

Table S1 Details of classic and modified rapid sequence induction

Concerns	Classic rapid sequence induction	Modified rapid sequence induction
Patient position	Supine	Reverse Trendelenburg or semi-upright position with operation table inclined at an angle of 30 to 45 degrees
Pre-oxygenation	Pre-oxygenated by facemask with oxygen flow rate over 10 L/min for 3 minutes or more	
Drug use	Induction agents are injected with a smooth infusion in following sequence: propofol at a dose of 1.5–2.5 mg/kg or etomidate 0.25–0.3 mg/kg, rocuronium at a dose of 0.6–1.0 mg/kg, fentanyl at a dose of 4.0–6.0 µg/kg or remifentanyl at a dose of 2.0–4.0 µg/kg. The vasoactive drugs are delivered as needed.	
Cricoid pressure and apneic oxygenation	Cricoid pressure is applied as patient lost response. Apneic oxygenation is not used	Jaw thrust is performed as patient lost response, and oxygen is continuously delivered at a flow rate about 2.0–3.0 L/min with face mask gently put on the patient face. Cricoid pressure is not applied until lung ventilation is needed
Lung ventilation	Manual ventilation is not regularly applied	Lungs are not ventilated as possible until the SpO ₂ decreases to the level that threatens patient safety (usually SpO ₂ ≤ 90 %)
Others	Suction is always prepared. The nasal gastric tube insertion is not forcefully	Suction is always prepared. The nasal gastric tube insertion is only needed in patient with serious abdominal distention
Tracheal intubation	Tracheal intubation is finished with video-assisted technique about 60–90 seconds after rocuronium injected. Skilled resident or anesthesia nurse is needed for intubation procedure	

Table S2 Demographic data of study population

Factors	Number of patients (%)
Gender	
Male	92300 (55.4 %)
Female	74191 (44.6 %)
Age	
18–64 years	119092 (71.5 %)
≥65 years	47399 (28.5 %)
ASA grade	
I	25012 (15.0%)
II	109793 (65.9 %)
III	26679 (16.0 %)
IV	4470 (2.7 %)
V	537 (0.3 %)
Type of admission	
Emergency	10661 (6.4 %)
Elective	155830 (93.6 %)
Type of anesthesia	
GA (ETT)	156534 (94.0 %)
GA (LMA)	8494 (5.1 %)
Regional anesthesia & MAC	1463 (0.9 %)
Total	166491

ASA: American Society of Anesthesiologist; GA: general anesthesia; ETT: endotracheal tube; LMA: laryngeal mask airway; MAC: monitored anesthesia care.

Table S3 Exclusion reasons for the patients that were ruled out the diagnosis of perioperative regurgitation events

Reasons for exclusion	Excluded cases (n)
Recording “regurgitation/aspiration not occurred”	120
Regurgitation/aspiration occurred before admitting	83
Gastric tube suctioning for surgical demands	42
Postoperative nausea and vomiting	13
Respiratory secretions	1
Biliary bronchial fistula	1
Total	260

Table S4 Detailed information of patients with pulmonary aspiration and regurgitation without aspiration

