Perioperative OSA Management: the A to Zzzzs…

Pieter A. Swart **November 8, 2014**

Vancouver Acute Department of Anesthesia and Perioperative Care

Agenda

I. Evolution & discovery
II. Definition & pathophysiology
III. Perioperative challenges
IV. Screening & diagnosis
V. Perioperative PAP therapy
VI. Prediction of postoperative risk
VII. Postoperative precautions
VIII. Conclusion

I. OSA: Evolution & Discovery

Jeffrey T. Laitman
Otolaryngologist & Anthropologist

“Chewing, walking, reproducing, thinking are all fine, but first one has to breathe.”

How long can humans stop breathing?

- **duration record for breath-holding at surface = 11 min 35 s**
  - Stéphane Mifsud, France

- **depth record for breath-hold dive = 700 ft**
  - Herbert Nitsch, Austria

Risk of precipitous desaturation with apnea

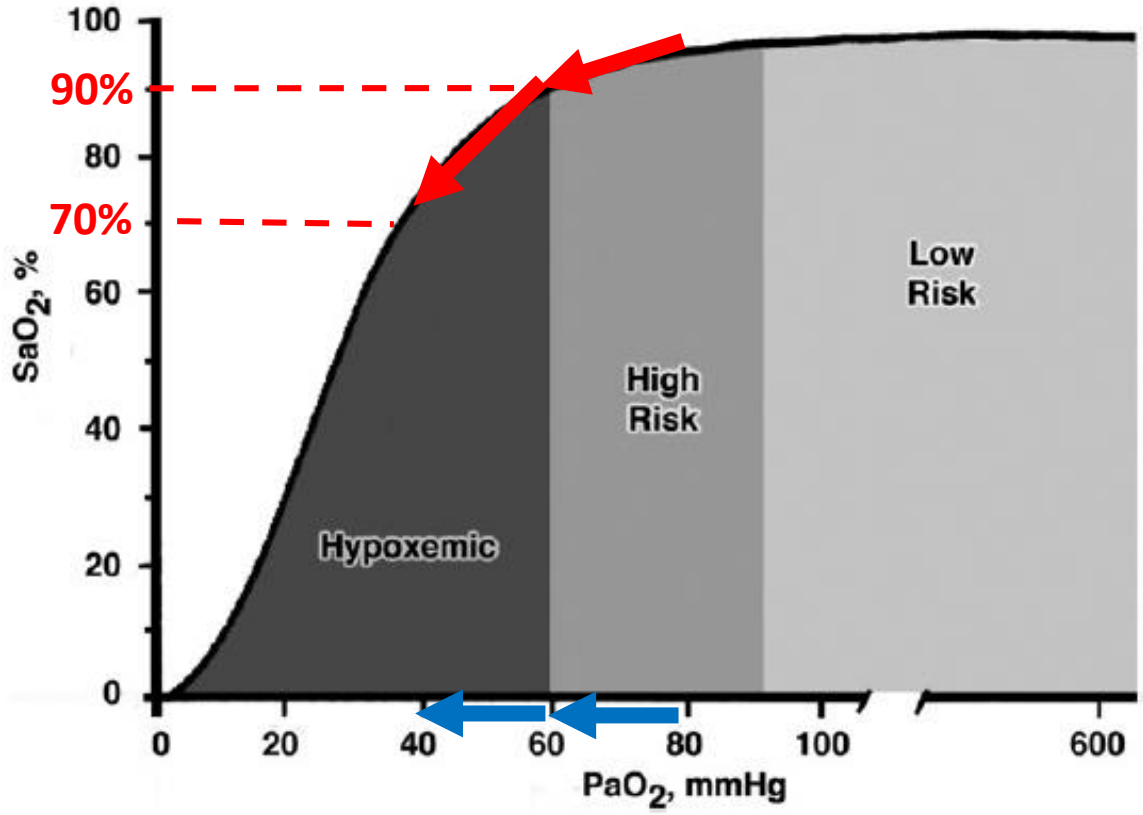
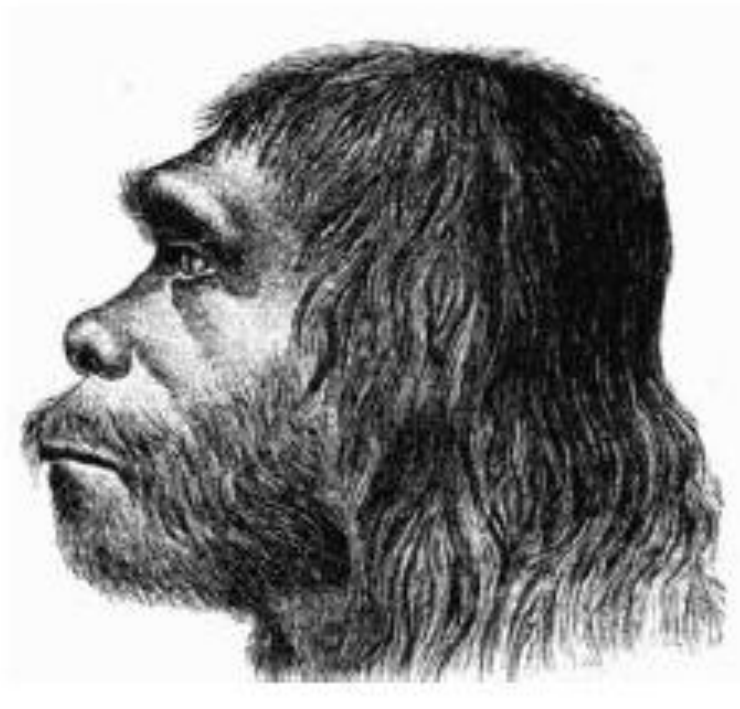


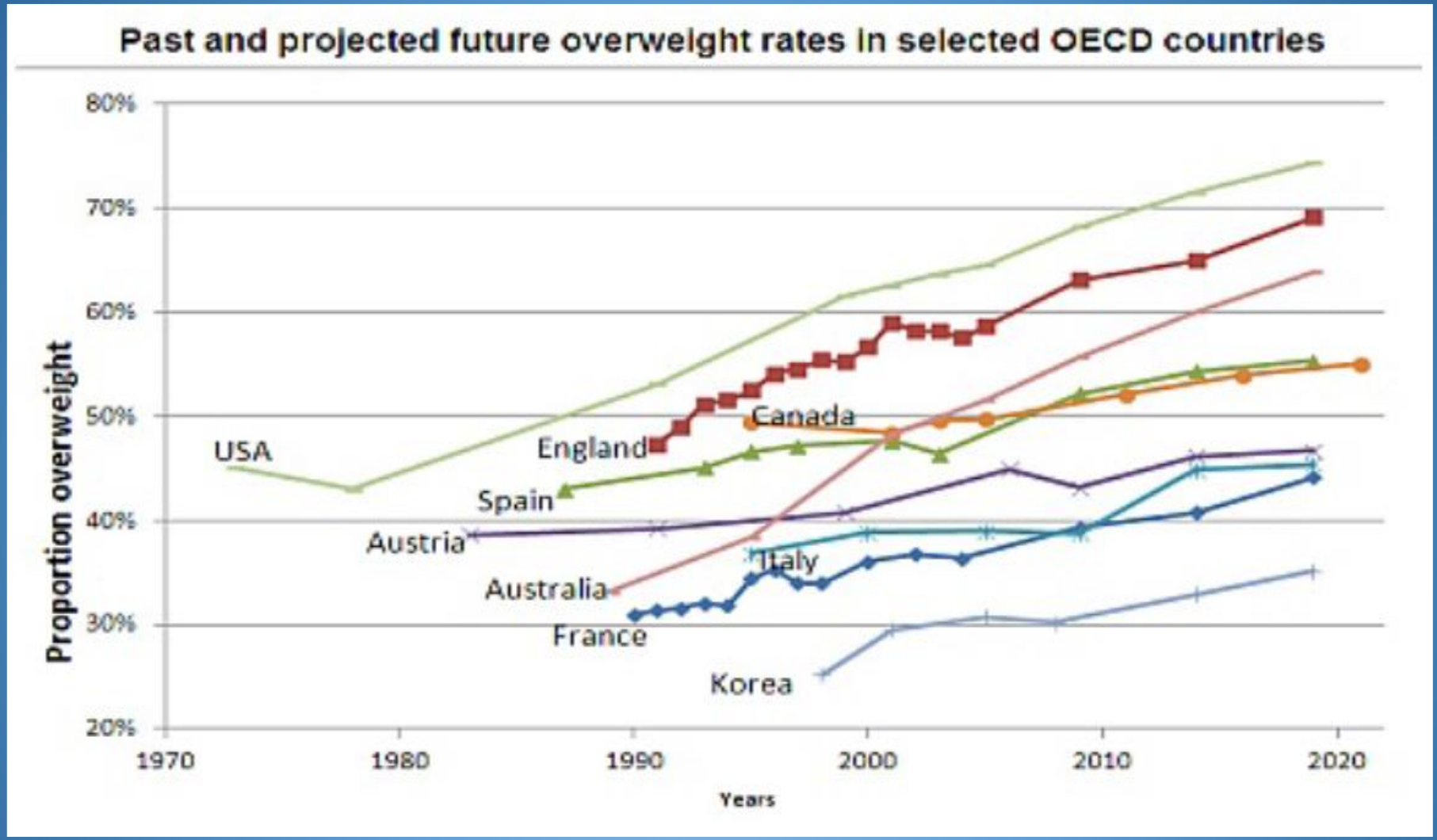
Figure 1. Oxyhemoglobin dissociation curve demonstrates the SpO_2 from various levels of PaO_2. Risk categories are overlaid on the curve. Patients near an SpO_2 of 90% are at risk for precipitous desaturation, as demonstrated by the shape of the curve.

Why are humans susceptible to OSA?

