Incidence and Risk Factors of Unplanned Extubation in Critically Ill Surgical Patients: The Multi-center Thai University-based Surgical Intensive Care Units Study (THAI-SICU Study)

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Objective: *Unplanned extubation (UE) is one of the most troubling events in critically ill patients who require endotracheal intubation and mechanical ventilation. The aims of this study are to determine the incidence and to identify the risk factors associated with UE in critically ill surgical patients.*

Material and Method: *This was a multi-center prospective observational cohort study, which included surgical patients admitted to nine university-based surgical intensive care units (SICUs) in Thailand between April 2011 and January 2013. UE was defined as deliberate extubation by patients (self-extubation) or accidental extubation during procedures or transportation. The incidence of UE was calculated, the adjusted logistic regression model was performed to determine the independent risk factors for UE and the outcomes were compared between those with planned extubation and UE.*

Results: *2,890 patients required endotracheal intubation and mechanical ventilation were included in the analysis. Of these, 54 patients experienced UE and, therefore, the incidence of UE was 1.9%. Five independent risk factors for UE were identified; congestive heart failure (adjusted odds ratio, OR, 3.48; 95% CI, 1.29-9.40), emergency surgery (adjusted OR, 2.18; 95% CI, 1.01-4.74), non-postoperative status (adjusted OR, 2.37; 95% CI, 1.05-5.37), sedation usage (adjusted OR, 3.19; 95% CI, 1.72-5.93) and delirium (adjusted OR, 3.61; 95% CI, 1.71-7.60). ICU length of stay (LOS) was significantly longer in patients with UE than those with planned extubation (adjusted coefficient, 2.76; 95% CI, 1.34-4.19). There was no significant difference between the two groups in terms of hospital LOS as well as ICU and 28-day mortality.*

Conclusion: *The incidence of UE in critically ill surgical patients was 1.9%. Five independent risk factors for UE were: underlying congestive heart failure, emergency surgery, non-postoperative status, sedation usage, and delirium. Patients with UE had significantly longer ICU LOS than those with planned extubation.*

Keywords: *Critical care, Incidence, Risk factors, Surgical patients, Unplanned extubation*

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Among critically ill patients who are admitted to intensive care units (ICUs), approximately one half to two-thirds of them require endotracheal intubation and mechanical ventilation either as a life-saving intervention in those with respiratory failure or as an organ support in those with hemodynamic instability or decreased levels of consciousness[1,2]. Nevertheless, there are well-recognized adverse events related to this intervention including ventilator-associated pneumonia[3] and ventilator-associated lung injury[4]. Besides these, unplanned extubation (UE), which occurred either accidentally during nursing care or deliberately by patient's own self, is one of the most concerned events. UE may lead to serious adverse events such as airway trauma as well as compromised hemodynamics and respiration[5]. Moreover, UE has been reported to associate with increased risk of nosocomial pneumonia[6], prolonged duration of mechanical ventilation[6,7] as well as prolonged length of stay (LOS) both in ICU[6-9] and in hospital[6,7]. The incidence of this event reported in literatures varies from 1.8 to 15%[6-13]. Some predisposing factors are proposed as potential risk factors for UE including male

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gender[9], comorbidity[8-10], severity of illness[8,14], levels of consciousness[10,11], administration of sedative medication[11], and physical restraints[8,10]. However, these factors are usually reported in the vast majority of mixed medical and surgical patient population. There is fairly limited data in some patient subgroups, particularly in critically ill surgical patients.

Recently, the methodology and ICU characteristics of the large, national, multi-center prospective observational cohort including 4,654 adult patients admitted to nine university-based surgical ICUs (SICUs) in Thailand has been published[15]. The study had the primary aim to investigate the incidences of adverse events and the outcomes in critically ill surgical patients. Therefore, the aims of this present study are to determine the incidence of UE and to identify the predisposing factors attributed to this event in this patient population.