No.	Gender	Age (yr)	ASA grade	Risk factors	Diagnosis	RSI	Airway management	Time of occurrence	PA/R	Treatment	Postoperative mechanical ventilation	Outcome
1	M	89	4	E, acute abdomen, sepsis	Postoperative biliary fistula	N	ETT	Induction	PA	H	Scheduled	ICU, death
2	M	46	4	E, RM	Tracheal stenosis	Y	ETT	Induction	PA	BS	Scheduled	ICU, discharge
3	M	67	5	E, acute abdomen	Gastrointestinal perforation	Y	ETT	Induction	PA (s)	None	Scheduled	NW, death
4	F	47	3	E, acute abdomen	Gastrointestinal perforation	Y	ETT	Induction	PA	BL, BS, H	Scheduled	ICU, discharge
5	M	49	2	None	Hepatoma	N	ETT	Induction	PA (s)	BL, PEEP, AB, H	None	NW, discharge
6	M	54	3	None	Abdominal space-occupying lesion	N	ETT	Induction	PA	PEEP, H	PA related	ICU [†] , discharge
7	M	75	4	Previous esophageal surgery	Postoperative thoracic infection	Y	ETT	Induction	PA	BS, H	Scheduled	ICU, discharge
8	M	28	5	E	Pancreatic transection	Y	ETT	Induction	PA	None	Scheduled	ICU, discharge
9	M	49	4	E, RM, drowsiness	Splenic rupture	Y	ETT	Induction	PA	None	Scheduled	ICU, discharge
10	M	48	2	BMI 29.4	Renal calculus	N	ETT	Induction	PA	BL, H	None	NW, discharge
11	M	78	4	E, RM, incarcerated inguinal hernia	Incarcerated inguinal hernia	Y	ETT	Induction	PA	BL	PA related	ICU [†] , death [†]
12	M	45	2	E, RM	Hand trauma	Y	ETT	Induction	PA (s)	H	None	NW, discharge
13	M	76	3	E, RM, intestinal obstruction, renal failure	Intestinal obstruction	Y	ETT	Induction	PA	BL	None	NW, discharge
14	M	45	2	BMI 29.4	Gallstone	N	ETT	Induction	PA	BL, BS, PEEP, H	None	NW, discharge
15	M	65	3	Previous esophageal surgery	Inguinal Hernia	Y	ETT	Induction	PA	BL, BS, AB, H	PA related	ICU [†] , discharge
16	M	69	5	E	Cerebral hemorrhage	Y	ETT	Induction	PA	H	Scheduled	NW, discharge
17	M	50	2	BMI 27.8	Varicocele	N	ETT	Induction	PA	BL, BS, PEEP, AP; H	None	NW, discharge
18	F	73	3	E, previous esophageal surgery	Tracheal stenosis	N	LMA	Induction	PA	BS, H	PA related	ICU [†] , discharge
19	M	76	3	E, intestinal obstruction	Intestinal obstruction	Y	ETT	Prior to induction	PA	H	None	NW, death [†]
20	M	74	3	E, intestinal obstruction	Intestinal obstruction	Y	ETT	Induction	PA	BL, BS, AP; H	PA related	ICU [†] , death [†]
21	M	50	2	E, RM, incarcerated inguinal hernia	Incarcerated inguinal hernia	Y	ETT	Prior to induction	R	H	None	NW, discharge
22	M	27	1	E, acute abdomen, BMI 31.2	Acute appendicitis	N	ETT	Induction	R	None	None	NW, discharge
23	M	28	5	E, RM	Haematemesis	N	ETT	Prior to induction	R	BS	Scheduled	ICU, death
24	F	64	4	E, coma	Cerebral hemorrhage	Y	ETT	Emergence	R	None	Scheduled	NW, discharge
25	M	20	3	E, RM	Pseudoaneurysm	Y	ETT	Prior to induction	R	None	None	NW, discharge
26	M	53	4	E, RM, coma	Cerebral hemorrhage	Y	ETT	Prior to induction	R	H	Scheduled	ICU, discharge
27	M	51	5	E, RM	Aortic dissection	N	ETT	Induction	R	None	Scheduled	NW, death
28	M	74	4	E, coma	Cerebral trauma	Y	ETT	Prior to induction	R	None	Scheduled	ICU, death
29	M	80	2	E, RM, acute abdomen	Acute appendicitis	Y	ETT	Prior to induction	R	None	None	NW, discharge
30	M	60	2	RM	Hepatic space-occupying lesion	Y	ETT	Prior to induction	R	None	None	NW, discharge
31	M	66	3	E, RM, Intestinal obstruction	Intestinal volvulus	Y	ETT	Prior to induction	R	None	None	NW, discharge
32	M	53	2	E, RM, acute abdomen	Gastrointestinal perforation	N	ETT	Induction	R	None	None	NW, discharge
33	M	79	4	E, RM, acute abdomen	Gastrointestinal perforation	Y	ETT	Induction	R	None	Scheduled	NW, discharge
34	M	51	1	None	Colon cancer	N	ETT	Maintenance	R	None	None	NW, discharge
35	M	69	3	None	Prostate cancer	N	ETT	Maintenance	R	None	None	NW, discharge
36	M	65	3	E, RM, sepsis	Acute appendicitis	Y	ETT	Induction	R	None	None	NW, discharge
37	M	66	4	E, RM, acute abdomen, sepsis, drowsiness	Gastrointestinal perforation	N	ETT	Induction	R	H	Scheduled	ICU, discharge
38	M	66	2	E, RM, Intestinal obstruction	Intestinal obstruction	Y	ETT	Maintenance	R	None	None	NW, discharge
39	M	84	3	E, RM, coma	Extensive burns	N	ETT	Maintenance	R	None	Scheduled	NW, discharge
40	M	31	4	E, RM, drowsiness	Cerebral trauma	Y	ETT	Prior to induction	R	BS, H	Scheduled	ICU, discharge

M: male; F: female; ASA: American Society of Anesthesiologists; E: emergency; RM: recent meal; BMI: body mass index; RSI: rapid sequence induction; ETT: endotracheal tube; LMA: laryngeal mask airway; PA: pulmonary aspiration; R: regurgitation (without aspiration); PA(s): suspected pulmonary aspiration; BL: bronchial lavage; BS: Bronchoscopy; PEEP: positive end-expiratory pressure; AB: antibiotics; AP: aminophylline; H: hydrocortisone; ICU: intensive care unit; NW: normal ward.

