), haste (21.9%) and communication failure (9.4%). The incident would be minimized by having prior experience of incident, high awareness and experienced assistants available. Three main strategies to prevent the incident included additional training, improvement supervision and established guideline practice.*
Conclusion: *Accidental endobronchial intubation was reported as 1.6% of anesthetic adverse event in Thai AIMS. Majority of the incidents were contributed by anesthesia and system factors. High awareness, experience of performers and additional training would decrease the incidents and improve anesthetic outcome.*

Keywords: *Anesthesia, Complication, Endobronchial intubation, Incident report, Patient safety*

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A major adverse event related to endotracheal intubation is accidental endobronchial intubation (EBI), which is the most common incident (42%) related to tracheal tube problems[1]. The incident of desaturation from EBI is 13-17% which is the major cause of desaturation during maintenance of anesthesia[2,3]. If unrecognized, EBI can lead to oxygen desaturation from collapse of the contralateral lung and risk of tension pneumothorax from hyperinflation of intubated lung[4].

Although withdrawal endotracheal tube position is a simple procedure to correct the EBI event, the methods to detect EBI may be delayed, unreliable,

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nonspecific and require additional equipments. The conventional chest auscultation is the most common method for assessing endotracheal tube position, this method is operator-dependent and limited reliability especially in patients with underlying lung diseases[5]. EBI could be detected by conventional breath sound examination in only 2 from 8 events[6]. The standard monitors such as pulse oximeter and end-tidal capnogram may not change and not specific to EBI[7,8]. Most of the etiology of EBI events are preventable. Recognition of the contributing factors and prompt awareness are important to minimize the EBI incident.

The purpose of the present study was to determine the frequency distribution, clinical courses, outcomes, contributing factors and corrective strategies of accidental endobronchial intubation from the 1996 incidents reported to the Thai Anesthesia Incident Monitoring Study (Thai AIMS).

Material and Method

The present study is a part of Thai AIMS which is a prospective descriptive multi-centered study conducted by the Royal College of Anesthesiologists of Thailand. The present study was conducted in 51 hospitals across Thailand ranging from primary to tertiary hospitals. After being approved by each institutional ethical committee, all the participants were asked to fill out an incident reporting form of adverse events occurred during 24 hours of anesthesia and operation on voluntary and anonymous basis. The details of Thai AIMS methodology and results have been described[9,10].

The definition of endobronchial intubation was defined as unintentional insertion of endotracheal tube that the tip of the tube was placed far beyond carina to the right or left main bronchus. Detection of EBI would be clinical (chest auscultation) or other devices (such as fiberoptic bronchoscopy). The possible EBI records were extracted from 1996 patients and were discussed and analyzed by three reviewers for the diagnostic methods, contributing factors, clinical courses, factors minimizing incident and suggested corrective strategies.

The data was analyzed by Descriptive statistics using SPSS for Windows, version 12.

Results

There were 32 cases of accidental endobronchial intubation fitting the diagnostic definition from a total 1996 records data of Thai AIMS (1.6%). EBI occurred in 23 female (71.9%) and 9 male (28.1%) patients (Table 1). The highest incidence (56.3%) of EBI was found in the 20-54 year old age group. Twenty six cases (81.3%) of EBI patients were classified as ASA physical status 1 and 2. EBI were found more frequently in elective surgery (22 incidents or 68.8%) than emergency surgery. General surgery and gynecological surgery had the highest EBI incidents (20.6%, 20.6% respectively) compared to other surgical specialties.