Material and Method

The THAI-SICU study was a multi-center prospective observational cohort study included surgical patients of nine-university-based SICU in Thailand[15]. The study's duration was between April 2011 and January 2013. The recruitment process began after the approval from the Thailand Joint Research Ethics Committees (No. 001/2011) or by the ethics committee or institutional review board of each individual institution prior to data collection. All patients or relatives provided informed consent before information was gathered. The Trial.gov identification number for this study is NCT01354197.

All adult surgical patients aged >18 years old who were admitted to general SICUs and required endotracheal intubation and mechanical ventilation during the study period were recruited. The investigators excluded moribund patients, those who required an ICU stay of <6 hours, medical patients, cardiac, neurosurgical patients, and foreign nationals. Collected data were divided into three categories; "on admission", "daily recording data", and "at discharge". All the patients who were included in the study were followed-up until their discharge from the ICU. If any patients were admitted in the ICU for longer than 28 days, they were followed-up until 28 days from ICU admission. The study was primarily designed to identify the incidence of UE in critically ill surgical patients. The primary outcome was the incidence of UE at any time during ICU admission. Secondary outcomes were the independent risk factors associated with UE and clinical outcomes including ICU and 28-day mortality, ICU and hospital LOS. UE was defined as deliberate extubation by patients (self-extubation) or accidental extubation during procedures or transportation. The detail of UE including time of the event, modes of ventilator during the event, medication usage, the requirement of re-intubation and complications were described.

The demographic information included age, gender, comorbidity, chest x-ray findings, smoking status, surgical status, American Society of Anesthesiologists (ASA) physical status, sites of surgery, severity of diseases, medications received in ICU, presence or absence of delirium and day of extubation (ICU admission as an index day). The surgical status referred to the status at ICU admission. The term "elective" and "emergency" referred to surgical patients who were initially admitted to ICU after elective and emergency surgery, respectively. The term "non-postoperative" referred to critically ill patients with history of surgery who developed any condition that required ICU admission. The Acute Physiology and Chronic Health Evaluation II (APACHE II) score and the Sequential Organ Failure Assessment (SOFA) score on admission were used to determine the severity of diseases. Delirium was diagnosed using the Intensive Care Delirium Screening Checklists (ICDSC) as described in the previous study[16].

Statistical analysis

The descriptive parameters were presented as number and percentage for categorical data. Mean and standard deviation (SD) or median and interquartile range (IQR) were used for continuous variables according to their distribution. To test the difference between two groups in the univariable analysis, unpaired t-test, Mann-Whitney U test, Chi-square test, and Fisher exact probability test were used as appropriate. To determine which characteristics were independently associated with UE, all of the covariates that were statistically significant at p-values of ≤ 0.2 in the unadjusted analyses were entered simultaneously into the adjusted logistic regression model. The adjusted odds ratios (OR) of variables associated with UE were reported along with their 95% confidence intervals (CI). To determine the difference in the outcomes between two groups, the adjusted logistic regression model was also performed and the results were reported as the adjusted OR with 95% CI for both ICU and 28-day mortality and the adjusted coefficient (Coef.) with 95% CI for both ICU and hospital LOS. Statistically

significant differences were defined as *p*-value <0.05. The statistical analyses were analyzed using STATA, version 11.0 (STATA INC., College Station, TX).

Results

A total of 6,548 patients were admitted to nine SICUs during the study period and 1,896 of these were excluded as described in the previous publication[15]. As a result, 4,652 patients were enrolled in this study. Of these, 2,890 (62.1%) patients were intubated and mechanically ventilated and 54 (1.9%) of them experienced UE during ICU stay (Fig. 1). Consequently, the incidence of UE in this cohort was 1.9%.