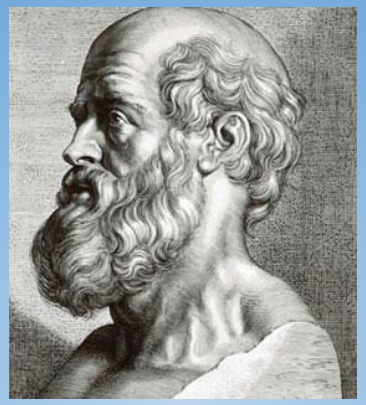
Homo Erectus – Java Man



Neanderthaler

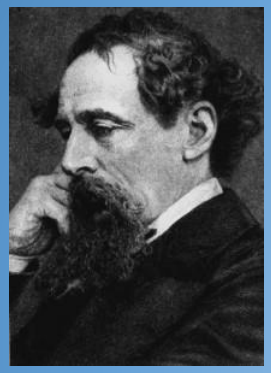

Past and projected future overweight rates in selected OECD countries
Proportion overweight
80%
70%
60%
50%
40%
30%
20%
1970
1980
1990
2000
2010
2020
Years
USA
England
Canada
Spain
Austria
Italy
Australia
France
Korea

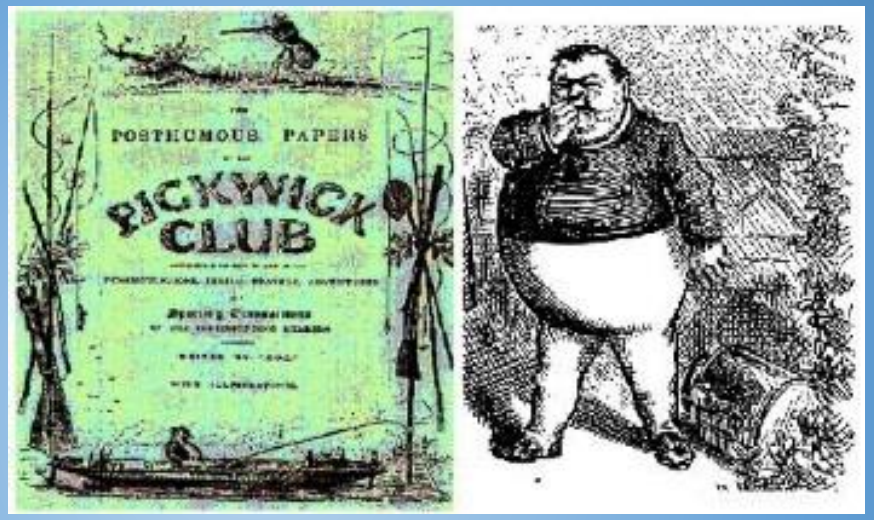
400 BCE - Hippocrates



"**I have known many persons in sleep** groaning and crying out, **some in a state of suffocation**, some jumping up and fleeing out of doors, and deprived of their reason **until they awaken**, and afterward becoming well and rational as before, although they be pale and weak; **and this will happen not once but frequently**."

1836 - Charles Dickens





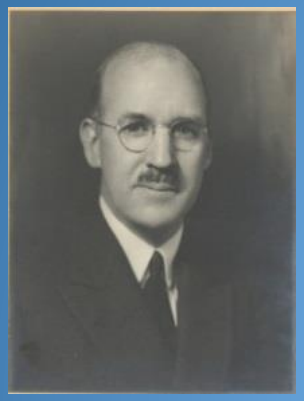
- Joe, an obese boy with snoring & sleepiness described in *The Posthumous Papers of the Pickwick Club:*

"And on the box sat a fat and red-faced boy in a state of somnolency"

1937 - Annie Spitz

- medical writer in Germany
- describes 3 pts with snoring, apneas, sleepiness, cyanosis, Cheyne-Stokes resp & RHF
- clearly OSA , but believed disorder caused by polycytemia

1956 – Sidney Burwell



Extreme Obesity Associated with Alveolar Hypoventilation – A Pickwickian Syndrome*

Am J Med. 1956;21:811-818.

C. Sidney Burwell, Eugene D. Robin, Robert D. Whaley, †Albert G. Bickelmann

- Dean of Harvard Medical School: published 1st case report of a somnolent, obese pt, titled "A Pickwickian syndrome"
- erred badly in evaluating somnolent obese pts only during waking, & attributing cause of somnolence to hypercapnia
- popularity of this paper likely contributed to delay in discovery of sleep apnea for an additional decade

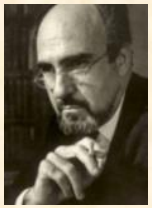
1965 - Discovery of OSA

Neurophysiological studies of abnormal night sleep and the Pickwickian syndrome

R. Jung and W. Kuhlo

Sleep Mechanisms, Progress in Brain Research 1965

Etude polygraphique des manifestations épisodiques (hypnique et respiratoires), diurnes et nocturnes, du syndrome de Pickwick



H. Gastaut, C.A. Tassinari and B. Duron

Rev. Neurol. 1965

1975: Term ***sleep apnea*** 1st introduced by Christian Guilleminault's team at Stanford. Becomes 1st editor of journal *Sleep* in 1978

Evolution of OSA Treatment

- **Surgery for Snoring**: Ikematsu
  - 1952: began removing excessive oropharyngeal tissue
  - 1962: reported results PPP with partial uvulectomy in 152 pts
- **Surgery for OSA**
  - **1969: Tracheostomy** (Kuhl et al)
  - 1979: Mandibular advancement (Kuo et al)
  - 1981: UPPP (Fujita et al)
- **1981: Nasal CPAP** - invention published in *Lancet*

Colin Sullivan

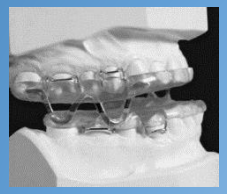
Moderate to severe OSA: 1st line Tx

Lifestyle changes + **Nasal CPAP**

- lose weight
- sleep on side
- avoid alcohol in evening
- d/c nocturnal sedation
- stop smoking

OSA: Efficacy of alternatives to PAP Tx

Oral Appliance

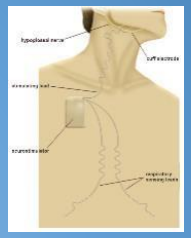


AHI ≤ 10 in 52.6%

Nasal EPAP

AHI ↓ 55%

HGNS

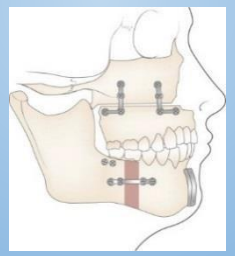


AHI ↓ 55%

Tracheostomy

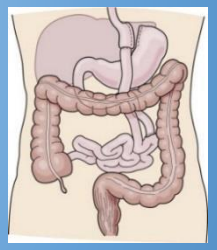
AHI ↓ 100%

MMA



AHI ↓ 87%

Bariatric Surgery



AHI ↓ 72%

RFA
AHI ↓ 34%

UPPP
AHI ↓ 33%

Palatal Implants
AHI ↓ 26%

LAUP
AHI ↓ 18%

Greenburg. Am J Med 2009 Caples. Sleep 2010 Ferguson. Sleep 2006

II. OSA: Definition & Pathophysiology

= repetitive upper airway obstruction during sleep → hypoxemia, hypercapnia, sleep fragmentation, marked swings in intrathoracic pressure, ↑ sympathetic activity, insulin resistance & inflammatory/oxidative Δs

Night

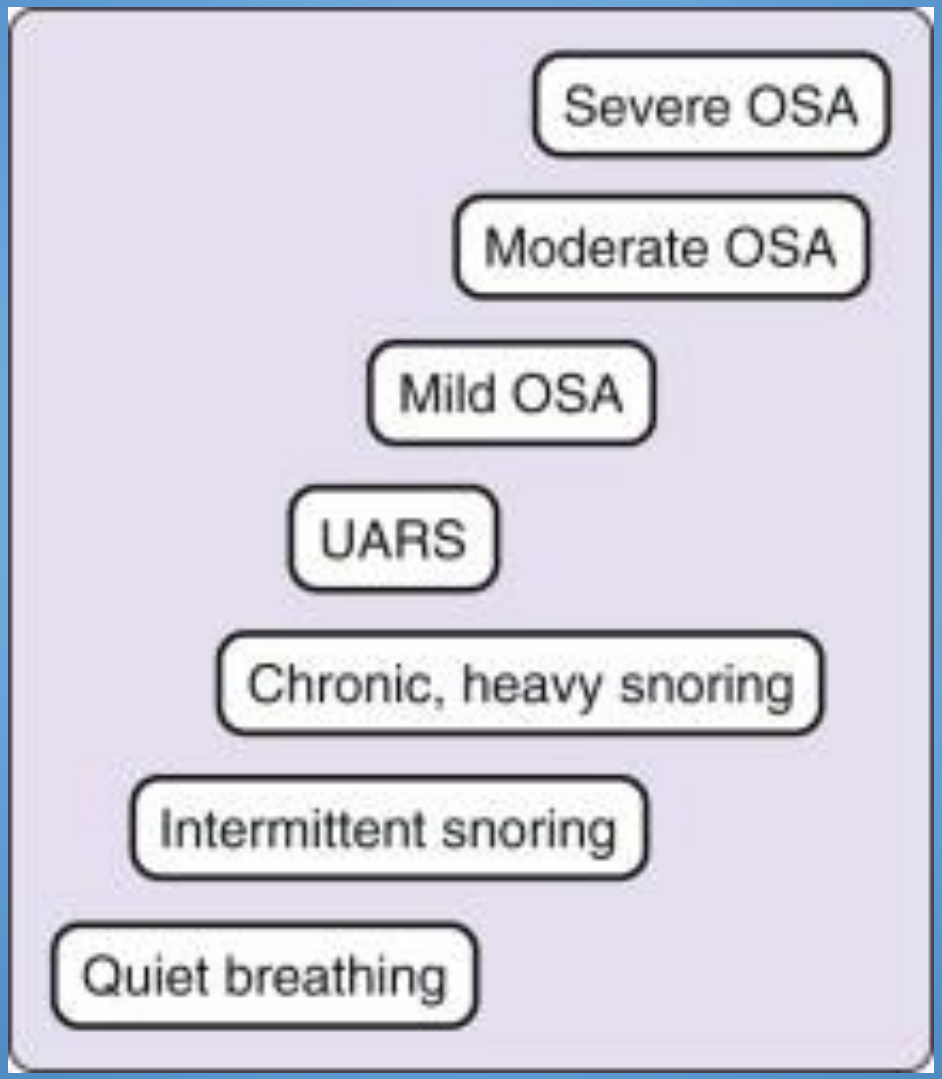
Day

Apnea Hypopnea Index

- **Apnea** = cessation airflow for ≥ 10 s
- **Hypopnea** = ≥ 50% ↓ of tidal volume for ≥ 10 s
- **AHI =** number of these events per hour during sleep

