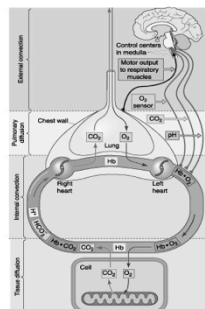


OSA and Outcomes After Elective Outpatient Procedures

*Amir Sharafkhaneh, MD, PhD
Professor of Medicine, Baylor College of Medicine
Director, Sleep Disorders & Research Center
Michael E. DeBakey VA Medical Center
Houston, Texas, USA*

Outline

- Changes in Respiration with Sleep/Sedation
- Does sleep disordered breathing increase peri-procedure complications?
- VA study on moderate sedation and OSA
- Conclusion



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Control of Breathing

- Effect of Sleep
 - Loss of wakefulness stimulus
 - Diminished hypoxic ventilatory respons
 - Diminished hypercapnic ventilatory response (about 50%) REM > NREM
 - Decreased operating lung volume
- Effect of Sedatives
 - Suppressed Arousal
 - Suppressed Ventilatory Hypoxic Response
 - Suppressed Ventilatory Hypercapnic Response

Lofsky, 2002/ Benumof, 2004/Krieger J. Chapter 19, Principle & Practice of Sleep Medicine

Conducting Airways- Upper Airway

- During transitions from wakefulness to NREM and from NREM to REM sleep
 - Upper airway resistance increases
 - Narrowing in the palatal and/or hypopharyngeal areas (*Lopes JM 1983*) due to
 - Diminished upper airway dilator muscle activity (*Krieger J 2000*)
 - loss of upper airway reflexes (*Orem J 1978*)
 - Resistance increase is greater in snorers and obese subjects (*Dempsey JA 1996*)
- Changes With Sedatives
 - Increased Upper Airway Resistance/Snoring
 - More Apnea & Longer Apnea
 - More Hypoxia

Lofsky, 2002/ Benumof, 2004/Krieger J. Chapter 19, Principle & Practice of Sleep Medicine

Recommendation from American Society for Gastrointestinal Endoscopy 2008 Guideline

- The assistance of an anesthesia specialist should be considered for ASA physical status III, IV, and V patients.
- Other possible indications..... patients with a history of
 - Adverse reaction to sedation
 - Inadequate response to moderate sedation
 - Anticipated intolerance of standard sedatives (eg, alcohol or substance abuse)
 - Those at increased risk for sedation-related complications, such as patients with severe comorbidities or with anatomic variants predictive of increased
 - risk for airway obstruction or difficult intubation (eg, morbid obesity or sleep apnea)

Difficulty in airway management & OSA

- 700 middle ear procedures
- Midazolam 0.03-0.04 mg/kg and fentanyl 1.4-1.5 microgram/kg
- 8 procedure interruption leading to general anesthesia
- All had OSA with AHI 48 (35-70)

Agro F., Can J Anaesth. 2004 Mar

Clinical use of the STOP-BANG questionnaire in patients undergoing sedation for endoscopic procedures

R. M. CORSO ¹, E. PIRACCINI ¹, V. AGNOLETTI ¹, M. LIPPI ¹, M. BUCCIOLI ¹, A. NEGRO ², G. GAMBALE ¹, E. RICCI ³

¹Emergency Department, Anesthesia and Intensive Care Unit; "GB Morgagni-L.Pierantoni" Hospital, Forlì, Italy; ²Agenzia Sanitaria e Sociale Regionale - Regione Emilia-Romagna (ASSR-RE), Bologna, Italy; ³Digestive Endoscopy Unit, G. B. Morgagni-L.Pierantoni, Hospital, Forlì, Italy

TABLE 1.—Patient and procedural characteristics, stratified by risk for OSA.

Variable	Low risk (N=131)	High risk (N=141)	P value
Mean age ±SD (yrs)	58±16	66±11	<0.0001
Sex M%	25	45	<0.0001
Mean BMI ±SD	24±4	29±6.5	<0.0001
ASA ≥3 %	7	28	<0.0001
Mean endoscopy time ±SD, min	60±20	58±18	NS
Mean total propofol dose ± SD, mg/kg	7±5	6.5±6	NS
MOAA/S during the procedure, median (IQR)	0 (0-0)	0(0-0)	NS
Concomitant use of benzodiazepine and/or opiate, %	49 (39-60)	51(41-64)	NS

IQR, interquartile range; SD, standard deviation; MOAA/S, Modified Observer's Assessment of Alertness/Sedation.

1) More Transient Hypoxia in the High Risk Group Compared to Low Risk Group (21/15% vs. 2/1.5%, Respectively)
2) No Intubation Needed for Any of the Groups

Ref: Corso and Colleagues, 2012

Sleep Breath (2012) 16:609-615
 DOI 10.1007/s11325-011-0546-5

ORIGINAL ARTICLE

Do patients at risk of sleep apnea have an increased risk of cardio-respiratory complications during endoscopy procedures?

