

# Perioperative and Anesthetic Adverse Events in Thailand (PAAad Thai) Incident Report Study: Anesthetic Adverse Events in Correlation with Communication Mishaps

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**Objective:** The Royal College of Anesthesiologists of Thailand (RCAT) had performed the trial entitled “The Perioperative Anesthetic Adverse Events Study in Thailand (PAAad Thai)”. This multi-center, prospective, observational study was held in 22 hospitals all over the country in 2015. The present trial was a part of the PAAad Thai that explicitly intended to emphasize on anesthetic adverse events related to communication mishaps.

**Materials and Methods:** The PAAad Thai working team generated a standardized incident record form. Any incidents marked by reporters by means of either communication problem as a contributing factor; to improve communication as a factor to minimize the incident, or improvement of communication as a suggested corrective strategy were collected for analysis.

**Results:** Among 2,206 incident reports, there were 234 cases (10.6%) of communication mishaps. The most frequent ineffective communication happened in ASA class III patients. The communication error-related adverse events mainly occurred intraoperatively in cases with cardiac arrest (27.8%), desaturation (23.5%), severe arrhythmia (21.8%), death (17.5%), and re-intubation (15.8%). Unplanned ICU admission accounted for 18.4% of the cases, while 17.5% died. At the seventh day post-operatively, 144 patients fully recovered. Communication problems took place mostly within the anesthesia team (46%) followed by with surgeon (31%). About one tenth happened with more than one type of colleagues.

**Conclusion:** From PAAad Thai study, communication mishaps were found in approximately 10% of the cases with anesthesia-related adverse events. Effective communication is mandatory for safe anesthesia and surgery. Strategies to improve communication among various health care professionals are highly recommended.

**Keywords:** PAAad Thai, Adverse events, Communication mishaps, Communication failure, Communication errors, Communication defects, Ineffective communication

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Implementation of effective human factors of communication, leadership, prioritization, and situation awareness<sup>(1)</sup>; are viewed as the fundamental

part of safe peri-operative care<sup>(2)</sup>. Communication is a fundamental skill of anesthetic practice<sup>(3)</sup> as well as other parts of healthcare<sup>(4)</sup>. Anesthesiologists are expected to have quality communication with colleagues, patients, patient’s family, and others in the health care service environment<sup>(5)</sup>. Apart from the quality, communication also refers to the quantity of the exchanged information<sup>(6)</sup>. Communication failure is common<sup>(7)</sup> and among the most important root

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causes of adverse events. Apart from that, failure of communication leads anesthesiologists to feel stress<sup>(8)</sup>.

The Royal College of Anesthesiologists of Thailand (RCAT) has conducted a trial by the name “The Perioperative Anesthetic Adverse Events Study in Thailand (PAAAd Thai)”. It was a multi-center, prospective, observational study performed in 22 hospitals across the nation in 2015<sup>(9,10)</sup>.

The present study was a part of the PAAAd Thai with a specific focus on failed communication related adverse events. The authors performed this study because effective communication is vital for the safe outcome of surgical patients undergoing anesthesia.

### Materials and Methods

The present study is a part of the PAAAd Thai hosted by the RCAT. It was a multi-center, prospective, observational trial done between January 1 and December 31, 2015. The PAAAd Thai intended to assess the incidence of anesthetic adverse events and associated factors contributing to these complications. Furthermore, its analyzed data will be used to create the preventive and corrective strategies to minimize the incidence of anesthetic unwanted consequences and improve outcomes including patient safety<sup>(9,10)</sup>.

Twenty-two hospitals throughout Thailand cooperated into the study. The PAAAd Thai working team generated a standardized incident report form. Each incident was recorded by using this standardized form and completed by either the anesthesiologist, nurse anesthetists, or both. The completed incident report forms were sent to a center of data management<sup>(9,10)</sup>.

The incident reports, marked by reporters by way of either (a) communication problem as a contributing factor, (b) to improve communication as a factor to minimize the incident, or (c) improvement of communication as a suggested corrective strategy, were collected for analysis. Statistical analysis was performed by using R software 2.14.1.

### Results

The 22 hospitals involved in the PAAAd Thai study provided 333,219 anesthetic services in the one-year of data collection. From these, 2,206 incident report forms were delivered to the data management center for analysis<sup>(9,10)</sup>.