Demographic data compared between patients with planned extubation and UE were presented in Table 1. When compared with patients with planned extubation, patients with UE had a higher frequency of congestive heart failure as comorbidity (9.3% versus 2.4%, $p = 0.001$) and a higher frequency of undergoing emergency surgery and non-postoperative status (40.7% versus 31.1% and 37.0% versus 24.5%, $p = 0.004$). The SOFA score was also significantly higher in patients with UE (median, 5 [IQR, 2-8] versus median, 3 [IQR, 1-6]; $p = 0.014$). Regarding the medications administered in the SICUs, there were a greater proportion of patients in the UE group receiving sedatives, vasopressors and inotropic agents than those in the planned extubation group. Delirium was found in 20.4% of patients with UE, which was 5-fold higher than that found in patients with planned extubation (4.5%, $p<0.001$). The day of extubation was significantly later in the UE group than that in the planned extubation group (median, day 3 [IQR, 2-6] versus median, day 2 [IQR 1-4], $p = 0.006$). There was no significant difference in terms of age, gender, other comorbidities, chest x-ray finding, smoking status, ASA classification and surgical site between two groups.

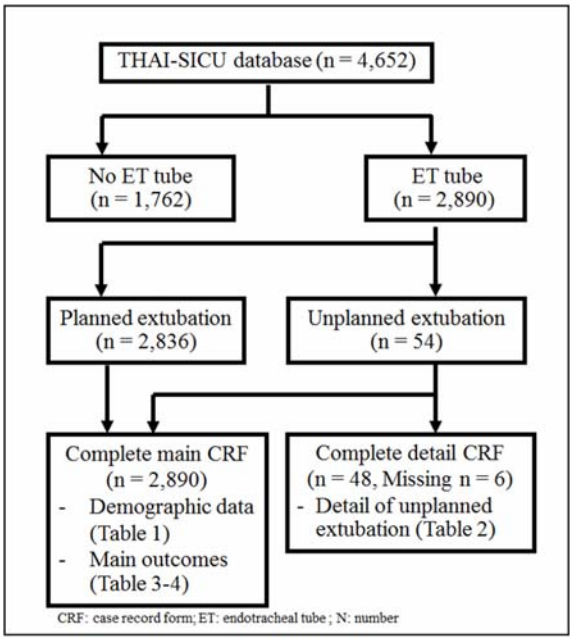

Fig. 1 Study flow and analysis.

Table 2 described the detail of UE. There were six patients who had missing data, leaving 48 patients for detail description. Thirty-five (72.9%) and 13 (27.1%) patients were identified as self-extubation and accidental extubation, respectively. The UE occurred mainly during the restrains (47.9%), followed by during weaning of ventilator (16.7%) and during nursing care (16.7%). The most common mode of ventilator used before UE was the pressure-controlled ventilation (37.5%). Opioids and sedative agents were administered in 47 (97.9%) and 37 (77.1%) patients with UE, respectively. Of these, midazolam was the most common sedative agent used for sedation (59.5%). Re-intubation was required in 33 (68.8%) of patients with UE and almost all re-intubations (32 of 33, 97.0%) were occurred in the first 24 hours. Respiratory distress was accounted for the cause of re-intubation in 19 (57.6%) patients, followed by unstable hemodynamics in 14 (42.4%). Laryngeal complications including obstruction (4.2%), bleeding (4.2%) and nerve injury (2.1%) were reported. Nosocomial pneumonia occurred in 3 (6.3%) patients.

The main outcomes of patients with planned extubation and UE were presented in Table 3. Patients with UE had longer ICU LOS than those with planned extubation (median, 8.5 [IQR, 4-17] days versus median, 2 [IQR, 1-6] days, $p<0.001$). The ICU and 28-day mortality as well as the hospital LOS were not significantly different between two groups. The logistic regression analysis was further performed to determine the independent variables associated with UE and the results were presented in Table 4. Five independent risk factors for UE were identified including congestive heart failure (adjusted OR, 3.48; 95% CI, 1.29-9.40), emergency surgery (adjusted OR, 2.18; 95% CI, 1.01-4.47), non-postoperative status (adjusted OR, 2.37; 95% CI, 1.05-5.37), sedation usage (adjusted OR, 3.19; 95% CI, 1.72-5.93) and delirium (adjusted OR, 3.61; 95% CI, 1.71-7.60). After adjusted by underlying of congestive heart failure, surgical status, the APACHE II score, the SOFA score, vasopressor, inotropic and sedation usage, and delirium, the ICU LOS remained longer in patients

