

Supplementary Appendix

This appendix has been provided by the authors to give readers additional information about their work.

Supplementary Tables

Table S1. STOP-BANG questions and scoring^a (From Jirapinyo and Thompson ^[1], with permission)

S	Snoring: Do you snore loudly (louder than talking or loud enough to be heard through closed doors)?	Yes/no
T	Tired: Do you often feel tired, fatigued, or sleepy during the daytime	Yes/no
O	Observed: Has anyone observed you stop breathing during your sleep?	Yes/no
P	Blood pressure: Have you been or are you being treated for high blood pressure?	Yes/no
B	BMI: $>35 \text{ kg/m}^2$	Yes/no
A	Age: Older than 50 years	Yes/no
N	Neck circumference: $>40 \text{ cm}$	Yes/no
G	Gender: Male	Yes/no

^aHigh risk of OSA: yes to three or more questions; low risk of OSA: yes to less than three questions.

Table S2. The modified Observer's Assessment of Alertness/Sedation (MOAA/S Scale)

MOAA/S Scale	Scale	ASA Classification
Responds readily to name spoken in normal tone	5 (alert)	Minimal
Lethargic response to name spoken in normal tone	4	Moderate
Responds only after name is called loudly and/or repeatedly	3	Moderate
Responds only after mild prodding or shaking	2	Moderate
Responds only after painful trapezius squeeze	1	Deep
Does not respond to painful trapezius squeeze	0	Deep/general anesthesia

ASA: American Society of Anesthesiologists.

Table S3. Post anesthetic discharge scoring system (PADSS)

criteria Metrics	score	criteria
vital signs	2	Fluctuation within 20% of preoperative level
	1	Within 10% to 40% of preoperative level
	0	40% of preoperative value
ambulation	2	Orientation and steady gait
	1	Orientation or steady gait
	0	Able to achieve either of the first two
nausea/vomiting	2	Very few
	1	Medium
	0	Severe
pain	2	Very few
	1	Medium
	0	Severe
bleeding	2	Very few
	1	Medium
	0	Severe

10 out of 10, score of ≥ 9 for discharge

Table S4. Patient satisfaction with the sedation

score	criteria
5	excellent, no pain
4	good, mild pain
3	fair, much discomfort but tolerable
2	poor, very uncomfortable and painful
1	very poor, very painful to the point of being unbearable

Table S5. Anesthesia sedation adverse event record

Step 1: Any adverse events?			
☐ NO		☐ YES (Continue to fill out the table below)	
Step 2: Describe the adverse event			
Mild hazard event description	Moderate risk event description	Alert Hazardous Event Description	
● Nausea, vomiting ● Muscle stiffness, clonus ● Excessive oral secretions ● Anomalous reaction*1 ● Restlessness during awakening*2 ● Extended awakening time*3	● Sedation failure*4 ● Non-allergic rash ● Bradycardia*5 ● Tachycardia*5 ● Hypertension*5 ● Hypotension*5 ● Epilepsy ● Allergic reactions	● Circulatory collapse/shock*6 ● Cardiac arrest/pulseless ● Anaphylactic shock ● Ventricular arrhythmias ● Regurgitation and malabsorption	
Step 3: Handling adverse events			
Mild hazard event description	Moderate risk event description	Alert Hazardous Event Description	Others
● No treatment ● Tactile stimulation ● Application of anti-salivary medication ● Supplemental sedation ● Application of antiemetic ● Application of antihistamines	● Mask ventilation ● Placement in the nasopharyngeal/oropharyngeal airway ● Laryngeal Mask Ventilation ● Continuous Positive Airway Pressure Ventilation ● Application of pro-arousal drugs, including flumazenil, naloxone, etc. ● Rapid intravenous infusion ● Application of anticonvulsant and antiepileptic drugs ● Application of cardiovascular active drugs, including atropine, epinephrine, etc.	● External chest compressions ● Glucocorticoids ● Lidocaine ● Application of vasoactive drugs such as atropine and epinephrine	
Step 4: Patient prognosis			
Prognosis of mild risk events	Prognosis of moderate risk events	Prognosis of alert hazardous events	Others

● No adverse prognosis	● Accidental hospitalization ● Medical Upgrades*6	● Patient death ● Permanent neurological deficits Aspiration pneumonia●*7	
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Description:

*1 Restlessness during awakening : Unanticipated restlessness and uneasiness about sedation

*2 Restlessness during awakening : Abnormal reactions during patient recovery, including crying, irritability, delirium, hallucinations, and nightmares

*3 Extended awakening time: No awakening to preoperative level within 2 hours

*4 Sedation failure : No way to keep the patient in a stable state for a successful surgery

*5 Circulatory collapse/shock: Inadequate perfusion with clinical evidence

*6 Medical Upgrades: Patients are admitted to the ICU from a general ward, or have an extended hospital stay

*7 Aspiration pneumonia : Suspected inhalation of exogenous substances, including gastric contents, and associated with new or worsening pulmonary manifestations