Table S5 Surgical specialized incidence of pulmonary aspiration and regurgitation without aspiration

Surgical departments	PA	R
Bronchoscopy	2/1747 (1:874)	0/1747 (0:1747)
General [†]	13/56058 (1:4312)	12/56058 (1:4672)
Urology	2/22963 (1:11482)	1/22963 (1:22963)
Neurosurgery	1/11590 (1:11590)	4/11590 (1:2898)
Thoracic	1/17117 (1:17117)	0/17117 (0:17117)
Orthopedic	1/29227 (1:29227)	0/29227 (0:29227)
Vascular	0/2256 (0:2256)	1/2256 (1:2256)
Cardiac	0/6828 (0:6828)	1/6828 (1:6828)
Ear nose throat	0/10400 (0:10400)	1/10400 (1:10400)
Plastic	0/2425 (0:2425)	0/2425 (0:2425)
Maxillofacial	0/2195 (0:2195)	0/2195 (0:2195)
Ophthalmology	0/2102 (0:2102)	0/2102 (0:2102)
Others	0/1583 (0:1583)	0/1583 (0:1583)
Total	20/166491 (1:10184)	20/166491 (1:8856)

PA: pulmonary aspiration; R: regurgitation (without aspiration). [†]Department of general surgery includes gastrointestinal, hepatobiliary, colorectum, thyroid and breast surgery.

Table S6 Higher ASA grades were found in patients with pulmonary aspiration and regurgitation without aspiration

Outcomes	ASA (n)					Median	Average rank	P value
	I	II	III	IV	V			
PA	0	5	7	5	3	III	137691.3	<0.001
Non-PA	25012	109788	26672	4465	534	II	83239.5	
R	2	5	5	6	2	III	124002.3	<0.001
Non-R	25010	109788	26674	4464	535	II	83241.1	

PA: pulmonary aspiration; R: regurgitation (without aspiration). ASA grades were compared by Mann-Whitney U test.

Table S7 Sample size estimation for future study

P_m	P_c	α	$1-\beta$	Allocation ratio	S_m	S_c
1/1055	12/4469	0.05	0.8	1:2	7484	14968

P_m : proportion of modified RSI group; P_c : proportion of classic RSI group; S_m : sample size of modified RSI group; S_c : sample size of classic RSI group. P_m and P_c were based on our current incidences of regurgitation events in emergency patients who received modified or classic RSI protocol. Since 'proportion' must be set between 0 and 1, P_m was set 1/1055 instead of 0/1055. With the extensive application of modified RSI protocol, the allocation ratio was set 1:2 (>1055/4469).

Table S8 Details of the three patients who died of perioperative pulmonary aspiration

No.	Details of pulmonary aspiration and postoperative course
11	Pulmonary aspiration occurred during induction and was confirmed by blind suctioning. Chest radiograph reported a newly detected multiple patchy of both lungs later in the day of surgery. The patient was diagnosed with ARDS with pneumonia of multidrug-resistant acinetobacter baumannii. He died of severe hypoxemia and cardiac arrest 12 days postoperatively.
19	Pulmonary aspiration occurred before induction and was confirmed by blind suctioning. The patient was extubated after surgery and returned normal ward with a pulse oxygen saturation of 93% breathing room air. But he developed progressively worse hypoxemia approximately 10 hours after surgery. He was then transferred to ICU for bronchial lavage and anti-infection but finally died of multiple organ failure 12 days after surgery.
20	Pulmonary aspiration occurred during induction and was confirmed by bronchoscopy. Chest radiograph reported a newly detected multiple patchy of both lungs the day after surgery. The patient received bronchial lavage in ICU with limited improvement on hypoxemia. He experienced supraventricular tachycardia and cardiac arrest the day after surgery and his family members abandoned invasive methods of rescue.

Patient number is in accordance with that in *Table S3*.