Most of the EBI cases were detected during anesthesia (93.8%). There were 2 cases that EBI occurred in the post anesthesia care unit both of which were pediatric patients that had undergone plastic surgical operations. Table 2 shows the immediate and long term outcomes after the incident happened. One pediatric patient (3.1%) was unintentionally admitted in the intensive care unit (unplanned ICU admission)

Table 1. Characteristic of patients and types of surgery (n = 32)

Characteristics	Number of incidents
Gender:	
Male	9 (28.1%)
Female	23 (71.9%)
Age range (years):	
< 5	4 (12.5%)
5-9	1 (3.1%)
10-19	4 (12.5%)
20-54	18 (56.3%)
55-65	5 (15.6%)
ASA physical status:	
ASA 1	11 (34.4%)
ASA 2	15 (46.9%)
ASA 3	4 (12.5%)
ASA 4	2 (6.3%)
Emergency state:	
Elective surgery	22 (68.8%)
Emergency surgery	10 (31.3%)
Type of surgery:	
General surgery	7 (20.6%)
Gynecological surgery	7 (20.6%)
Plastic surgery	4 (11.8%)
Obstetrical surgery	3 (8.8%)
Orthopedic suregery	3 (8.8%)
Otolaryngological surgery	3 (8.8%)
Neurosurgical surgery	2 (5.9%)
Endoscopic procedure	1 (2.9%)
Urological surgery	1 (2.9%)
Others	3 (8.8%)
Place of incidents happened	
In operating room	30 (93.8%)
Recovery room	2 (6.3%)

due to aspiration pnumonitis and was discharged from the ICU on the next 2 days. Two patients (6.2%) had major physiological change on respiratory system (hypoxemia) postoperatively. The first patient was a one-year old pediatric patient who underwent palatoplasty and had postoperative hypoxemia from pulmonary aspiration. The other patient was a 2-year old child who presented with respiratory distress syndrome (secondary from corrosive esophagitis) undergone revised tracheostomy tube. This patient died after 24 hours in the ICU after operation from multiple organ failure. The long-term adverse outcomes from prolonged ventilator support were found only in one patient that had pulmonary aspiration as mentioned. None of all 32 EBI patients had other long term adverse outcomes (such as prolonged hospital stay, psychic trauma, disability, vegetative stage and death).

Among all 32 EBI incidents, only 11 incidents (34.4%) could be detected by clinical evaluation (chest auscultation).21 EBI incidents (65.6%) were detected by monitoring equipment. Pulse oximeter was the major clinical monitor equipment that detected EBI (71.4%). Other monitor equipment were airway pressure measurement and chest radiography (Table 3).

Almost all of EBI incidents (31 cases) were concluded to be preventable and resulted from human error. The major cause of human error was knowledge-based error (20 cases or 62.5%) followed by skill-based error (7 cases or 20.6%) and rule-based error (6 cases or 18.8%) respectively. Table 4 shows the factors that were related to EBI events of which 62.5% of all incidents related to anesthesia factors. Experience of anesthesia personnel was the major cause of anesthesia factors. For patient factors, the EBI related to the infant's age group and morbid obesity patients. For surgical factors, EBI related to airway surgery, laparoscopic surgery and Trendelenburg position. The system factors related to EBI lacked communication and confirmed endotracheal tubes position while transferring patients to the operating room. There were 2 EBI incidents which were intubated in the recovery room by non-anesthesia personnel (under-supervision of anesthesia staff in the recovery room).

Table 2. Major outcomes after incidents (n = 34)

Outcomes	Number of incidents
Immediate outcome (within 24 hours)	
Unplanned ICU admission	1 (2.9%)
Major physiological changes - hypoxia	2 (5.8%)
Death	1 (2.9%)
Long term outcome	
Prolong ventilatory support	1 (2.9%)

Table 3. Detection methods of incidents (n = 32)

Detection method	Number of incidents
Clinical detection before monitors	11 (34.4%)
Clinical detection after monitors	21 (65.6%)
Monitors detection of incidents (21 cases)	
Oxygen saturation	15 (71.4%)
Airway pressure	1 (4.8%)
Oxygen saturation plus airway pressure	4 (19%)
Oxygen saturation plus chest radiography	1 (4.8%)