M. Jeffery Mador · Jamie Nadler · Amjad Mreyoud · Ghana Khadka · V. Anand Gottumukkala · Mohammad Abo-Khamis · Shahid Mehboob

Baseline Characteristics

Table 1 Patient characteristics

Characteristics	Low risk, N=553(61.2%)	High risk, N=351(38.8%)
Male/Female	493/60 (89/11%)	333/18 (95/5%)
Age (years) +	59.9±11.3	58.9±9.1
BMI +	27.9±5.4	30.4±7.9
Neck circumference (inches) +	16.0±1.9	16.4±1.7
Mallimpati score	2 (2-2)	2 (2-2)
LVEF %		
≥55%	132 (23.87%)	88 (25.07%)
40-55%	9 (1.63%)	10 (2.85%)
25-40%	16 (2.89%)	14 (3.98%)
<25%	2 (0.36%)	2 (0.57%)
Unknown	394 (71.25%)	237 (67.52%)

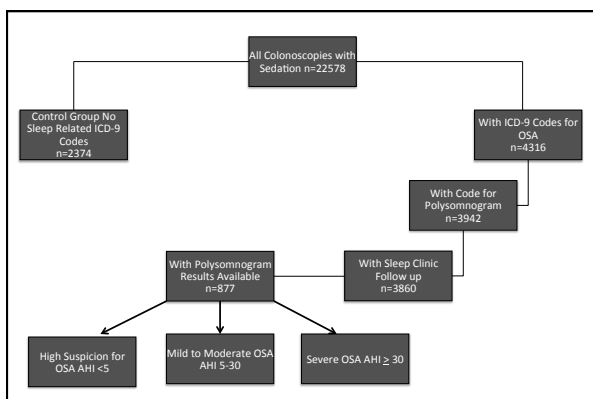
Complication Rate

	Low risk (N=553)	High risk (N=351)	Total (N=904)	p value
Minor complications				
Bradycardia	24 (4.3%)	15 (4.2%)	39 (4.3%)	1.00
Tachycardia	8 (1.4%)	9 (2.5%)	17 (1.8%)	0.22
Hypertension	18 (3.2%)	11 (3.1%)	29 (3.2%)	1.00
Hypotension	7 (1.3%)	4 (1.1%)	11 (1.2%)	1.00
Bradypnea	5 (0.9%)	0 (0.0%)	5 (0.6%)	0.16
Desaturation	1 (0.2%)	2 (0.5%)	3 (0.3%)	0.56
Total minor complications	60 (10.56%)	38 (10.63%)	98 (10.6%)	1.00
Major complications				
Arrhythmias	2 (0.3%)	0 (0.0%)	2 (0.2%)	0.52
AMS/LOC	0 (0.0%)	0 (0.0%)	0 (0.0%)	1.0
Chest pain/MI	0 (0.0%)	0 (0.0%)	0 (0.0%)	1.0
Respiratory distress	0 (0.0%)	0 (0.0%)	0 (0.0%)	1.0
Significant interventions*	16 (1.9%)	7 (0.8%)	23 (2.5%)	0.39
Total major complications	18 (3.25%)	7 (1.9%)	25 (2.77%)	0.21

Complications according to OSA severity						
Complications	Negative sleep study (N=130)	Mild OSA (N=135)	Moderate OSA (N=125)	Severe OSA (N=249)	Total (N=639)	P value
Minor	22 17.69%	27 20%	31 24.80%	44 17.67%	124 19.56%	0.38
Major	8 6.15%	7 5.19%	12 9.60%	18 7.23%	45 7.04%	0.54

Moderate Sedation & OSA

- Retrospective cohort study of subjects who underwent colonoscopy with moderate sedation
- Years FY 2000-2012