Table S6. The last interventions during the procedure

	Capnography (n=96)	Standard (n=34)	<i>P</i>
Interventions,n(%)			0.000
Increasing oxygen flow (5 L/min)	47(49.0)	1(2.9)	
A chin lift or jaw thrust maneuver	46(47.9)	26(76.5)	
Placement of the nasopharyngeal airway and chin lift	2(2.1)	5(14.7)	
Mask positive-pressure ventilation	1(1.0)	2(5.9)	
Ventilator-assisted ventilation with tube insertion	0	0	

STATISTICAL ANALYSES

Per Protocol analysis

Table S7. Demographic, clinical, and procedural characteristics of subjects — per-protocol analysis

	Standard (n=111)	Capnography (n=110)	<i>P</i>
Age (years)	48.50[38.75 to 55.2]	46.50[37.7 to 56.2]	0.860
Sex, male	86 (77.5)	83 (75.5)	0.723
BMI ,kg/m ²	30.45[29.3 to 31.8]	30.09[28.9 to 32.4]	0.550
ASA class			0.296
I	93(82.9)	85(77.3)	
II	19 (17.1)	25(22.7)	
History of smoking	37 (33.3)	41 (37.3)	0.540
History of alcohol consumption	38 (34.2)	40 (36.4)	0.740
Mallampati Class			0.544
I	38(34.2)	34(30.9)	
II	70(63.1)	70(63.6)	
III	3(2.7)	6(5.5)	
TMD<6cm	24 (21.6)	27 (24.5)	0.606
Micrognathia or retrognathia	16 (14.4)	16 (14.5)	0.978
STOP-BANG questionnaire score >3 分	34 (30.6)	34 (30.9)	0.964
Type of procedure			0.462
EGD	43 (38.7)	41 (37.3)	
Colonoscopy	13 (11.7)	8 (7.3)	
Colonoscopy + EGD	55 (49.5)	61 (55.5)	
Procedure time, minutes	25[14 to 33]	25[15 to 33]	0.812
Induction dose of propofol, mg/Kg	1.5[1.4 to 1.5]	1.5[1.4 to 1.5]	0.632
Induction dose of Sufentanil, ug	5.0[0.0 to 0.0]	5.0[0.0 to 0.0]	0.831
Total dose of propofol, mg	200[170 to 245]	210[180 to 250]	0.562
Polypectomy	13 (11.7)	21 (19.1)	0.128
Baseline heart rate, beats/min	72.5[66 to 80]	70[67 to 77]	0.304
Baseline systolic blood pressure, mmHg	132[128 to 140]	132[127 to 137]	0.508
Baseline oxygen	99[99 to 100]	99[99 to 100]	0.186

saturation, %

Data are presented as medians [IQR] or numbers (proportions). ASA, American Society of Anesthesiologists; BMI, body mass index; TMD, thyromental distance; EGD, esophagogastroduodenoscopy.

Table S8. Preselected outcomes in the two groups — per-protocol analysis

	Standard (n=111)	Capnography (n=110)	<i>P</i>
Hypoxia (SpO ₂ <90%,≥10s)	34 (30.6)	15 (13.6)	0.002
Severe hypoxia (SpO ₂ ≤ 85%) ,	16 (14.4)	6 (5.5)	0.026
Subclinical respiratory depression (90%≤SpO ₂ <95%)	20 (18)	34 (30.9)	0.026
SpO ₂ minimum	95[88 to 98]	95[92 to 97]	0.581
Conducting interventions	34 (30.1)	94 (85.5)	0.000
Patient Satisfaction	5[5 to 5]	5[5 to 5]	0.364
Endoscopist Satisfaction (NAS, 1 – 10)	9[8 to 10]	9[8 to 10]	0.295

Data are presented as medians [IQR] or numbers (proportions). SBP, systolic blood pressure.

Table S9. Anesthesia sedation adverse events and management measures—per-protocol analysis

	Standard (n=111)	Capnography (n=110)	<i>P</i>
Anesthesia sedation adverse events			
PONV	0 (0)	3 (2.7)	0.242
Bradycardia(<50 heartbeats/min)	7 (6.3)	5 (4.5)	0.768
Hypotension (BP < 90 mmHg)	1 (0.9)	1 (0.9)	0.998
Premature intraoperative ventricular contractions	3 (2.7)	2 (1.8)	0.549
Management measures			
Ondansetron hydrochloride	0 (0)	3 (2.7)	0.242
Atropine	7 (6.3)	5 (4.5)	0.768
Noradrenaline	1 (0.9)	1 (0.9)	0.998
Lidocaine	3 (2.7)	2 (1.8)	0.549

Data are presented as medians [IQR] or numbers (proportions). PONV, Post-operative nausea and vomiting.

Table S10. Intraoperative interventions used for corrective ventilation— per-protocol analysis

	Standard (n=111)	Capnography (n=110)	<i>P</i>
Interventions			0.000
Increasing oxygen flow(5L/min)	1 (2.9)	45 (47.9)	
A chin lift or jaw thrust maneuver	26 (76.5)	46 (48.9)	
Placement of the nasopharyngeal airway and a chin lift	5 (14.7)	2 (2.1)	
Artificial mask positive pressure ventilation	2 (5.9)	1 (1.1)	

References

- [1] P Jirapinyo CCT. Sedation challenges: obesity and sleep apnea. Gastrointestinal Endoscopy. 2016 .