Table 4. Factors related to accidental endobronchial intubation (n = 32)*

Related factor	Number of incidents
Anesthesia factor only	20 (62.5%)
Surgical factor only	0
Patient factor only	1 (3.1%)
System factor only	4 (11.8%)
Combined anesthesia and system	2 (6.3%)
Combined anesthesia and surgical	3 (9.4%)
Combined anesthesia and patient	1 (3.1%)
Combined system and patient	1 (3.1%)
Anesthesia factor (26 cases)	
Inexperience personnel	20 (62.5%)
Lack of knowledge	4 (11.8%)
Urgency	1 (2.9%)
Endotracheal tube migration during anesthesia	1 (2.9%)
Surgical factor (3 cases)	
Tracheal operation	1 (2.9%)
Trendelenburg position	1 (2.9%)
Laparoscopic surgery plus trendelenburg position	1 (2.9%)
Patient factor (2 cases)	
Infant age group	1 (2.9%)
Morbid obesity	1 (2.9%)
System factor (7 cases)	
Not confirm ET tube position from ICU to OR	3 (8.8%)
Under supervision of anesthesiologists	2 (5.8%)
Lack of personnel	1 (2.9%)
Inadequate equipments check up	1 (2.9%)

* Not mutually exclusive

Inexperience of the performers was the major contributing factors of EBI events (84.4%). Other contributing factors were lack of knowledge, haste, communication failure and emergency situation (Table 5). Having prior experience of EBI and high awareness of EBI events were the highest suggestive strategies to minimize the incidents (Table 6). The major strategies to prevent the EBI incidents were additional training (56.3%), improvement supervision (53.1%) and established practice guidelines (40.6%) as shown in Table 7.

Table 5. Contributory factors that may related to the incidents*

Contributory factors	Number of incidents
Inexperience	27 (84.4%)
Lack of knowledge	13 (40.6%)
Haste	7 (21.9%)
Communication failure	3 (9.4%)
Emergency situation	2 (6.3%)
Poor preoperative preparation	2 (6.3%)
Long working hour	1 (3.1%)
Inadequate staff	1 (3.1%)
Inadequate equipments	1 (3.1%)

* Not mutually exclusive

Table 6. Suggested factors for minimizing the incidents* (n = 32)

Factor minimizing incidents	Numbers
Prior experience	27 (84.4%)
High awareness	21 (65.6%)
Experienced assistant	11 (34.4%)
Comply to guidelines	2 (6.3%)
Training system improvement	1 (3.1%)
Adequate instruments	1 (3.1%)

* Not mutually exclusive

Table 7. Suggested corrective strategies for prevention incidents* (n = 32)

Suggested corrective strategies	Numbers
Additional training	18 (56.3%)
Improvement of supervision	17 (53.1%)
Guideline practice	13 (40.6%)
Quality assurance activity	6 (18.8%)
Communication improvement	3 (9.4%)
More manpower	1 (3.1%)
More equipments	1 (3.1%)

* Not mutually exclusive

Discussion

Patient safety has received increased attention in recent years. Accidental EBI is a major cause of oxygen desaturation during anesthesia[2]. The incidence of EBI were varied among many studies. There was a higher incidence of EBI in emergency and intensive care unit than during anesthesia. Dronen et al reported 28% of EBI incidence among 64 cardiac arrest patients who were intubated by ACLS-certified physicians[11]. Taryle et al found that 6 of 13 patients who underwent endotracheal intubation in the emergency room were actually intubated endobronchially[12]. The incidence of EBI in the intensive care unit has been reported as 2.4%[13] and 5%[14]. During anesthesia, McCoy reported 3.7% EBI incidence in an Australian incident monitoring study[15]. From the present study, the authors found 1.6% EBI incidents from overall 1,996 Thai AIMS incidents which was lower than McCoy's study. This may be due to under-estimation from misdiagnosis or unrecognized the incidents of the present study.

The authors found that women had a higher incidence of EBI than men (71.9% versus 28.1%) which was compatible with the study by Brunel[14] and Schwartz et al[16]. Kim et al[17] explained the higher risk of accidental EBI in women may be from the shorter tracheal length in women than men, because the distance between the distal end of the adult endotracheal tube to the proximal end of endotracheal tube cuff is about 6 cm. Then the large proportion of female patients whose trachea is shorter than 12 cm should have a small margin of safety of optimal tracheal tube position. The authors also found major incidents of EBI occurred in general surgery and gynecological surgery (14 incidents, 41.2%). Four cases of general and gynecological were associated with the use of laparoscopy and abdominal carbon dioxide insufflation. The laparoscopic surgery has a significant association with endobronchial intubation during maintenance of anesthesia from cephalad movement of the carina[18]. Kim et al found tracheal length shortening by 0.42 ± 0.19 cm in laparoscopic gynecological surgery with the Trendelenburg position[17]. Therefore, anesthesia providers should pay more attention to prevent accidental EBI during laparoscopic surgery.