Among the 2,206 incident reports, there were 234 cases related to communication mishaps. This accounted for 10.6% of the adverse events. Patients’ demographic data including age group and the American Society of Anesthesiologists

**Table 1.** Demographic data of patients whose anesthetic adverse events were related to communication mishaps (n=234)

	Number (%)
Age group	
Adult	201 (85.9)
Children	33 (14.1)
ASA classification	
I	23 (9.8)
IE	7 (3.0)
II	52 (22.2)
IIE	4 (1.7)
III	57 (24.4)
IIIE	33 (14.1)
IV	10 (4.3)
IVE	32 (13.7)
VE	15 (6.4)
IV	1 (0.4)

ASA=American Society of Anesthesiologists

**Table 2.** Specific data of patients whose anesthetic adverse events were in correlation with communication errors (n=234)

	Number (%)
In-patients	232 (99.1)
Out-patients	2 (0.9)
Office hour service	173 (73.9)
Out of hour service	61 (26.1)
Elective	142 (60.7)
Emergency	92 (39.3)
Duration of anesthesia (minutes), Mean (range)	171 (20 to 840)

(ASA) classification are presented in Table 1. The most frequent communication mishaps took place in patients with ASA classification of III (57 cases, 24.4%), II (52 cases, 22.2%), IIIE (33 cases, 14.1%), and IVE (32 cases, 13.7%), respectively.

Table 2 illustrates anesthesia-related data including whether cases were in- or out-patients, elective or emergency, in-time, or overtime, and duration of anesthesia. Departments of cases with communication mishaps associated adverse events are shown in Figure 1.

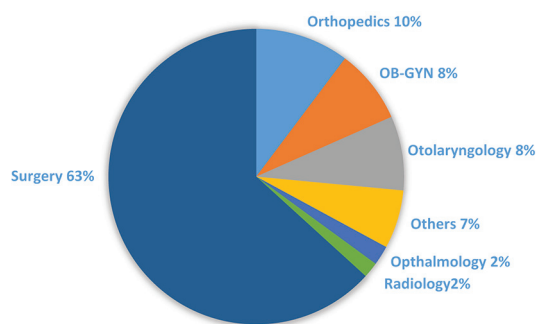
Table 3 shows various adverse events and timing

**Table 3.** Anesthetic adverse events which occurs in association with communication difficulties (n=234) and timing of the incidents

Adverse events	Total number (%)	Intraoperatively	Recovery phase in PACU	Within 24 hours after the operation
Difficult intubation	9 (3.8)	9	0	0
Endobronchial intubation	1 (0.4)	1	0	0
Esophageal intubation	12 (5.1)	12	0	0
Failed intubation	2 (0.8)	2	0	0
e-intubation	37 (15.8)	11	19	7
Desaturation	55 (23.5)	42	13	0
Pulmonary aspiration	7 (3.0)	7	0	0
Pulmonary embolism	3 (1.3)	1	2	0
Severe arrhythmias	51 (21.8)	51	0	0
Myocardial ischemia/infarction	8 (3.4)	5	1	2
Cardiac arrest	66 (27.8)	43	1	22
Death	41 (17.5)	15	0	26
Awareness	1 (0.4)	1	0	0
Emergency delirium	1 (0.4)	1	0	0
Coma, stroke, convulsion	8 (3.4)	2	3	3
Nerve injury	2 (0.8)	2	0	0
Wrong patient, wrong site	7 (3.0)	7	0	0
Drug errors	26 (11.1)	25	0	1
Anaphylaxis, anaphylactoid reaction, allergy	4 (1.7)	4	0	0
Transfusion mismatch	1 (0.4)	1	0	0

PACU=postanesthesia care unit

Data are presented as the number of patients and percentage which was calculated based on 234 cases. The presented number and percentage are beyond 234 cases because many patients experienced more than 1 anesthetic adverse event.



**Figure 1.** Departments whose patients had anesthetic adverse events in relation to communication problems (n=234).

Data are presented as percentage

of their occurrences (intraoperatively, recovery phase in post-anesthesia care unit (PACU), and within

24 hours postoperatively). It was demonstrated that communication breakdowns took place most frequently in cases with cardiac arrest (66 cases, 27.8%), followed by desaturation (55 cases, 23.5%), severe arrhythmia (51 cases, 21.8%), death (41 cases, 17.5%), and re-intubation (37 cases, 15.8%), respectively.