AHI	Severity OSA
5-14	~ mild
15-30	~ moderate
> 30	~ severe

Sleep-related obstructive breathing



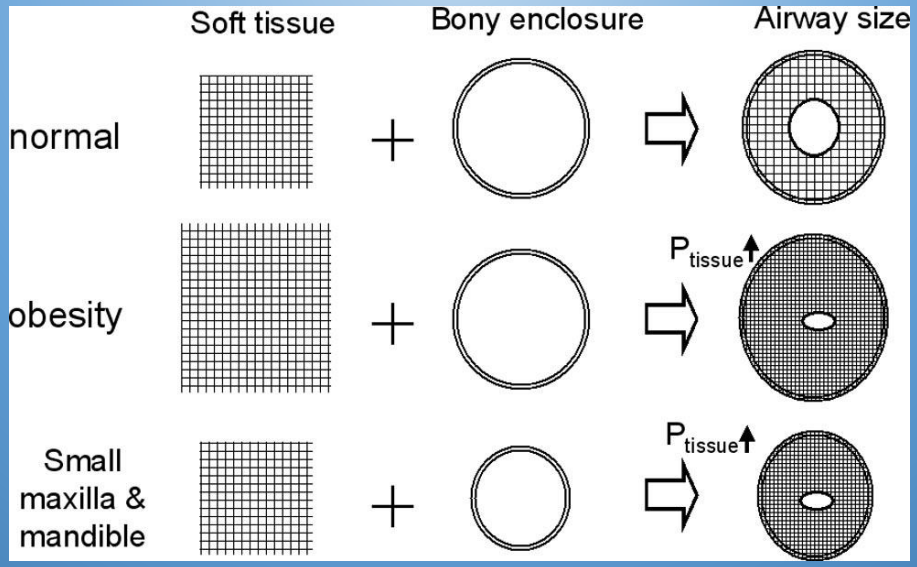
Sleep-Related Breathing Disorders

- **Obstructive Sleep Apnea: most common form of SDB**
- **Central Sleep Apnea**
  - **1° idiopathic**
  - **2° CSA**
    - drug/substance related (rising - e.g. methadone population)
    - medical conditions
      - Cheyne-Stokes breathing (CHF & neurologic)
      - non Cheyne-Stokes breathing (neurologic)
    - high altitude periodic breathing
    - complex CSA = emergence of CSA after PAP therapy titrated to eliminate OSAS
- **Sleep Related Hypoventilation/Hypoxemic Syndromes**
- **Mixed pattern – e.g. 90% patients with OHVS has OSA**

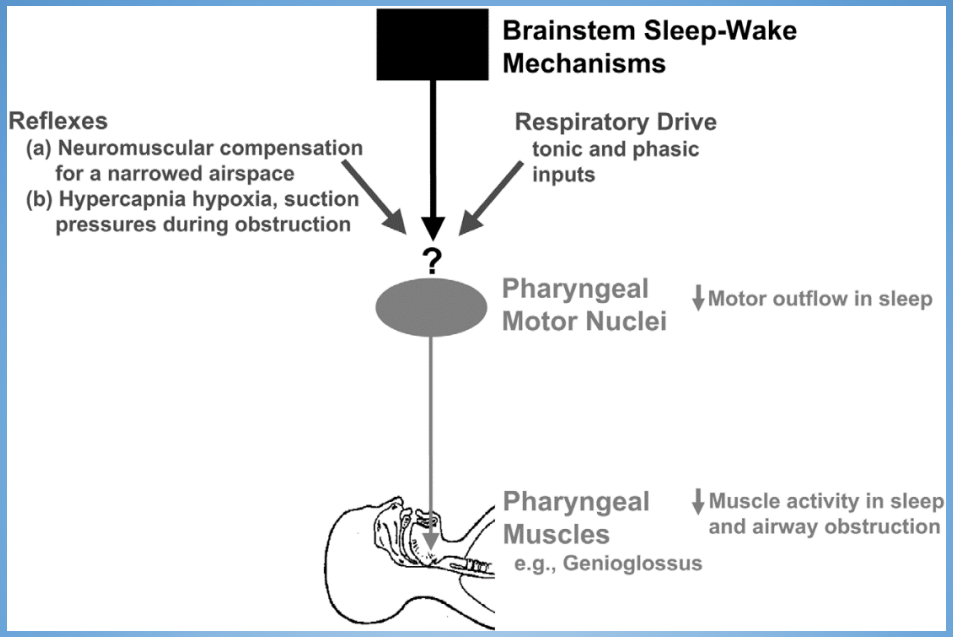
OSA Pathophysiology: Anatomic Hypothesis

excessive pharyngeal airway soft tissue for a given mandible-maxilla size

narrowed, & more collapsible pharyngeal airway



OSA pathophysiology: neural hypothesis



1. sleep fragm from OSA may → excessive ↓ pharyng tone during sleep
2. ? also sensori-neural abn in upper airway propagating OSA

OSA: upper airway inflammation & edema

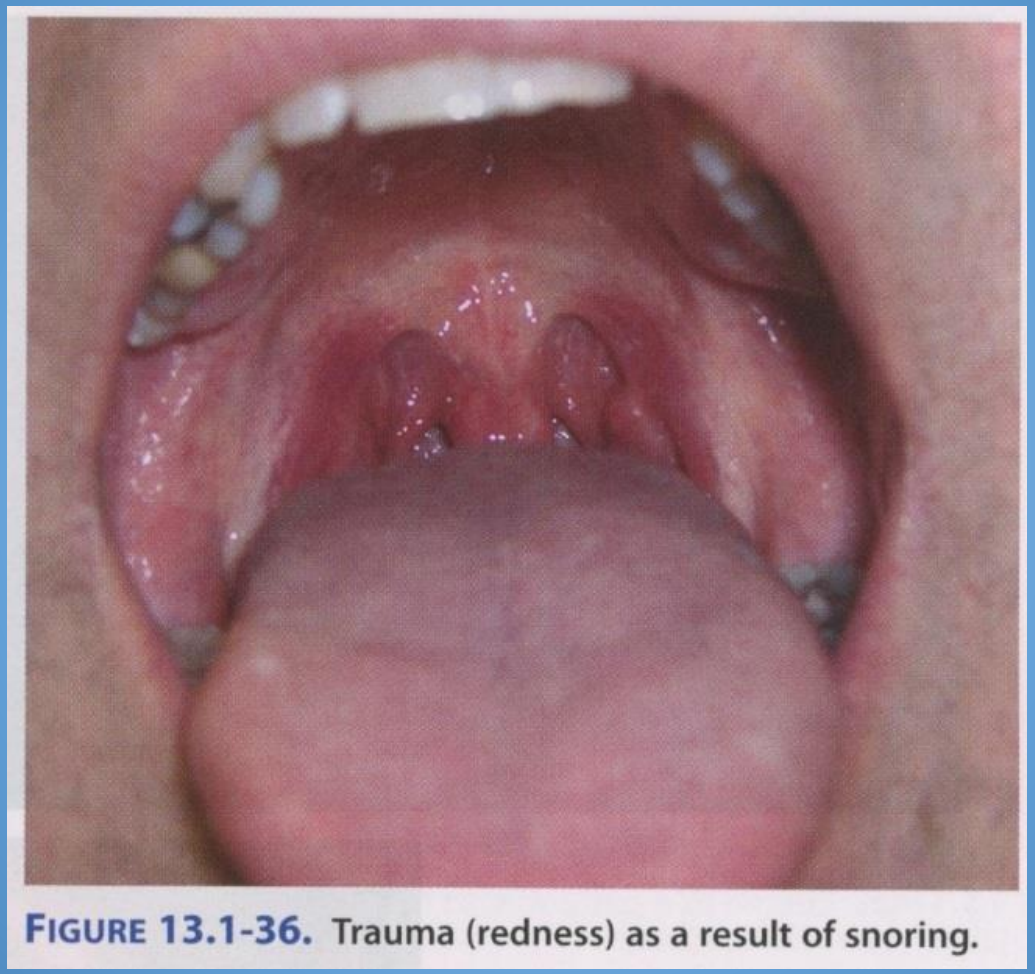
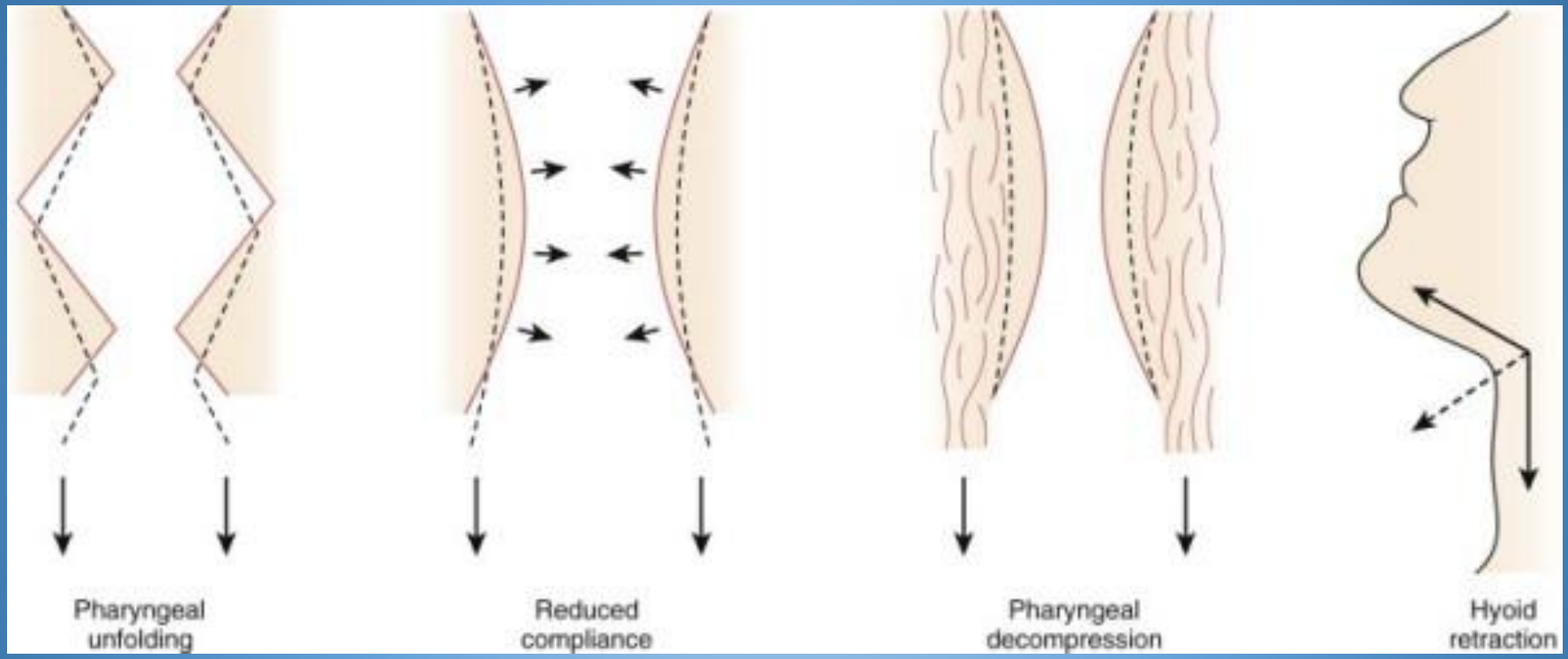