Table 1. Patient characteristics

	Planned extubation (n = 2,836)	Unplanned extubation (n = 54)	*p*-value
Age, year; mean (SD)	60.9 (17.5)	62.4 (17.9)	0.531
Male; n (%)	1,695 (59.8)	34 (63.0)	0.635
Comorbidity; n (%)			
Hypertension	1,239 (43.7)	28 (51.9)	0.231
Coronary artery disease	211 (7.4)	5 (9.3)	0.615
Stroke	152 (5.4)	5 (9.3)	0.210
Vascular disease	145 (5.1)	4 (7.4)	0.450
Congestive heart failure	67 (2.4)	5 (9.3)	0.001
COPD	141 (5.0)	4 (7.4)	0.417
Asthma	47 (1.7)	1 (1.9)	0.912
Diabetic mellitus	600 (21.2)	13 (24.1)	0.603
Chronic renal failure	255 (9.0)	4 (7.4)	0.686
Chest x-ray finding*; n (%)			
Normal	1,919 (70.3)	29 (56.9)	0.112
Bilateral infiltration	426 (15.6)	11 (21.6)	
Localized infiltration	385 (14.1)	11 (21.6)	
Smoking status; n (%)			
None	1,773 (62.5)	31 (57.4)	0.486
Ex-smoker	693 (24.4)	17 (31.5)	
Still smoker	370 (13.0)	6 (11.1)	
Surgical status; n (%)			
Elective postoperative	1,260 (44.4)	12 (22.2)	0.004
Emergency postoperative	882 (31.1)	22 (40.7)	
Non-postoperative	694 (24.5)	20 (37.0)	
ASA classification**; n (%)			
Class I	127 (6.0)	0 (0.0)	0.221
Class II	628 (29.9)	9 (26.5)	
Class III	978 (46.6)	14 (41.2)	
Class IV	317 (15.1)	10 (29.4)	
Class V	47 (2.2)	1 (2.9)	
Class VI	3 (0.1)	0 (0.0)	
Surgical site*; n (%)			
Upper abdomen	894 (31.5)	19 (35.2)	0.566
Lower abdomen	787 (27.8)	15 (27.8)	0.996
Head and neck	195 (6.9)	2 (3.7)	0.360
Extremities	185 (6.5)	3 (5.6)	0.775
Thoracic	165 (5.8)	0 (0.0)	0.068
Spine	83 (2.9)	0 (0.0)	0.202
Peripheral vascular disease	54 (1.9)	1 (1.9)	0.978
Cesarean section	10 (0.4)	0 (0.0)	0.662
Severity of diseases; median (IQR)			
APACHE II	12 (8-18)	14 (9.5-20)	0.054
SOFA	3 (1-6)	5 (2-8)	0.014
Medication received in ICU; n (%)			
Analgesic agents	2,407 (84.9)	47 (87.0)	0.660
Vasopressor agents	982 (34.6)	27 (50.0)	0.019
Sedative agents	915 (32.3)	37 (68.5)	<0.001
Inotropic agents	279 (9.8)	11 (20.4)	0.011
Neuromuscular blocking agents	207 (7.3)	7 (13.0)	0.115
Delirium; n (%)	128 (4.5)	11 (20.4)	<0.001
Day of extubation; median (IQR)	2 (1-4)	3 (2-6)	0.006