Among the 234 cases, sign in, time out, and sign out were done in 224 (95.7%), 217 (92.7%), and 194 (82.9%) cases, accordingly. The anesthetic adverse events occurred at different stages. Fourteen incidents (6%) happened in pre-induction period, while 48 (20.5%), 92 (39.3%), 19 (8.1%), and 31 (13.3%) incidents took place during induction, maintenance, emergence, and recovery phases, respectively. Thirty (12.8%) adverse events occurred within 24 hours after the operation.

Table 4 reveals immediate outcomes of cases

**Table 4.** Immediate outcomes of patients whose anesthetic adverse events were related to communication mishaps (n=234)

Immediate outcomes	Number (%)
Unplanned ICU admission	43 (18.4)
Unplanned hospital admission	1 (0.4)
Cancellation/postponement of surgery	4 (1.7)
Minor physiologic changes	16 (6.8)
Major physiologic changes	19 (8.1)
Cardiac arrest	24 (10.3)
Death	41 (17.5)
Complete recovery	40 (17.1)
Others	46 (19.7)

ICU=intensive care unit

**Table 5.** Long-term outcomes (7 days) of patients whose anesthetic adverse events were in correlation with communication errors (n=234)

Long-term outcomes	Number (%)
Prolonged ventilator support	24 (10.3)
Prolonged hospital stay	13 (5.6)
Disability	1 (0.4)
Vegetative/brain death	2 (0.8)
Death	50 (21.4)
Complete recovery	144 (61.5)

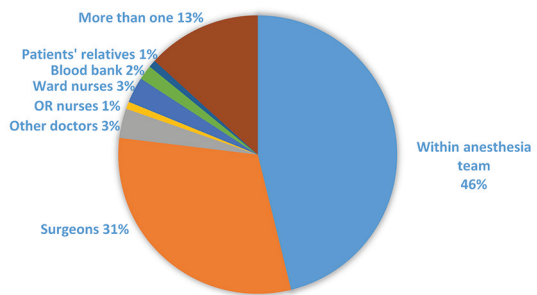
whose adverse events were in correlation with communication difficulties. Almost one fifth of the patients were admitted to intensive care unit (ICU) on an unplanned basis. Similar number of patients died (41 cases, 17.5%) and fully recovered (40 cases, 17.1%).

Table 5 shows long-term outcomes seven days after the incidents. An additional nine patients died while 104 patients full recovered.

Ratio of health care personnel involved in communication errors are illustrated in Figure 2. Communication problems occurred mostly within the anesthesia team (46%), followed by with surgeons (31%). About one tenth of communication defects happened with more than one type of colleagues.

## Discussion

The PAAad Thai study shows that communication mishaps can happen in patients undergoing anesthesia who developed various kinds of adverse events



**Figure 2.** Ratio of health care providers involved in communication errors.

Data are presented as percentage

ranging from mild to severe consequences. Almost 11% of the incident reports of adverse events were associated with communication failures. The Thai Anesthesia Incident Monitoring Study (AIMS) has shown that communication defects accounted for 3.2% of 1,996 incident reports<sup>(11)</sup>. Nagpal et al demonstrated that communication failures happened along the entire continuum of care and could harm seriously the patients<sup>(12)</sup>. Shortcoming in communication was found as the highest reported category of the 2,563 incidents. Additionally, 11.5% of peri-operative incidents of near misses and adverse events was caused by communication problems<sup>(13)</sup>. Communication breakdown and loss of information have been found to jeopardize team performance and patient safety in the operation theater<sup>(14)</sup>. A date back study also indicated that failure of communication was related to anesthetic mortality<sup>(15)</sup>.

The authors found communication defects mainly in cases with ASA class III and II but none in ASA class I patients. However, it is possible that problems of communication existed in cases with ASA class I, but they did not have any adverse event, so they were not reported in the present study. The possible reason to explain the present study findings that the most frequent communication mishaps took place in ASA class III and II patients, is that the patients were not in a critical condition enough for an anesthetic team to raise communication with a surgical team.

The anesthesiologists frequently had communication mishaps with physicians from department of surgery. The most likely explanation is the anesthesiologists provided most of its services to this department, so it was inevitable not to have the most frequent ineffective communication with this department. Pre-operative lack of communication between anesthesiologists and surgeons was found

as the most frequent issue based on a semi-instructed interview study<sup>(12)</sup>.

In identifying each adverse event, the authors discovered that inadequate communication was the reason the patients sustained severe adverse events such as cardiac arrest, severe arrhythmia, and death. Better communication may lessen these unwanted outcomes. Most of the adverse incidents happened during maintenance and induction phases, so the anesthesiologists should be alert, focusing, and well prepared to manage any problems that may occur. However, we must be ready to interact promptly with any unwanted events that happen in other phases of the anesthetic services, which extend at least 24 hours post-operatively.