FIGURE 13.1-36. Trauma (redness) as a result of snoring.

↑ Lung volumes → ↑ pharyngeal patency



Van de Graaff WB. Thoracic influence on upper airway patency. J Appl Physiol 1988;65:2124-2131

III. OSA: Perioperative Challenges

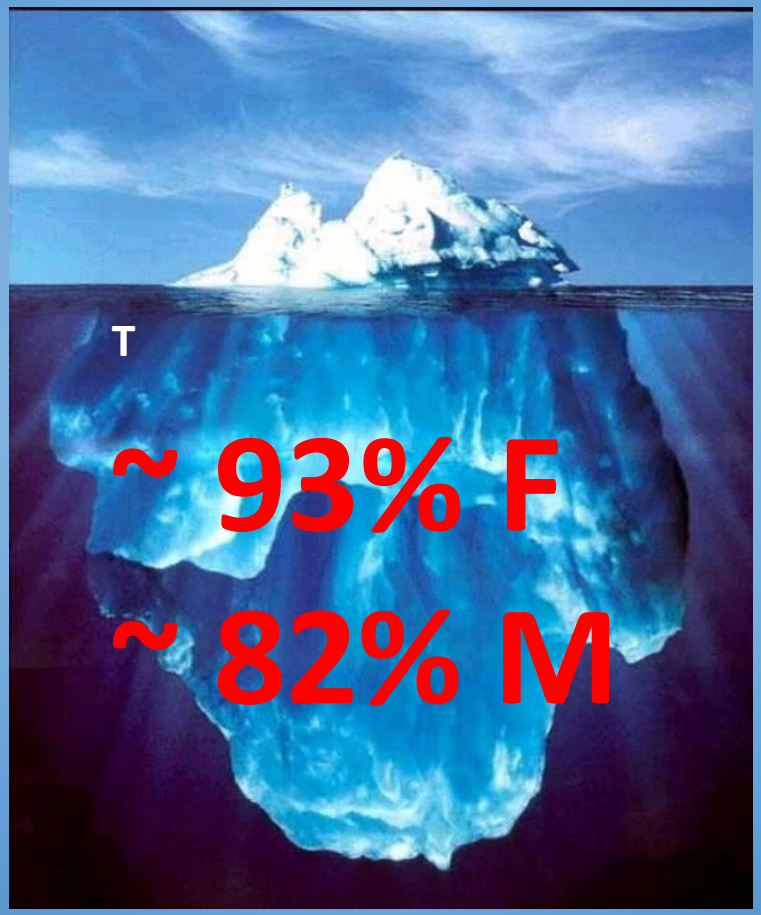
OSA: Widely Prevalent

- most prevalent form of SDB
- gen. population: 30-60 yo[1]
  - AHI ≥ 5 (all grades OSA): 24% M & 9% F
  - AHI ≥ 15 (moderate to severe OSA): 9% M & 4% F
- surgical populations > gen. population ?
  - bariatric surgery: preval > 70%[2,3]
  - elective non-upper airway surgery: preval ~ 22%[4]
  - however, preval of treated OSA only 7% in largest academic centre study of preop pts[5]

[1]Young. Am J Respir Crit Care Med. 2002
[2]Frey. Obes Surg. 2003; [3]Lopez. Ann Surg. 2008
[4]Finkel. Sleep Med. 2009
[5]Ramachandran. Anesth Analg. 2010

OSA: Vastly Underdiagnosed

Terry Young



Wisconsin Cohort. Young et al. 1997

Sleep Disorder Programs in BC

Diagnostic Accreditation Program

- Vancouver (UBCH; BCCH)
- Victoria (Royal Jubilee Hospital)
- Richmond
- Surrey
- Abbotsford
- Kelowna (KGH)
- Kamloops (Royal Inland Hospital)
- Nanaimo

OSA: High Prevalence Comorbidities

Category	Condition	Prevalence (%)
Cardiac	Treatment-Resistant HTN	63-83
	CHF	76
	IHD	38
	AF	49
	Dysrhythmias	58
Respiratory	Asthma	18
	Pulmonary HTN	77
Neurologic	First-Ever stroke	71-90
Metabolic	DM Type II	36
	Metabolic Syndrome	50
	Hypothyroidism	45
	Morbid Obesity	50-90
Surgical	Bariatric Surgery	71
	Intracranial Tumor Surgery	64
	Epilepsy Surgery	33
Other	GERD	60
	Nocturia	48
	Alcoholism	17
	Primary Open-Angle Glaucoma	20
	Head and Neck Cancer	76

Adapted from Seet & Chung. Anesthesiology Clin. 2010;28:199-215

OSA: ↑ Incidence Difficult Intubation

	General population	OSA in adult obese population[2]
Difficult intubation	0.5-2%[1]	13%[3]; 24%[4]
Failed intubation	0.045-0.3[1]	5%[5]

1. Crosby, E. The unanticipated difficult airway. Can J Anesth 2005 / 52:6 / pp. 562-567
2. Benumof, J. OSA in the adult obese patient: implications for airway management. Anesthesiology Clin N Am 20 (2002) 789– 811
3. Buckley, et al. Anaesthesia in the morbidly obese. Anesthesia 1983;38:840-51
4. Cherit, et al. Anesthesia for morbidly obese patients. World J Surg 1998;22:969-73.
5. Esclamado, et al. Perioperative complications and risk factors in the surgical treatment of OSAS. Laryngoscope 1989; 99:1125– 9.

OSA: Predictor Impossible Mask Ventilation

Anesthesiology 2009; 110:891–7

Prediction and Outcomes of Impossible Mask Ventilation

A Review of 50,000 Anesthetics

Sachin Kheterpal, M.D., M.B.A., Lizabeth Martin, M.D.,† Amy M. Shanks, M.S.,‡ Kevin K. Tremper, Ph.D., M.D.§*

- University Hospital Ann Arbor, Michigan; 2004 to 2008
- 53,041 attempts at mask ventilation recorded
- 77 cases of impossible mask ventilation (0.15%)
  - 19 (25%) of those also demonstrated difficult intubation
- **Sleep Apnea 1 of 5 independent predictors of impossible mask ventilation**

Table 4. Independent Predictors of Impossible Mask Ventilation

Predictor	ß Coefficient	Standard Error	*P* Value	Weighted Points*	Adjusted Hazard Ratio (95% Confidence Interval)
Neck radiation changes	1.964	0.628	0.002	6	7.1 (2.1–24.4)
Male sex	1.206	0.322	< 0.001	4	3.3 (1.8–6.3)
Sleep apnea	0.859	0.302	0.005	3	2.4 (1.3–4.3)
Mallampati III or IV	0.678	0.276	0.014	2	2.0 (1.1–3.4)
Presence of beard	0.639	0.284	0.024	2	1.9 (1.1–3.3)

Independent predictors of impossible mask ventilation were derived using a logistic regression full model fit.

* Points in the weighted score were assigned to each risk factor by dividing each ß coefficient by the smallest ß coefficient of the independent predictors, multiplying by two, and rounding to the nearest integer.