* Chest X-ray findings were available in 2,730 and 51 patients with planned and unplanned extubation, respectively.
** ASA classification was available in 2,100 and 34 patients with planned and unplanned extubation groups, respectively.
APACHE II = Acute Physiology and Chronic Health Evaluation II score; ASA = American Society of Anesthesiologists physical status; COPD = chronic obstructive pulmonary disease; ICU = intensive care unit; IQR = interquartile range; SOFA = Sequential Organ Failure Assessment score; SD = standard deviation

Table 2. Detail of unplanned extubation

	n = 48	%
Event		
Self-extubation	35	72.9
Accidental extubation	13	27.1
Event occurrence		
During restraints	23	47.9
During nursing care	8	16.7
During weaning	8	16.7
During procedure	1	2.1
During transport	1	2.1
Not defined	7	14.6
Mode of ventilators		
PCV	18	37.5
PSV	9	18.8
CPAP	6	12.5
SIMV	9	18.8
T-piece	7	14.6
VCV	3	6.3
Bird	2	4.2
Sedation usage	37	77.1
Midazolam	22 of 37	59.5
Propofol	7 of 37	18.9
Diazepam	4 of 37	10.8
Dexmedetomidine	0 of 37	0.0
Other (e.g. haloperidol and quetiapine)	4 of 37	10.8
Opioids	47	97.9
Required re-intubation	33	68.8
Timing of re-intubation		
<24 hours	32 of 33	97.0
24-48 hours	1 of 33	3.0
>48 hours	0 of 33	0.0
Cause of re-intubation		
Respiratory distress	19 of 33	57.6
Unstable hemodynamics	14 of 33	42.4
Laryngeal complications		
Obstruction	2	4.2
Bleeding	2	4.2
Nerve injury	1	2.1
Nosocomial pneumonia occurrence	3	6.3

CPAP = continuous positive airway pressure; PCV = pressure-controlled ventilation; PSV = pressure support ventilation; SIMV = synchronized intermittent mandatory ventilation; VCV = volume-controlled ventilation

who had UE (adjusted Coef., 2.76; 95% CI, 1.34-4.19) (Table 4).

Discussion

The present study demonstrated that the overall incidence of UE in a large cohort of critically ill surgical patients was 1.9%, which was comparable to the incidence reported in related literature that ranged from 1.8 to 15%[6-13]. When focused on surgical patients, Lee et al[12] retrospectively investigated 4,407 immediate postoperative patients who were admitted to a SICU and required mechanical ventilation. They found that the incidence of UE in their cohort was 1.8%, which was similar to this study. However, the information regarding the risk factors for UE was not available in their cohort. In this study, five independent risk factors associated with UE were identified including underlying congestive heart failure, emergency surgery,

Table 3. Main outcomes of unplanned extubation

	Planned extubation (n = 2,836)	Unplanned extubation (n = 54)	*p*-value
ICU mortality; n (%)	415 (14.6)	9 (16.7)	0.6760
28-day mortality; n (%)	559 (19.7)	15 (27.8)	0.1410
ICU LOS, day; median (IQR)	2 (1-6)	8.5 (4-17)	<0.0010
Hospital LOS, day; median (IQR)	16 (10-28)	23 (11-35)	0.0611

ICU = intensive care unit; IQR = interquartile range; LOS = length of stay

Table 4. Multivariable regression analysis of risk factors and outcomes of unplanned extubation

	Adjusted odds ratio	95% confidence interval	*p*-value
Risk factors of unplanned extubation			
Congestive heart failure	3.48	1.29 to 9.40	0.014
Emergency surgery	2.18	1.01 to 4.74	0.048
Non-postoperative status	2.37	1.05 to 5.37	0.038
APACHE II score	0.98	0.94 to 1.03	0.383
SOFA score	1.02	0.93 to 1.12	0.598
Vasopressor usage	0.93	0.48 to 1.81	0.829
Inotropic usage	1.42	0.67 to 3.01	0.360
Sedation usage	3.19	1.72 to 5.93	<0.001
Delirium	3.61	1.71 to 7.60	0.001
Outcomes of unplanned extubation*			
ICU mortality	0.67	0.28 to 1.62	0.374
28-day mortality	1.09	0.53 to 2.24	0.820
ICU LOS	2.76**	1.34 to 4.19	<0.001
Hospital LOS	0.85**	-6.31 to 8.01	0.816