In the present study, the authors found that 65.6% of EBI incidents could be detected from monitors before clinical detection (chest auscultation). Clinical detection by chest auscultation of bronchial migration of endotracheal tube could be missed. Brunel et al found that 60% of mainstem intubation occurred despite the presence of equal breath sound on examination[14]. This may come from transmission of breath sound to the contralateral side of lung[19]. Sugiyama et al found that unilateral breath sound change was not observed until the endotracheal tube tip was advanced beyond the carina and inserted 2 ± 0.4 cm into the right main bronchus when the Murphy tube was used[20]. For the monitoring equipment, 71.4% EBI could be detected from the pulse oximeter. This is comparable to the study of McCoy that reported 65.5% of EBI events detected via desaturation alone[15]. However, oxygen desaturation is not specific to EBI and may be caused by other incidents such as airway obstruction, hypoventilation, aspiration, atelectasis and pulmonary edema[3]. Prompt awareness, realizing the causes of desaturation and immediate treatments are the major keys for patient safety and prevention of serious morbidity.

The high peak airway pressure is also another manifestation of endobronchial intubation but may also be caused by several other complications such as obstructed airway, bronchospasm and stiff chest wall. Peak airway pressure may not be changed during endobronchial intubation[6]. Chest x-ray is a very accurate and reliable method for detect the EBI event[14] but not practical during anesthesia. There are many novel methods developed to detect correct endotracheal tube placement such as acoustic reflextometry[21], electronic stethoscope[22], lung compliance and resistance model[23], fiberoptic bronchoscopy, Rapiscope[6]. Anyway these equipments would add more cost, not widely available and need more skill to operate. In the present study the authors found that both clinical signs and information of standard monitors are adequate for detection of nearly all EBI events if there is high alert on EBI event during anesthesia.

The main involving factors contributed to EBI in the present study were anesthesia related for 26 of a total of 32 cases or 81.6% which was comparable to the study of McCoy et al[15]. Inexperience of the performers and lack of knowledge were the major causes of anesthesia-related factors. All of the anesthesia factors were related to human error and supposed to be preventable. System factor was the second most common involving factor of EBI (21%). Lack of communication and confirmation of endotracheal tube depth while transferring from the patient's ward to the operating room were noted as the cause of EBI in 3 incidents. There were 2 cases of EBI performed by an internist in the recovery room without supervision of anesthesia staff. In summary, the present study showed that the major contributing factors were inexperience of the performers, lack of knowledge about EBI risk, haste and communication failure. Therefore, all anesthesia providers should be fully aware of the potential risk of EBI during anesthesia care.

The major factors to minimize the incidents in the present study were prior experience (84.4%), high awareness of incident (65.6%) and presence of an experienced assistant (34.4%). Many studies have been designed to prevent the EBI incident such as estimate the airway length and formula for predicting proper length of orotracheal intubation[24-27]. McCoy et al suggested tracheal tube marking at 28-32 mm above the upper edge of the cuff in both 5 vertical and 5 horizontal lines[15] and found that this marking of tubes would prevent the EBI incidents in 46.6%. Chong et al[28] suggested the tracheal tube manufacturers to reduce the risk of EBI by 1) tracheal tubes cuff should be colored for easy identification 2) marking on proximal edge of the cuff 3) marking on 2 and 4 cm from proximal end of the cuff 4) shorten the tracheal cuff and 5) shorten post cuff distance while still including the "Murphy eye". From the present study there was not any single method that could prevent the EBI incident. The authors found that additional training, improved supervision and following guideline-practices were the most frequent recommendations for prevention of EBI. Quality assurance activity and improved communication between colleagues would also improve anesthesia care and reduce adverse anesthetic incidents.