OSA: ↑ severity in postop period

- **pharmacological airway challenge**
  - ↓ upper airway muscle tone (hypnotics; opioids; NMB)
  - ↓ ventilatory drive (opioids)
  - ↓ arousal response (hypnotics)
- **airway edema**
  - airway/head/neck/C-spine procedures
  - prolonged Trendellenburg/prone position
  - significant fluid administration
- **↓ lung volumes → ↑ collapsibility pharynx**
  - trachea exerts longitudinal traction during deep insp
- **REM sleep rebound POD 3-4**
  - ↑ resp depression & ↑ sympathetic activity

OSA: ↑ in Perioperative Morbidity

ANESTHESIA & ANALGESIA January 2011 • Volume 112 • Number 1

Perioperative Pulmonary Outcomes in Patients with Sleep Apnea After Noncardiac Surgery

Stavros Memtsoudis, MD, PhD,* Spencer S. Liu, MD,* Yan Ma, PhD,† Ya Lin Chiu, MS,† J. Matthias Walz, MD,‡ Licia K. Gaber-Baylis, BA,† and Madhu Mazumdar, PhD†

British Journal of Anaesthesia **109** (6): 897–906 (2012)
Advance Access publication 6 September 2012 · doi:10.1093/bja/aes308

BJA

Meta-analysis of the association between obstructive sleep apnoea and postoperative outcome

R. Kaw[1,2*], F. Chung[3], V. Pasupuleti[4], J. Mehta[3], P. C. Gay[6,7] and A. V. Hernandez[5]

- ↑ desats, resp failure, aspiration, re-intubation, ARDS, dysrhythmias & myocard injury.
- ↑ requirement postop vent support, unplanned transfer to ICU, admission to SDU, telemetry services, longer hospital stay, & consume more economic resources.

Does OSA → ↑ Periop Mortality?

- ↑ **in all cause mortality** associated with OSA in general population, correlating with severity OSA
- **unexpected/unexplained postop deaths within 7 days postop most often occur at night**
  - cardio-resp events related to sleep proposed as most likely cause of postop mortality at night
- **anecdotes/reports:** preventable periop deaths following resp arrest do occur in pts with OSA

Busselton Health Study
Rosenberg et al. Br J Surg 1992;79:1300-1302
Rosenberg-Adamsen. Br J Anaesth. 1996;76:552-559
Gill et al. Br J Anaesth 1992;68:471-473
Cotes. Anesth Analg. 2014

OSA & Periop Mortality: data lacking…

- ***prospective* studies**
  - ethical issue with denying known sleep apnea pts approp level of risk reduction care, including ↑ level of postop monitoring
- ***retrospective* studies**
  - difficult/impossible to retrospectively determine sequence of events leading up to arrest
  - unexplained cardioresp arrest may be attributable to unDx OSA in surgical pts, however this connection has yet to be tested by RCTs

Death or Neurologic Injury after Tonsillectomy in Children with a Focus on Obstructive Sleep Apnea: Houston, We Have a Problem!

Anesth Analg 2014;118:1276–83

Charles J. Coté, MD,* Karen L. Posner, PhD,† and Karen B. Domino, MD, MPH†

Charles J Cote
Professor of Anesthesia
Harvard Medical School

"Death after tonsillectomy related to hemorrhage may not be preventable, but death due to apnea is preventable"

OSA: Periop Medicolegal Perspective

- Benumof: "expert opinion" in ~ 50 OSA medico-legal cases in US
  - ~ 30% cases intubation/extubation misadventures (usually latter)
  - ~ 70% cases found "dead in bed" - prototypical OSA malpractice case

J. Benumof

- clinical components of prototypical "dead in bed" case:
  1. severe OSA
  2. morbid obesity
  3. isolated ward room
  4. no monitoring
  5. receiving narcotics
  6. painful incision
  7. off O_2
  8. off CPAP device

“? OSA” is not a diagnosis!

“? OSA”, like “? angina”, is a problem requiring workup, especially if daytime somnolence

“? OSA” not followed up

Medical Malpractice Lawyer

OSA: Summary of Perioperative Challenges

- widely prevalent, vastly underDx
- ↑ incidence periop complications
  - signif comorbidities
  - ↑ incid difficult airway
  - postop exacerbation of OSA
- relative shortage resources
  - preop: diagnostic bottle neck
  - postop: limited monitored beds
- preventable deaths do occur

IV. OSA: Screening

- cardinal symptoms
  - snoring/observed apneas/tiredness
- physical examination
  - anthropometrics: BMI/neck circumference
  - morphometrics: upper airway
- multivariate clinical prediction tools
  - **Flemons SACS:** 1994
  - Berlin Questionnaire: 1996
  - ASA Checklist: 2006
  - **STOP-BANG Score**: 2008
  - P-SAP Score: 2010

OSA: Snoring

- most frequently reported symptom in OSAHS
  - 70-95% of such pts
- however, poor predictor OSA
  - gen pop: 35-45% M, & 15-28% F snore

Central Obesity

= single physical finding most predictive of OSAS

- **BMI**
  - **60-90% pts with OSA have BMI > 30 (Benumof)**
  - **BMI > 40: AHI ≥ 15 in ~50% M, & ~20% F (Wisconsin Cohort)**
- **Neck (or waist) size may be better indicators of OSA severity**
  - **neck circ: > 43 cm (17") in M; > 41 cm (16") in F**
  - **waist circ: > 102 cm (40")**

STOP-BANG OSA Screening Tool

			Yes	No
S	***S***noring	Do you ***s***nore loudly (loud enough to be heard through closed doors)?	☐	☐
T	***T***ired	Do you often feel ***t***ired, fatigued, or sleepy during daytime?	☐	☐
O	***O***bserved	Has anyone ***o***bserved you stop breathing during your sleep?	☐	☐
P	Blood ***P***ressure	Do you have or are you being treated for high blood ***p***ressure?	☐	☐
B	***B***MI	***B***MI more than 35 kg/m^2?	☐	☐
A	***A***ge	***A***ge over 50 years old?	☐	☐
N	***N***eck circumference	***N***eck circumference greater than 40 cm?	☐	☐
G	***G***ender	Male?	☐	☐

Score	Probability of moderate to severe OSA
5-8	high
3-4	intermediate
0-2	low

Frances Chung

British Journal of Anaesthesia Page 1 of 8
doi:10.1093/bja/aes022

High STOP-Bang score indicates a high probability of obstructive sleep apnoea

F. Chung[1*], R. Subramanyam[1], P. Liao[1], E. Sasaki[1], C. Shapiro[2] and Y. Sun[1]

Table 4 Predicted probabilities per score for all OSA, moderate/severe OSA, and severe OSA. CI, confidence interval; AHI, apnoea–hypopnoea index; *n*, number; Mod/Sev OSA, moderate/severe OSA

Score	All OSA (AHI>5)		Mod/Sev OSA (AHI>15)		Severe OSA (AHI>30)	
	n	Probability (95% CI)	*n*	Probability (95% CI)	*n*	Probability (95% CI)
0–2	81	0.46 (0.39–0.53)	31	0.18 (0.13–0.24)	7	0.04 (0.02–0.08)
3	123	0.72 (0.65–0.78)	61	0.36 (0.29–0.43)	22	0.13 (0.09–0.19)
4	121	0.73 (0.66–0.79)	69	0.42 (0.34–0.49)	30	0.18 (0.13–0.25)
5	95	0.77 (0.69–0.84)	62	0.50 (0.42–0.59)	37	0.30 (0.23–0.39)
6	54	0.79 (0.68–0.87)	39	0.57 (0.45–0.69)	22	0.32 (0.22–0.44)
7 and 8	36	0.86 (0.72–0.93)	25	0.60 (0.44–0.73)	16	0.38 (0.29–0.53)

↑ probability of OSA with ↑ STOP-Bang Score

STOP-Bang score ≥ 5: indicates high probability of moderate-severe OSA

Sleep Apnea Clinical Score: 1994

Ward Flemons

Likelihood Ratios for a Sleep Apnea Clinical Prediction Rule

Am J Respir Crit Care Med
Vol 150. pp 1279-1285, 1994

W. WARD FLEMONS, WILLIAM A. WHITELAW, ROLLIN BRANT, and JOHN E. REMMERS

Departments of Medicine and Community Health Sciences, Foothills Hospital and University of Calgary, Calgary, Alberta, Canada

Physician to circle sleep apnea clinical score on table

Sleep Apnea Clinical Score (SACS)

	Not Hypertensive Snoring &/or Choking (usually/always)			Hypertensive Snoring &/or Choking (usually/always)		
Neck Circumference (cm)	**None**	**One** snoring *or* choking	**Both** snoring & choking	**None**	**One** snoring *or* choking	**Both** snoring & choking
<30	0	0	1	0	1	2
30-31	0	0	1	1	2	4
32-33	0	1	2	1	3	5
34-35	1	2	3	2	4	8
36-37	1	3	5	4	6	11
38-39	2	4	7	5	9	16
40-41	3	6	10	8	13	22
42-43	5	8	14	11	18	30
44-45	7	12	20	15	25	42
46-47	10	16	28	21	35	58
48-49	14	23	38	29	48	80
>49	19	32	53	40	66	110