* Adjusted by underlying of congestive heart failure, surgical status, APACHE II score, SOFA score, vasopressor usage, inotropic usage, sedation usage, and delirium

** Values were reported as adjusted coefficient

APACHE II = Acute Physiology and Chronic Health Evaluation II score; ICU = intensive care unit; LOS = length of stay; SOFA = Sequential Organ Failure Assessment score

non-postoperative status, sedation usage, and delirium. Patients with some comorbidities may have an increased risk of UE. Chuang et al[8] found in their case-control study in mixed ICU patients that pleural disorders, coronary artery disease and urinary tract infection were independent risk factors for UE while respiratory infection was independently attenuated the risk. In the present study, underlying congestive heart failure was identified as one of the independent risk factors for UE. Due to limited information, it is unclear why such patients had an increased risk of UE. Another two independent risk factors found in this study were emergency surgery and non-postoperative status. In the cohort of postoperative patients, Lee et al[12] also found that there was a higher proportion of patients with UE undergoing emergency surgery than that of patients without UE (39.5% versus 20.2%, $p<0.001$). One of the possible explanations is that, in patients who seem to be very sick like patients with multiple comorbidities, those undergoing emergency surgery as well as those suffered from postoperative adverse events or complications, physicians may hesitate to extubate such patients even though there are ventilator weaning protocols implemented as evidenced by low adherence rate[17]. As a result, this could put such patients at risk of UE due to delayed early extubation. This hypothesis was supported by the results of a prospective cohort in 190 medical ICU patients by Jarachovic et al[13]. They demonstrated that in patients with ventilator weaning protocol ordered and followed,

the risk of UE was significantly attenuated ($p = 0.02$). In addition, they also showed that only 60% of patients had the protocol ordered by physician but 96% of adherence rate was reported when the protocol was prescribed.

Another independent risk factor found in this study, sedation usage, was similar to that reported in the previous study[11]. Sedation usage per se may not be a direct cause of UE. In the recent quality improvement study in a mixed ICU, Tanios et al[18] compared three sedation strategies for patients who required mechanical ventilation: no sedation, intermittent sedation and continuous sedation with daily interruption. Interestingly, they found that patients in continuous sedation with daily interruption group significantly had the lowest incidence of UE (1.5, 5 and 16 events per 1,000 days of mechanical ventilation in continuous sedation with daily interruption, intermittent sedation and no sedation, respectively, $p<0.05$). Generally, sedative medication is usually prescribed for mechanically ventilated patients for reducing anxiety and agitation. However, inappropriate use of sedatives, especially benzodiazepines, may cause paradoxical agitation and subsequently increased risk of UE[19]. In this study, approximately 60% of patients with UE received midazolam for sedation. Instead of sedation usage, levels of consciousness may be a potential risk factor for UE. Patients with increased levels of consciousness or with agitation are prone to experience UE[10,11]. One should be aware that changes in levels of consciousness or agitation may be an early symptom of delirium[20]. Dubois et al[21] found that the incidence of self-extubation was significantly higher in critically ill patients who developed delirium than those who did not (10% versus 2.3%, $p = 0.02$). Pipanmekaporn et al[16] showed that among patients in the THAI-SICU study, delirium commonly occurred on the first and the third day of ICU admission while UE in this study occurred on median day 3 after ICU admission. These results supported the finding in this study that delirium was one of the independent risk factors for UE. It emphasizes the importance of assessment of delirium in such patients and managing patients with delirium properly. Regarding the patient outcomes, this study revealed that UE was independently associated with prolonged ICU LOS but hospital LOS and mortality. These findings were consistent with others reported in literatures[6-9]. Interestingly, UE has been shown to associate with decreased mortality in some studies[7-9,11]. Even though UE per se may not obviously result in serious harm to patients, re-intubation following UE, if required, may potentially impact patient outcomes. It has been found that patients with UE who required re-intubation has increased ICU-acquired infection[7,12], increased duration of mechanical ventilation[9,12], increased LOS in both ICU[9,11,12] and in hospital[11] as well as increased mortality rate[7,11,12]. These results point out that the need for re-intubation is the main determinant of patient outcomes following UE. The re-intubation rate in patients with UE in this study was quite a bit higher than those reported in the previous studies (69% versus 21 to 54%[7, 9-12,18]). Re-intubation was required more frequently in patients with accidental extubation than in those with self-extubation[9,18] and the most common reason for re-intubation was respiratory distress[9,10,18]. In this study, almost all re-intubation were required within 24 hours following UE and the most common reason for re-intubation was also respiratory distress.