The main immediate outcomes of communication mishaps-related cases were unplanned admission to ICU and death. Communication defect might not, itself, be the main cause of these two severe consequences, but it is obvious that health care providers need to intensify effective communication while taking care of patients in critical conditions. Immediate outcomes can be improved if communication is adequate and more effective. However, we did not face only poor outcomes as many cases had full recovery from adverse events. Halverson et al discovered that communication failures associated most commonly with equipment and keeping team members informed about the progress of the surgery. These failures led to delays, inefficiencies, and increased stress of the health care providers in an operating room<sup>(16)</sup>.

Most of the patients fully recovered from the adverse events by the seventh day post-operatively.

Focusing on the health care personnel involved in communication mishaps, the authors found that the most frequent ineffective communication existed within the anesthesia team. This finding is surprising because it was believed that the anesthetic team worked as ally and in the same manner. However, as we worked with our colleagues within the anesthetic team at all times, it is possible or even likely, to face communication errors among us from time to time. An interview study demonstrated that information exchange skill is one of the main abilities for anesthetic assistants to develop<sup>(17)</sup>. The second most frequent communication mishaps happened with surgeons. This result is expected because we gave anesthesia to their patients. Under the present circumstance, close collaboration is required but not warranted. Unlike our results, Hu et al revealed that of all communication failures, two out of three were interdisciplinary while only one out of three was intradisciplinary<sup>(18)</sup>.

Interestingly, culture, such as hierarchy, has an impact on communication interaction between a speaker and a listener<sup>(19)</sup>.

Lingard et al has classified four types of communication failures including occasion, content, purpose, and audience. "Occasion failure" is defined as problems in the situation or context of the communication event (poor timing), "content failure" is defined as insufficiency or inaccuracy apparent in the information being transferred (missing or erroneous information), "purpose failure" is defined as communication events in which the purpose is unclear, not achieved, or inappropriate (problems are not resolved), and "audience failure" is defined as gaps in the composition of the group engaged in the communication<sup>(20)</sup>.

Besides inadequate communication, case-irrelevant communications (CICs) has been observed. This kind of communication can negatively affect very sensitive work. Better coordinated communication could lessen this interference and distraction<sup>(21)</sup>.

Kumar et al has revealed that most surveyed anesthesiologists thought that communication skill trainings should be compulsory for all health care providers and they had an interest to join such a program<sup>(8)</sup>. Davis et al has recommended that operative training courses should highlight the significance of quality communication in the immediate period following an abrupt alteration in a patient's clinical setting<sup>(22)</sup>.

Crew resource management (CRM) is a team building communication process. CRM training has been demonstrated to improve staff perception of safety environment including areas of communication<sup>(23)</sup>. Awad et al has shown a similar result of improving communication by medical team training using CRM<sup>(24)</sup>.

On the other hand, Raemer et al found that education alone was not effective to improve the speaking-up performances of practicing non-trainee anesthesiologists<sup>(25)</sup>.

The present study had multiple strengths. It was a large prospective study with a period of data collection of 12 months. Moreover, it was a multi-center trial involving 22 large hospitals from all regions of Thailand. Under these circumstances, this PAA Thai study included over 2,200 incident reports of various anesthetic adverse events. Up until now, the present study is one of few studies to focus on the communication issues based on a large source of anesthetic incident reports.

On the other hand, some detailed data on the

incident reports were missing. Extracting the data in relation to communication problems by reading the incident reports was not the same as being involved in the real situations or judging from watching the recorded videos.

## Conclusion

From the PAAad Thai study, communication mishaps were demonstrated in approximately 10% of the cases with various anesthesia-related adverse events. Effective communication is essential for safe anesthesia and surgery. Improvement of communication among various medical staff is strongly required.

## What is already known on this topic?

It has been known that human errors including communication deficiency, jeopardize safety in many situations such as aviation and health care service. Safe anesthesia requires technical and non-technical skills, of which effective communication is essential.

## What this study adds?

This study has identified that communication failures were involved in various kinds of anesthetic adverse events with different degrees of consequences. Ineffective communication could occur at different stage of anesthesia. The most common communication mishaps took place within the anesthesia team.

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## Conflicts of interest

The authors declare no conflict of interest.

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