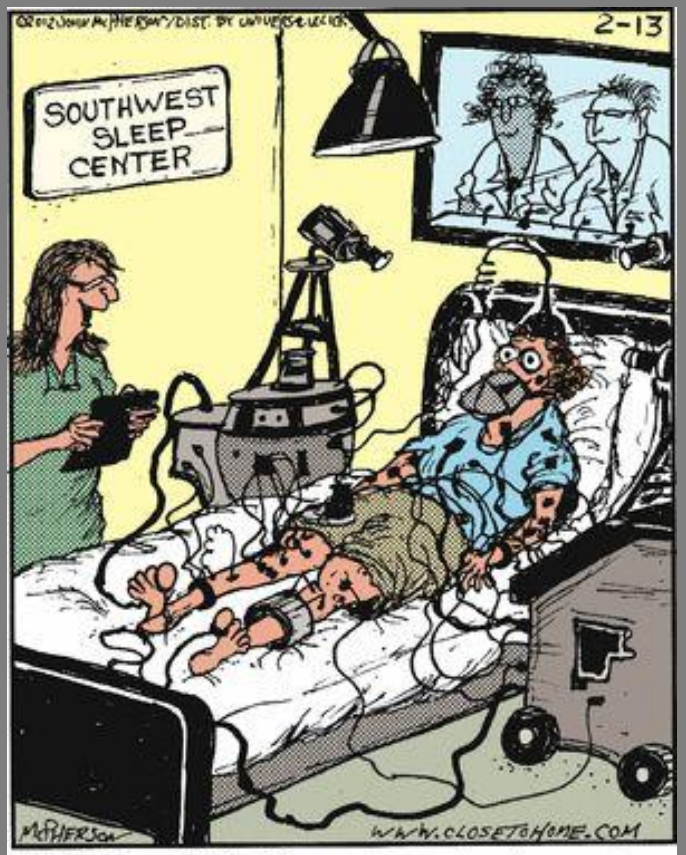
Hypertension is positive if patient is receiving antihypertensive medication, or blood pressure in supine position > 160/95

Choking can also be described as gasping or snorting

Usually is defined as 3-5 times per week

SACS ≥ 15: high probability of sleep apnea

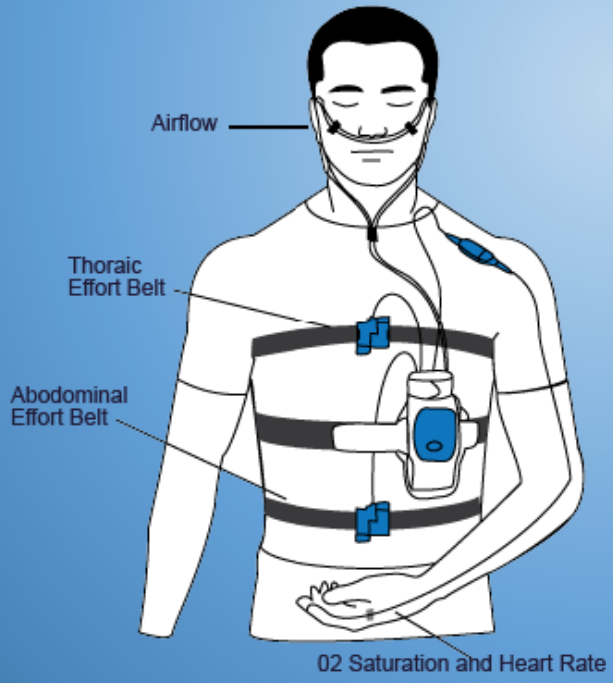
V. OSA: Diagnosis



"OK, Mrs. Tully. We want you to relax, get a good night's sleep, and we'll evaluate any sleep issues that you have."

Sleep Study: Levels

- **Level I: Full In-laboratory Polysomnography** (technician attended)
  1. airflow
  2. respiratory effort
  3. SpO_2
  4. ECG or HR
  5. EEG
  6. EOG
  7. chin EMG
  8. (recommended: body position & leg EMG)
- **Level II: Full Ambulatory Polysomnography** (unattended)
- **Level III: Portable Monitor (Home Sleep Testing)**
  1. airflow
  2. respiratory effort
  3. SpO_2
- **Level IV: Overnight Oximetry**


Airflow
Thoraic
Effort Belt
Abodominal
Effort Belt
02 Saturation and Heart Rate

PACU: ? biggest sleep laboratory

VI. OSA & perioperative PAP therapy

- Professional Guidelines (ASA, CTS, SASM)
  - initiate PAP Tx preop
  - resume PAP Tx postop
- Postop period not ideal time to initiate PAP Tx in PAP naive

OSA: potential benefits preop PAP Tx

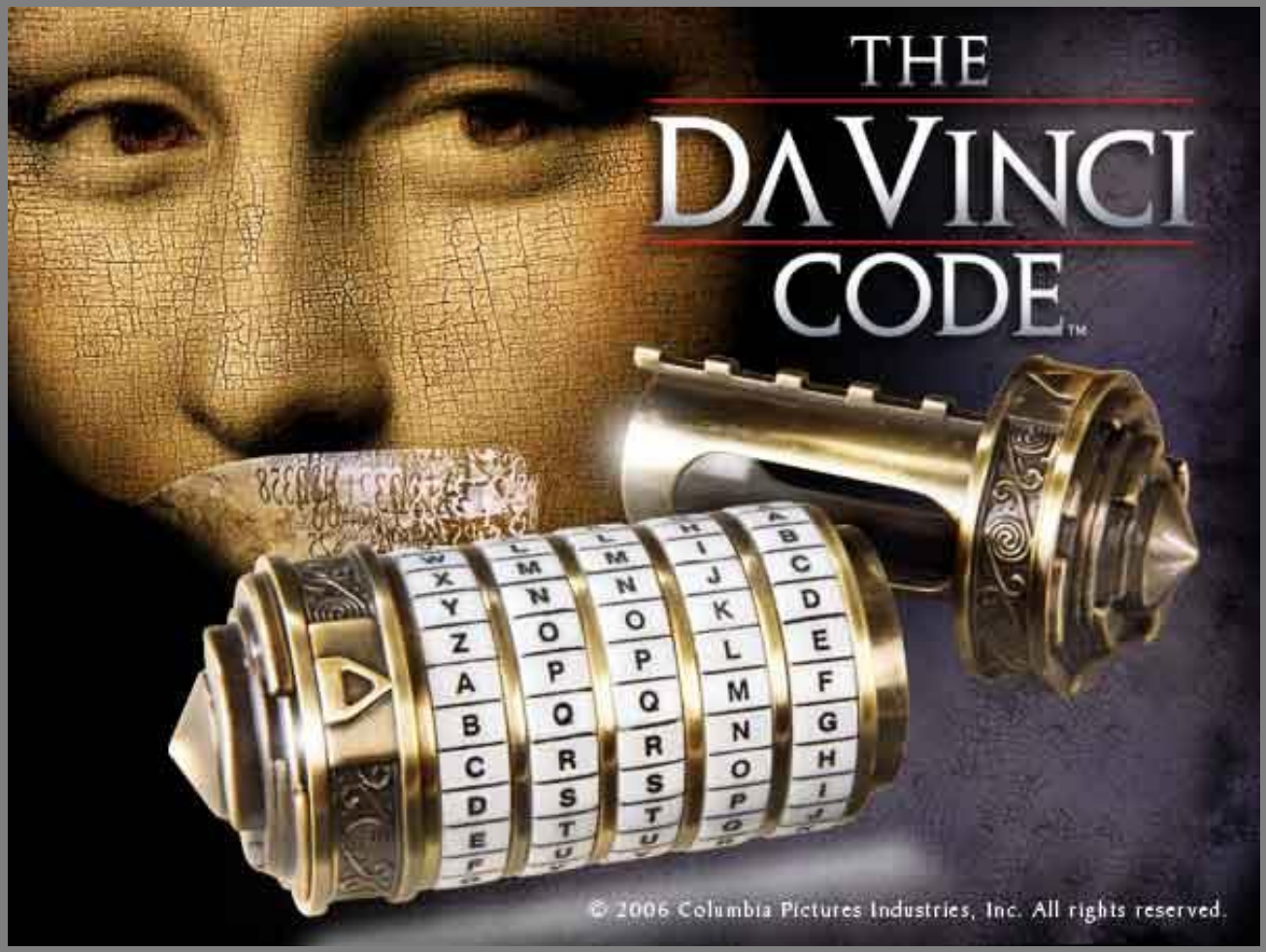
- ↑ compliance with postop PAP Tx
- ↓ edema & inflammation upper airway
- improved genioglossus fxn
- can reverse CVS & metab disturbances

OSA: postop PAP Tx in PAP naive patient

ASA OSA Task Force: consider CPAP or NIPPV if frequent or severe airway obstruction or hypoxemia occurs postop

- high risk situation
- significant compliance challenge

VII. OSA: Prediction of Postop Risk



The Challenge of Postop Risk Prediction

to identify pts at ↑ risk from sleep apnea with enough sensitivity to prevent arrests & enough specificity to avoid occupying monitored beds unnecessarily

"Risk of OSA" - a potentially confusing phrase !

Risk of "**having OSA**"

↑

OSA screening tool

(e.g. STOP-BANG or Flemons SACS)

Risk of "**postop complications from OSA**"