Conclusion

The present study was the prospective incident reports study of accidental endobronchial intubation in anesthesia service in multicenter representation. The incidence of EBI was 1.6% from the total of 1,996 incidents of Thai AIMS. The complication was detected in most cases by pulse oximeter, high peak airway pressure and chest auscultation. Mostly the incidents were contributed by anesthesia and system factors. High awareness, experience of anesthetic personnel and additional training would help minimize the EBI incidents and improve anesthetic care.

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References

1. Szekely SM, Webb RK, Williamson JA, Russell WJ. The Australian Incident Monitoring Study. Problems related to the endotracheal tube: an analysis of 2000 incident reports. Anaesth Intensive Care 1993; 21: 611-6.
2. Szekely SM, Runciman WB, Webb RK, Ludbrook GL. Crisis management during anaesthesia: desaturation. Qual Saf Health Care 2005; 14: e6.
3. Raksakietisak M, Chinachoti T, Vudhikamraksa S, Svastdi-Xuto O, Surachetpong S. Perioperative desaturation: incidence, causes, management and outcome. J Med Assoc Thai 2002; 85 (Suppl 3): S980-6.
4. Owen RL, Cheney FW. Endobronchial intubation: a preventable complication. Anesthesiology 1987; 67: 255-7.
5. Mansy HA, O'Connor CJ, Balk RA, Sandler RH. Breath sound changes associated with malpositioned endotracheal tubes. Med Biol Eng Comput 2005; 43: 206-11.
6. Ezri T, Khazin V, Szmuk P, Medalion B, Shechter P, Priel I, et al. Use of the Rapiscope vs chest auscultation for detection of accidental bronchial intubation in non-obese patients undergoing laparoscopic cholecystectomy. J Clin Anesth 2006; 18: 118-23.
7. Barker SJ, Tremper KK, Hyatt J, Heitzmann H. Comparison of three oxygen monitors in detecting endobronchial intubation. J Clin Monit 1988; 4: 240-3.
8. Gandhi SK, Munshi CA, Kampine JP. Early warning sign of an accidental endobronchial intubation: a sudden drop or sudden rise in PACO2? Anesthesiology 1986; 65: 114-5.
9. Punjasawadwong Y, Suraseranivongse S, Charuluxananan S, Jantorn P, Thienthong S, Chanchayanon T, et al. Multicentered study of model of anesthesia related adverse events in Thailand by incident report (the Thai Anesthesia Incident Monitoring Study): methodology. J Med Assoc Thai 2007; 90: 2529-37.
10. Charuluxananan S, Suraseranivongse S, Jantorn P, Sriraj W, Chanchayanon T, Tanudsintum S, Kusumaphanyo C, et al. Multicentered study of model of anesthesia related adverse events in Thailand by incident report (The Thai Anesthesia Incidents Monitoring Study): Results. J Med Assoc Thai 2008; 91: 1011-9.
11. Dronen S, Chadwick O, Nowak R. Endotracheal tip position in the arrested patient. Ann Emerg Med 1982; 11: 116-7.
12. Taryle DA, Chandler JE, Good JT, Jr, Potts DE, Sahn SA. Emergency room intubations - complications and survival. Chest 1979; 75: 541-3.
13. Rivera R, Tibballs J. Complications of endotracheal intubation and mechanical ventilation in infants and children. Crit Care Med 1992; 20: 193-9.
14. Brunel W, Coleman DL, Schwartz DE, Peper E, Cohen NH. Assessment of routine chest roentgenograms and the physical examination to confirm endotracheal tube position. Chest 1989; 96: 1043-5.
15. McCoy EP, Russell WJ, Webb RK. Accidental bronchial intubation. An analysis of AIMS incident reports from 1988 to 1994 inclusive. Anaesthesia 1997; 52: 24-31.
16. Schwartz DE, Lieberman JA, Cohen NH. Women are at greater risk than men for malpositioning of the endotracheal tube after emergent intubation. Crit Care Med 1994; 22: 1127-31.
17. Kim JH, Hong DM, Oh AY, Han SH. Tracheal shortening during laparoscopic gynecologic surgery. Acta Anaesthesiol Scand 2007; 51: 235-8.
18. Morimura N, Inoue K, Miwa T. Chest roentgenogram demonstrates cephalad movement of the carina during laparoscopic cholecystectomy. Anesthesiology 1994; 81: 1301-2.
19. Pollard BJ, Junius F. Accidental intubation of the oesophagus. Anaesth Intensive Care 1980; 8: 183-6.
20. Sugiyama K, Yokoyama K, Satoh K, Nishihara M, Yoshitomi T. Does the Murphy eye reduce the reliability of chest auscultation in detecting endobronchial intubation? Anesth Analg 1999; 88: 1380-3.
21. Raphael DT. Acoustic reflectometry profiles of