There are some limitations in this study that should be addressed. Firstly, the data in this study were exclusively obtained from critically ill surgical patients. The results may not be applicable to critically ill medical patients. Secondly, the dosages of sedative medication and the levels of consciousness prior to UE were not recorded in this study. Moreover, it was not recorded whether such sedation protocols and ventilator weaning protocols were implemented in each SICU and, if any, what the adherence rates were. This information may suggest some preventive measures for UE. Lastly, this study did not thoroughly investigate the impact of re-intubation on the outcomes of patients with UE.

Conclusion

In this large cohort of critically ill surgical patients, it was demonstrated that the incidence of UE was 1.9% and UE was independently associated with increased ICU LOS but did not affect mortality. Underlying congestive heart failure, emergency surgery, non-postoperative status, sedation usage and delirium were five independent risk factors associated with UE identified in this study. These risk factors were seemingly preventable. The results of using the ventilator weaning protocol as well as the sedation protocol and the occurrence of UE have been investigated in medical patient population but not in surgical one. The impact of assessment and management of delirium on the occurrence of UE has been not thoroughly investigated in mechanically ventilated patients. The authors provide some

suggestions for future studies regarding these issues.

What is already known on this topic?

UE is one of the most concerned events in critically ill patients who required endotracheal intubation and mechanical ventilation. The incidences of this event reported in literatures range from 1.8 to 15%. Some risk factors associated with UE are also proposed. Nevertheless, there is fairly limited data in subgroup of critically ill surgical patients in terms of the incidence and the risk factors associated with UE.

What this study adds?

This study demonstrated that the incidence of UE in critically ill surgical patients was 1.9% and UE was independently associated with increased ICU LOS but did not affect mortality. Five independent risk factors for UE were identified: underlying congestive heart failure, emergency surgery, non-postoperative status, sedation usage, and delirium. These factors seemed to be preventable with some available interventions such as the sedation and ventilator weaning protocols, the delirium assessment tools and vigilance during nursing care.

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Potential conflicts of interest

None.

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อุบัติการณ์และปัจจัยเสี่ยงของการถอดท่อหายใจโดยไม่ได้วางแผนในผู้ป่วยวิกฤตศัลยกรรม: การศึกษาสหสถาบันในหออภิบาลศัลยกรรมของโรงพยาบาลมหาวิทยาลัยในประเทศไทย (THAI-SICU study)

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วัตถุประสงค์: การถอดท่อหายใจโดยไม่ได้วางแผนเป็นเหตุการณ์ไม่พึงประสงค์ที่สำคัญอันหนึ่งในผู้ป่วยที่ต้องการการช่วยหายใจผ่านทางท่อหายใจ จุดประสงค์ของการศึกษานี้ คือ เพื่อหาอุบัติการณ์และปัจจัยเสี่ยงของการถอดท่อหายใจโดยไม่ได้วางแผนในผู้ป่วยวิกฤตศัลยกรรม