↑

2-component risk prediction model

severity OSA & comorbidities

impact surgery/anesthesia

postop opioid requirement

+

postop indicators of risk

OSA: Determinants of Postoperative Risk

C

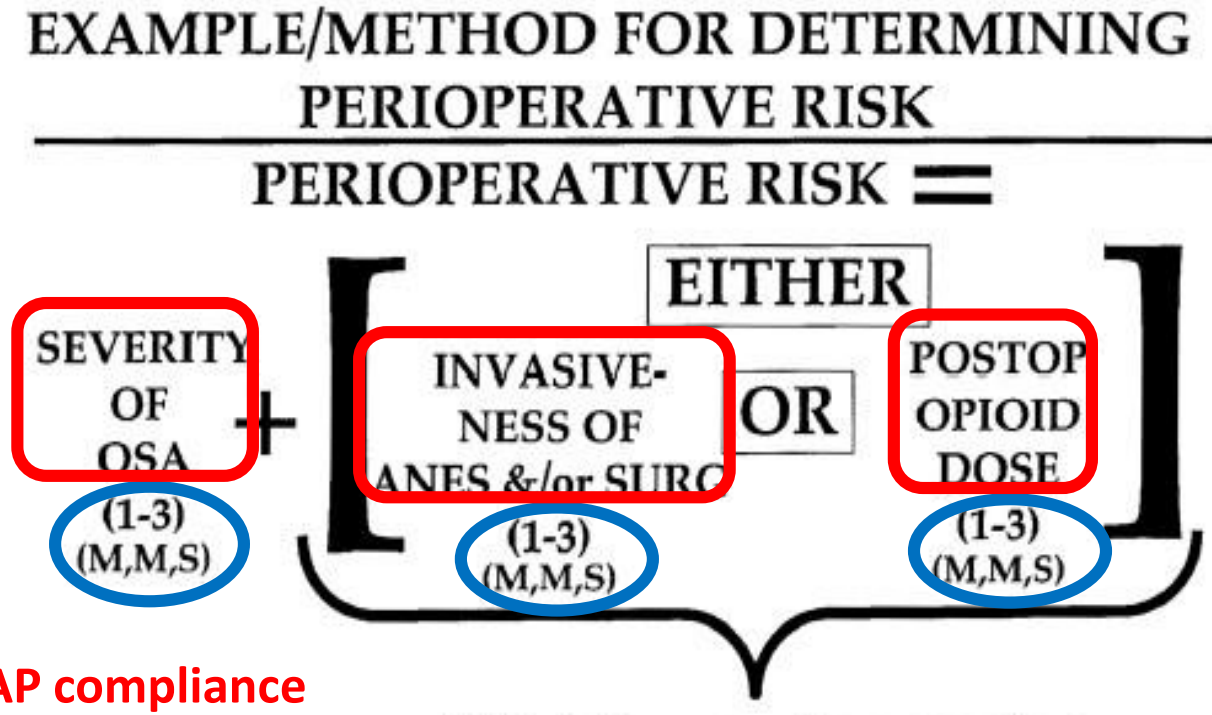


FIG. 6. Calculating perioperative risk. M, M, S = mild, moderate, or severe.

ASA-OSA Guideline 2006 & 2014

ASA-OSA: Postop Risk Scoring System

Table 2. OSA Scoring System: Example

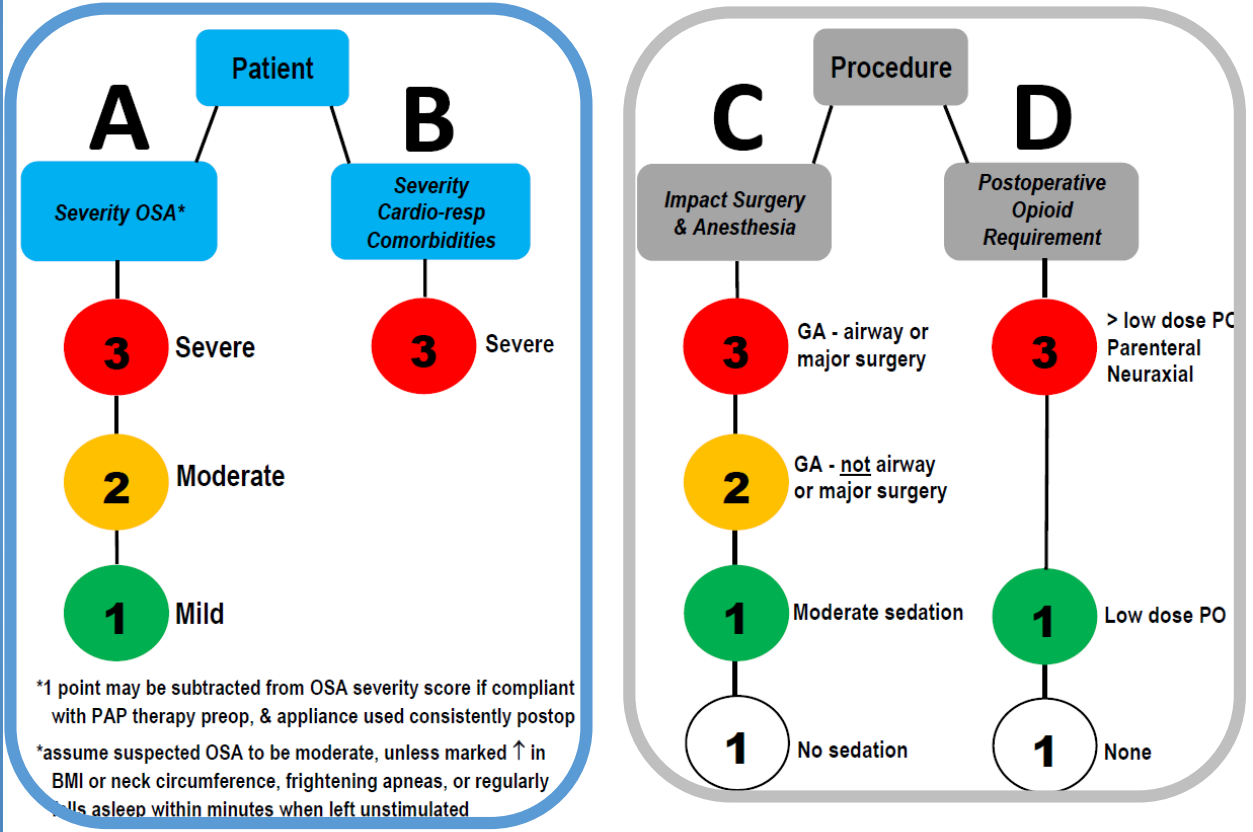
	Points
A. Severity of sleep apnea based on sleep study (or clinical indicators if sleep study not available). Point score _____ (0–3)*†	
Severity of OSA (table 1)	
None	0
Mild	1
Moderate	2
Severe	3
B. Invasiveness of surgery and anesthesia. Point score _____ (0–3)	
Type of surgery and anesthesia	
Superficial surgery under local or peripheral nerve block anesthesia without sedation	0
Superficial surgery with moderate sedation or general anesthesia	1
Peripheral surgery with spinal or epidural anesthesia (with no more than moderate sedation)	1
Peripheral surgery with general anesthesia	2
Airway surgery with moderate sedation	2
Major surgery, general anesthesia	3
Airway surgery, general anesthesia	3
C. Requirement for postoperative opioids. Point score _____ (0–3)	
Opioid requirement	
None	0
Low-dose oral opioids	1
High-dose oral opioids, parenteral or neuraxial opioids	3
D. Estimation of perioperative risk. Overall score = the score for A plus the greater of the score for either B or C. Point score _____ (0–6)‡	

A scoring system similar to this table may be used to estimate whether a patient is at increased perioperative risk of complications from obstructive sleep apnea (OSA). This example, which has not been clinically validated, is meant only as a guide, and clinical judgment should be used to assess the risk of an individual patient.

* One point may be subtracted if a patient has been on continuous positive airway pressure (CPAP) or noninvasive positive-pressure ventilation (NIPPV) before surgery and will be using his or her appliance consistently during the postoperative period. † One point should be added if a patient with mild or moderate OSA also has a resting arterial carbon dioxide tension ($Paco_2$) greater than 50 mmHg. ‡ Patients with score of 4 may be at increased perioperative risk from OSA; patients with a score of 5 or 6 may be at significantly increased perioperative risk from OSA.

OSA: Postoperative Risk Score

Vancouver Acute Department of Anesthesia & Perioperative Care



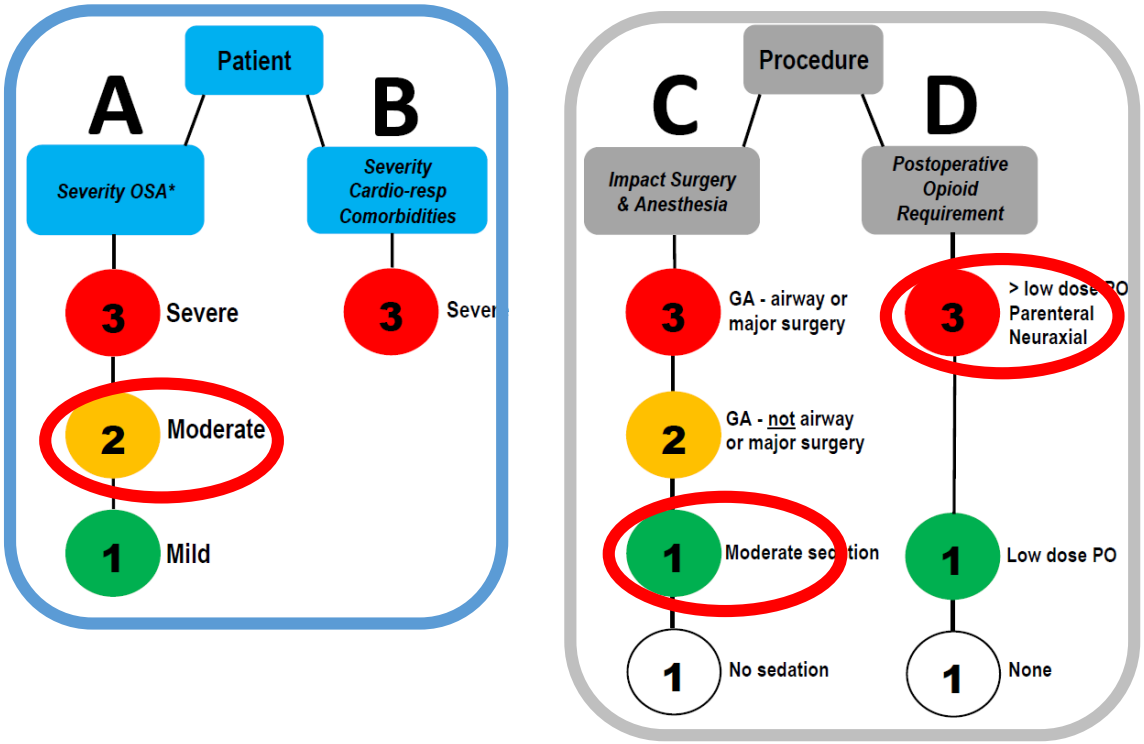
Postoperative Risk Score	Postoperative Risk	Minimum Observation Level
5-6	may be significantly ↑	monitored bed
4	may be ↑	? ward
2-3	probably not ↑	home

