

Supplementary Materials

Section S1. Codes Used in Case Report Form

Table S1. Codes recorded by the on-site researcher during procedural sedation.

Code	Event	Description
AAV	Non-patient abnormal sound	e.g., endoscope sound
ABB	Ambu bagging	All kinds of manual ventilation (Ambu bagging, bag-valve-mask, reservoir bag)
AMF	Airmod failure	Unable to read RR, or Airmod crash
AMP	Modify AS-101 amplifier setting	
APN	Apnea	
BDE	Bed stops moving	Participant arrived and settled in the PACU or recovery room
BEI	Device reconnected	Sound cable reconnected after the patient arrived in the PACU
BDM	Bed starts moving	Participant being moved to the PACU or recovery room
BER	Device disconnected	Sound cable unplugged during transfer to the PACU
CAV	Continuous abnormal sound	Wheeze, stridor, or rhonchus
DAD	Maintenance dose of sedatives administered	
DIN	Induction dose of sedatives administered	
DPE	End of target-controlled infusion (TCI)	
DPM	Modification of TCI pump setting	
DPS	Start of TCI pump	
EGV	Very loud environmental noise	
EHV	Air exhaust or insufflation noise	
ETF	EtCO ₂ failure	Spectrogram shows breathing but EtCO ₂ waveform is flat, abnormal, or absent

FCV	Friction noise	Loud noise from touching the acoustic sensor or cable
FIN	Participant discharged from PACU or recovery room	
HBP	High blood pressure	Systolic BP > 30% above baseline, decided by PI
HHR	Tachycardia	HR > 100 bpm, decided by PI
JWT	Airway-opening maneuver	Jaw thrust, chin lift, head tilt, and other positional adjustments
LBP	Low blood pressure	Systolic BP < 30% below baseline, decided by PI
LHR	Bradycardia	HR < 60 bpm, decided by PI
NSA	Nasal airway inserted	
O2M	Supplemental oxygen flow adjusted	
OMO	Oxygen mask applied	
OPE	End of procedure	
OPS	Start of procedure	
ORA	Oral airway inserted	
NCV	Non-continuous abnormal sound	Crackle or saliva sound
PAO	Partial airway obstruction	
PTM	Patient movement	Active or passive
PTV	Participant's active vocalization	e.g., talking or mumbling
SAE	Serious adverse event	
SPF	SpO2 failure	

PACU, post-anesthesia care unit; PI, principal investigator; TCI, target-controlled infusion.

Section S2. Jaccard Index Criteria for Detection Evaluation

We used the Jaccard Index to evaluate whether an AI-detected episode correctly matched a ground-truth episode:

$$\text{Jaccard Index} = |A \cap B| / |A \cup B| \quad [\text{S1}]$$

A highly overlapping relationship between a ground-truth episode and a detected episode (Jaccard Index ≥ 0.5) was counted as a true positive (Figure S1a). A ground-

truth episode that only partially overlapped a single AI-detected episode ($0 < \text{Jaccard Index} < 0.5$) was counted as a false negative (Figure S1b). When one or several AI-detected episodes only partially overlapped the same ground-truth episode ($0 < \text{Jaccard Index} < 0.5$; Figure S1c), the case was counted as a single false negative without additional false positives, in order to avoid overly penalizing the model. If an AI-detected episode did not overlap with any ground-truth episode at all (Jaccard Index = 0), it was counted as a false positive (Figure S1d). True negatives were not defined in this study.

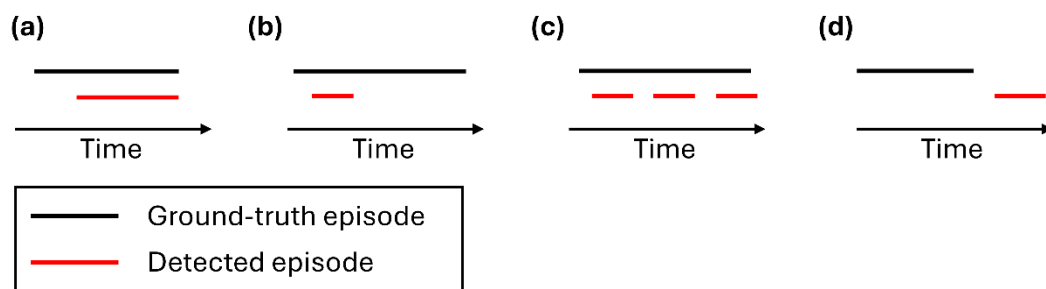


Figure S1. Schematic representation of temporal overlap scenarios for Jaccard Index calculation. (a) High overlap (Jaccard Index ≥ 0.5): true positive; (b) partial overlap ($0 < \text{Jaccard Index} < 0.5$): false negative; (c) one or several detected episodes partially overlap ($0 < \text{Jaccard Index} < 0.5$) with the same ground-truth episode: counted as a single false negative without additional false positives; (d) no overlap (Jaccard Index = 0): false positive.