วัสดุและวิธีการ: การศึกษานี้เป็นการศึกษาสหสถาบันในหออภิบาลศัลยกรรมของโรงพยาบาลมหาวิทยาลัยในประเทศไทยจำนวน 9 แห่ง ระหว่างเดือนเมษายน พ.ศ. 2554 ถึง เดือนมกราคม พ.ศ. 2556 การถอดท่อหายใจโดยไม่ได้วางแผน หมายถึง การถอดท่อหายใจโดยไม่ได้วางแผนโดยผู้ป่วยและการถอดท่อหายใจโดยไม่ตั้งใจระหว่างการดูแลผู้ป่วย อุบัติการณ์ของการถอดท่อหายใจโดยไม่ได้วางแผนจะถูกคำนวณปัจจัยเสี่ยงของเหตุการณ์ไม่พึงประสงค์นี้จะถูกวิเคราะห์ด้วยวิธีวิเคราะห์การถดถอย และผลลัพธ์ที่เกิดตามมาจากเหตุการณ์ไม่พึงประสงค์นี้จะถูกเปรียบเทียบระหว่างกลุ่มที่มีการถอดท่อหายใจโดยมีการวางแผนและกลุ่มที่ไม่มีการวางแผน

ผลการศึกษา: *ผู้ป่วยจำนวน 2,890 รายที่ต้องการการช่วยหายใจผ่านทางท่อหายใจในจำนวนนี้ 54 รายมีการถอดท่อหายใจโดยไม่มีการวางแผน ซึ่งคิดเป็นอุบัติการณ์ร้อยละ 1.9 ปัจจัยเสี่ยงของเหตุการณ์ไม่พึงประสงค์นี้ ได้แก่ ภาวะหัวใจล้มเหลว (adjusted OR, 3.48; 95% CI, 1.29-9.40) การผ่าตัดฉุกเฉิน (adjusted OR, 2.18; 95% CI, 1.01-4.74) การเข้ารับการรักษาในหออภิบาลที่ไม่ใช่หลังการผ่าตัด (adjusted OR, 2.37; 95% CI, 1.05-5.37) การใช้ยากล่อมประสาท (adjusted OR, 3.19; 95% CI, 1.72-5.93) และภาวะสับสนเฉียบพลัน (adjusted OR, 3.61; 95% CI, 1.71-7.60) ผู้ป่วยที่มีการถอดท่อหายใจโดยไม่มีการวางแผน มีระยะเวลาการรักษาในหออภิบาลนานกว่าผู้ป่วยที่มีการถอดท่อหายใจ โดยมีการวางแผนอย่างมีนัยสำคัญ (adjusted Coef., 2.76; 95% CI, 1.34-4.19) แต่ไม่พบความแตกต่างอย่างมีนัยสำคัญของระยะเวลาการรักษาในโรงพยาบาลและอัตราการเสียชีวิตทั้งในหออภิบาลและในโรงพยาบาล*

สรุป: *อุบัติการณ์ของการถอดท่อหายโดยไม่มีการวางแผนในผู้ป่วยวิกฤตศัลยกรรมเท่ากับร้อยละ 1.9 ปัจจัยเสี่ยงของการเกิดเหตุการณ์ไม่พึงประสงค์นี้ ได้แก่ ภาวะหัวใจล้มเหลว การผ่าตัดฉุกเฉิน การเข้ารับการรักษาในหออภิบาลที่ไม่ใช่หลังการผ่าตัด การใช้ยากล่อมประสาท และภาวะสับสนเฉียบพลัน ผู้ป่วยที่มีการถอดท่อหายใจโดยไม่มีการวางแผนจะมีระยะเวลาการรักษาในหออภิบาลนานขึ้นอย่างมีนัยสำคัญ*