endotracheal and esophageal intubation. Anesthesiology 2000; 92: 1293-9.
22. O'Connor CJ, Mansy H, Balk RA, Tuman KJ, Sandler RH. Identification of endotracheal tube malpositions using computerized analysis of breath sounds via electronic stethoscopes. Anesth Analg 2005; 101: 735-9.
23. Visaria RK, Westenskow DR. Model-based detection of endobronchial intubation. Anesth Analg 2006; 103: 888-93.
24. Lau N, Playfor SD, Rashid A, Dhanarass M. New formulae for predicting tracheal tube length. Paediatr Anaesth 2006; 16: 1238-43.
25. Techanivate A, Kumwilaisak K, Samranrean S. Estimation of the proper length of orotracheal intubation by Chula formula. J Med Assoc Thai 2005; 88: 1838-46.
26. Techanivate A, Rodanant O, Charoenraj P, Kumwilaisak K. Depth of endotracheal tubes in Thai adult patients. J Med Assoc Thai 2005; 88: 775-81.
27. Cherng CH, Wong CS, Hsu CH, Ho ST. Airway length in adults: estimation of the optimal endotracheal tube length for orotracheal intubation. J Clin Anesth 2002; 14: 271-4.
28. Chong DY, Greenland KB, Tan ST, Irwin MG, Hung CT. The clinical implication of the vocal cords-carina distance in anaesthetized Chinese adults during orotracheal intubation. Br J Anaesth 2006; 97: 489-95.

การศึกษาการเกิดภาวะใส่ท่อช่วยหายใจเข้าหลอดลมลึกเกินโดยไม่ได้ตั้งใจ ขณะระงับความรู้สึกในประเทศไทย โดยการรายงานอุบัติการณ์

ไกรฤกษ์ สินธวานุรักษ์, อรลักษณ์ รอดอนันต์, อินทิพร โฆษิตานุฤทธิ์, ภูพิงค์ เอกะวิภาต, อักษร พูลนิติพร, วิมลรัตน์ ศรีราช

วัตถุประสงค์: *การศึกษานี้เป็นส่วนหนึ่งของการศึกษาแบบสหสถาบัน ของแบบจำลองการเกิดภาวะแทรกซ้อนทางวิสัญญี ในประเทศไทยโดยการรายงานอุบัติการณ์ (The Thai Anesthesia Incident Monitoring Study: Thai AIMS) โดยเป็นการรายงานและวิเคราะห์ปัญหา ภาวะแทรกซ้อนจากการใส่ท่อช่วยหายใจเข้าหลอดลมลึกเกินไปโดยไม่ได้ตั้งใจ เพื่อหาอุบัติการณ์ ผลที่เกิด ปัจจัยเสี่ยง ปัจจัยแก้ไข และการป้องกันเชิงระบบ*