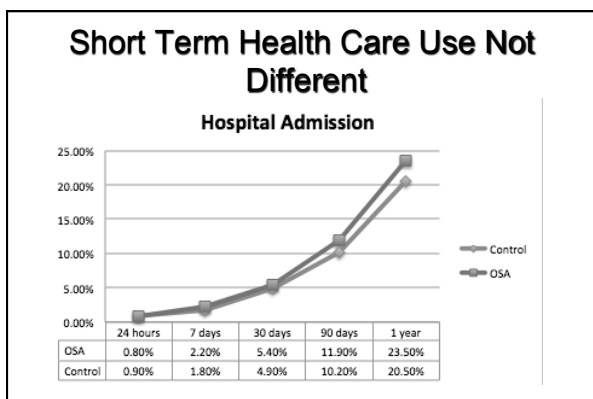


Demographic of Study Subjects

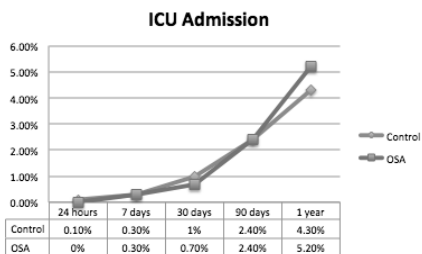
	Control Group	OSA Group	OSA-827 Group	
Number	2374	3860	827	
Age: years (SD)	61.2 (9.9)	60.1 (8.4)*	59.1 (7.9)	
Gender: female, n (%)	211 (8.9%)	224 (5.8%)*	47 (5.4%)**	
Race: n (%)	Caucasian	1613 (67.9%)	2699 (69.9%)	675 (77%)
	African-American	707 (29.8%)	1074 (27.8%)	289 (33%)
	Other	26 (1.1%)	51 (1.3%)	10 (1%)
	Unknown	28 (1.2%)	36 (0.9%)	9 (1%)
BMI (SD)	30.2 (6.7)	35.5 (7.7)	36.5 (8.02)**	
Charlson Comorbidity Index (SD)	1.49 (1.83)	1.76 (1.94)*	1.96* (2.02)**	

Comorbid Conditions In The Study Cohort

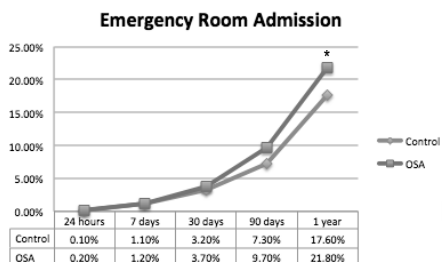
Comorbid Condition	Control Group: n (%)	OSA Group n (%)
Hypertension	1808 (76.2%)	3243 (84%)
Coronary Artery Disease/Myocardial Infarction	819 (34.5%)	1667 (43.2%)
Heart Failure	172 (7.2%)	490 (12.7%)
Cerebrovascular Disease	354 (14.9%)	564 (14.6%)
Dyslipidemia	1132 (47.7%)	2211 (57.3%)
Diabetes Mellitus	739 (31.1%)	1771 (45.9%)
Chronic Obstructive Pulmonary Disease	459 (19.3%)	1005 (26%)
Pain Syndromes	1774 (74.7%)	3191 (82.7%)
Anxiety	867 (36.5%)	1506 (39%)
Depression/Mood Disorders	1115 (47%)	1975 (51.2%)
Alcohol Abuse	305 (12.8%)	351 (9.1%)
Other Drug Abuse	288 (12.1%)	298 (7.7%)



Short Term Health Care Use Not Different



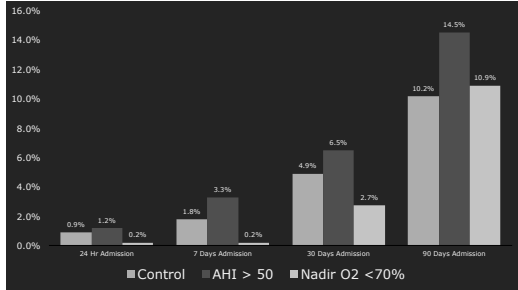
Short Term Health Care Use Not Different



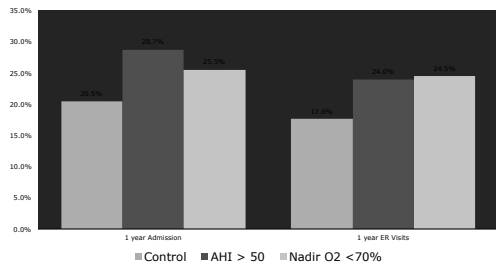
Short Term Study Outcomes Did Not Differ

	Hospital Admissions n, %		ICU Admissions n, %		Emergency Room Visits n, %	
	Control	827-OSA	Control	827-OSA	Control	827-OSA
24 hours	21 (0.9%)	7 (0.8%)	3 (0.1%)	0 (0%)	2 (0.1%)	2 (0.2%)
7 days	42 (1.8%)	18 (2.2%)	8 (0.3%)	3 (0.3%)	25 (1.1%)	10 (1.2%)
30 days	116 (4.9%)	52 (5.4%)	23(1%)	6 (0.7%)	77 (3.2%)	31 (3.7%)

Does Severity of OSA Affects Outcomes



Long Term Outcome and OSA Severity



Conclusion

- Post procedural complication rates are not higher in patients with OSA
- Post procedural health care utilization is not higher in patients with OSA
- This does not mean that OSA patients are not at risk.
- Peri-procedural care has improved significantly and that may have improved the outcomes