วัสดุและวิธีการ: *เป็นการศึกษาแบบพรรณนา เก็บข้อมูลแบบไปข้างหน้าโดยใช้แบบสอบถามสำรวจอุบัติการณ์การเกิดภาวะแทรกซ้อน ในขณะระงับความรู้สึก จนถึงหลังการผ่าตัด 24 ชั่วโมง ในโรงพยาบาล 51 แห่งทั่วประเทศไทย ในช่วงระหว่างเดือนมกราคม ถึง เดือนมิถุนายน พ.ศ. 2550 และนำรายงานอุบัติการณ์การเกิดภาวะใส่ท่อช่วยหายใจเข้าหลอดลมลึกเกินไป มาวิเคราะห์หาสาเหตุ ปัจจัยที่เกี่ยวข้องและวิธีการป้องกัน โดยผู้เชี่ยวชาญ 3 คน*

ผลการศึกษา: *พบอุบัติการณ์ใส่ท่อช่วยหายใจเข้าหลอดลมลึกเกิน โดยไม่ได้ตั้งใจจำนวน 32 อุบัติการณ์ คิดเป็นร้อยละ 1.6 ของอุบัติการณ์ทั้งหมด ภาวะนี้พบได้บ่อยในผู้ป่วยเพศหญิง (ร้อยละ 71.9) และอุบัติการณ์เกือบทั้งหมดเกิดในห้องผ่าตัด (ร้อยละ 93.8) ชนิดของการผ่าตัดที่เกิดอุบัติการณ์นี้บ่อย คือการผ่าตัดศัลยกรรมทั่วไป และการผ่าตัดทางนรีเวชกรรม มีผู้ป่วยที่เกิดภาวะออกซิเจนในเลือดต่ำในช่วง 24 ชั่วโมงหลังผ่าตัดจำนวน 2 ราย และมีหนึ่งรายที่ต้องใช้เครื่องช่วยหายใจหลังผ่าตัด ร้อยละ 65.6 ของอุบัติการณ์สามารถตรวจพบได้ โดยการใช้เครื่องมือโดยมีค่าความอิ่มตัวของออกซิเจนในเลือดต่ำกว่าปกติ และค่าความดันบวกในทางเดินหายใจ มีค่าสูงกว่าปกติ ร้อยละ 96 ของอุบัติการณ์เกิดจากปัจจัยที่สามารถป้องกันได้ โดยส่วนใหญ่ (ร้อยละ 62.5) เป็นปัจจัยที่เกี่ยวข้องกับวิสัญญี และร้อยละ 11.8 เป็นปัจจัยเชิงระบบ ปัจจัยนำที่ทำให้เกิดอุบัติการณ์เกิดจากหลายปัจจัยร่วมกัน โดยเกิดจากการขาดประสบการณ์ของผู้ปฏิบัติงาน (ร้อยละ 84.4) การขาดความรู้ (ร้อยละ 40.6) ความรีบร้อน (ร้อยละ 21.9) และการขาดการสื่อสารที่ดี (ร้อยละ 9.4) และปัจจัยที่สามารถลดอุบัติการณ์นี้ได้ ได้แก่ การมีประสบการณ์ในเรื่องนั้นมาก่อน การเฝ้าระวังการเกิดอุบัติการณ์ และการมีผู้ช่วยที่มีประสบการณ์ วิธีการป้องกันการเกิดอุบัติการณ์ ได้แก่ การเพิ่มการฝึกอบรมการปรับปรุงระบบการให้คำปรึกษา และการจัดทำและปฏิบัติตามแนวทางคู่มือการปฏิบัติงาน*

สรุป: *พบอุบัติการณ์การเกิดภาวะใส่ท่อช่วยหายใจเข้าหลอดลมลึกเกินไปโดยไม่ได้ตั้งใจ ร้อยละ 1.6 ของอุบัติการณ์ทั้งหมด ปัจจัยทางวิสัญญีและปัจจัยเชิงระบบเป็นสาเหตุนำให้เกิดอุบัติการณ์ การเฝ้าระวังการเกิดอุบัติการณ์ ประสบการณ์ของผู้ปฏิบัติงานและการฝึกอบรมเพิ่มเติม สามารถช่วยลดอุบัติการณ์การเกิดภาวะแทรกซ้อนนี้ได้ และช่วยเพิ่มคุณภาพการให้บริการทางวิสัญญี*