Postoperative Risk Score: Example 1

TKR

OSA: moderate; no PAP Tx
Comorb: none
Procedure: peripheral; SAB; sedation
Opioid: PCA

Add greatest score under either column A or B, to greatest score under either column C or D



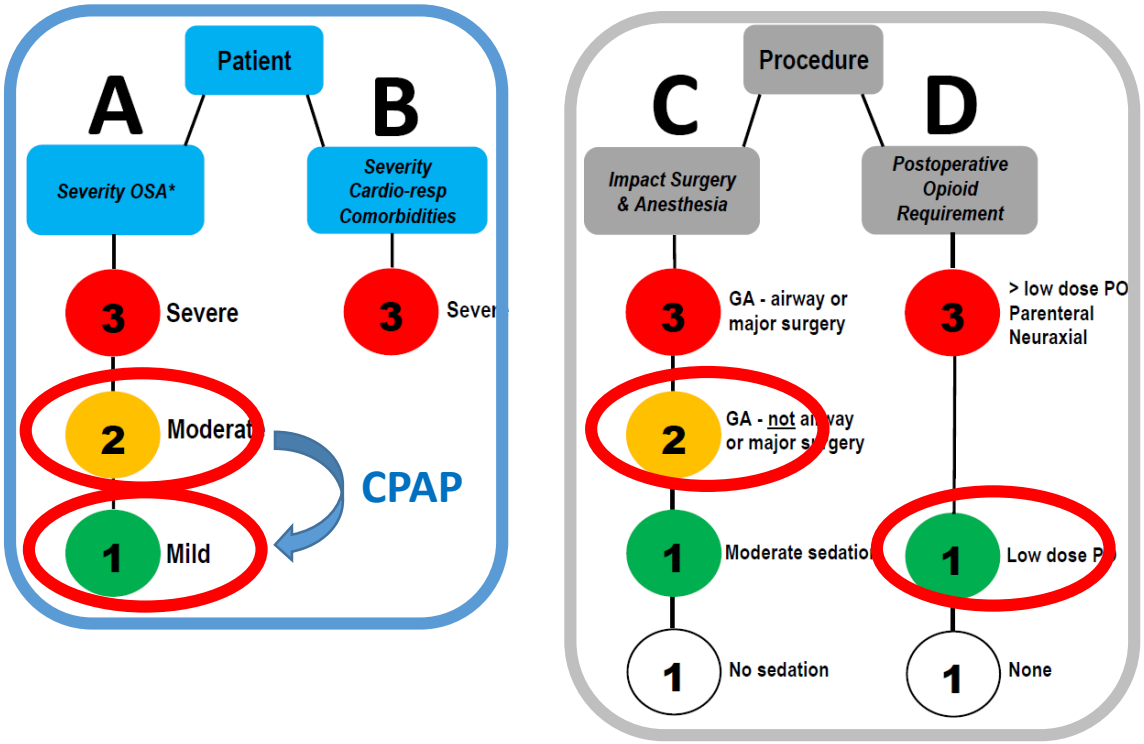
Postoperative Risk Score	Postoperative Risk	Minimum Observation Level
5-6	may be significantly ↑	monitored bed
4	may be ↑	? ward
2-3	probably not ↑	home

Postoperative Risk Score: Example 2

MIS Chole

OSA: moderate; on CPAP
Comorb: no severe cardio-resp issues
Procedure: GA; not major
Opioid: low dose PO

Add greatest score under either column A or B, to greatest score under either column C or D



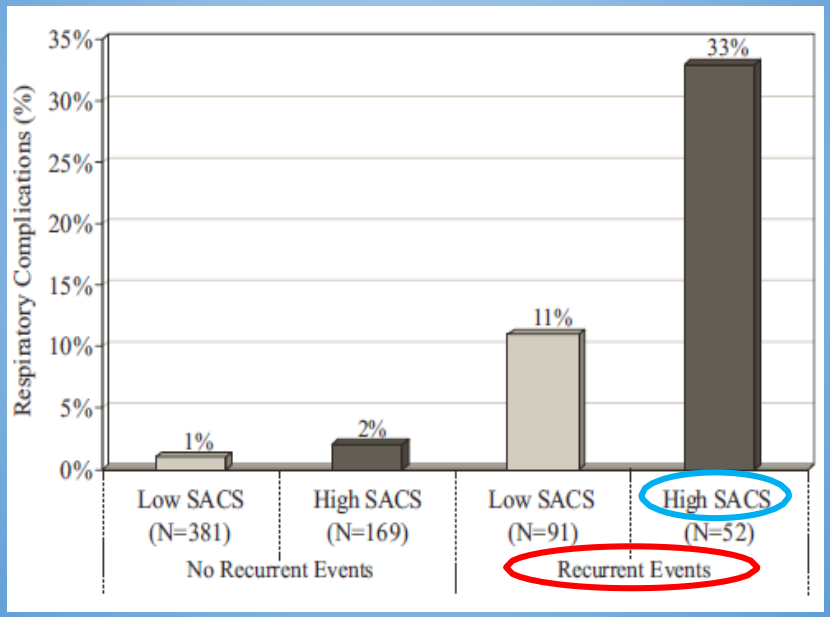
Postoperative Risk Score	Postoperative Risk	Minimum Observation Level
5-6	may be significantly ↑	monitored bed
4	may be ↑	? ward
2-3	probably not ↑	home

Anesthesiology 2009; 110:869–77

Identification of Patients at Risk for Postoperative Respiratory Complications Using a Preoperative Obstructive Sleep Apnea Screening Tool and Postanesthesia Care Assessment

Bhargavi Gali, M.D., Francis X. Whalen, M.D.,* Darrell R. Schroeder, M.S.,† Peter C. Gay, M.D.,‡ David J. Plevak, M.D.§*

Bhargavi Gali

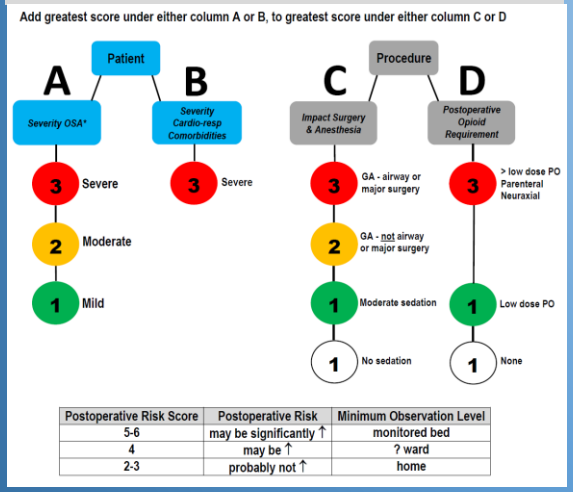


Conclusion: recurrent resp events in PACU are signif predictors of risk of postop resp complications, esp if preop OSA screening test +ve

OSA: 2-component Postop Risk Prediction

www.stopbang.ca

Postoperative Risk Score



Postoperative Risk Score	Postoperative Risk	Minimum Observation Level
5-6	may be significantly ↑	monitored bed
4	may be ↑	? ward
2-3	probably not ↑	home

+

Postoperative Risk Indicators

- Recurrent respiratory events
- Newly required PAP therapy
- Respiratory failure
- Significant risk of myocardial ischemia/dysrhythmia
- Opioid or sedative requirement not stabilized
- Pain-sedation mismatch

VIII. OSA: Postoperative Precautions

1. Resume PAP Tx
2. Avoid supine position if possible
3. Extended PACU stay
4. Monitored bed for patients at ↑ risk
5. Respirology consult for high risk patients
6. Caution with opioids/sedatives
7. Judicious O_2 supplementation
8. Provide discharge instructions

OSA: Extended PACU Stay

- **2006 ASA-OSA Guideline:**
  - for a median of 3 hrs longer
- **2014 ASA-OSA Guideline:**
  - lit insuff to offer guidance re. approp duration of postop resp monitoring in pts with OSA
  - continuous monitoring should be maintained "as long as pts remain at ↑ risk"
- **2011: Seet & Chung: Algorithms for Periop OSA Mx**
  - 30-60 min after standard discharge criteria met (based on Gali's study)

OSA: Indications for a Monitored Bed

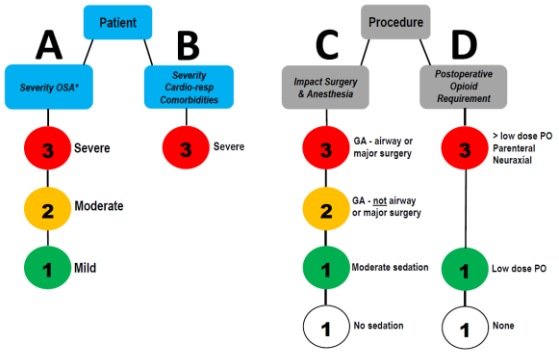
High Postoperative Risk Score,

or

Presence of any Postoperative Risk Indicators

Postoperative Risk Score

Add greatest score under either column A or B, to greatest score under either column C or D



Postoperative Risk Score	Postoperative Risk	Minimum Observation Level
5-6	may be significantly ↑	monitored bed
4	may be ↑	? ward
2-3	probably not ↑	home

Postoperative Risk Indicators

- Recurrent respiratory events
- Newly required PAP therapy
- Respiratory failure
- Significant risk of myocardial ischemia/dysrhythmia
- Opioid or sedative requirement not stabilized
- Pain-sedation mismatch

OSA: Definition of a Monitored Bed

= continuous oximetry & possibility of early nursing intervention:

- PACU/SDU/other critical care unit, or
- dedicated, approp trained professional observer in room, or
- remote oximetry monitoring by telemetry on ward

- consider adding cardiac monitoring if at risk of myocardial ischemia or dysrhythmia
- intermittent oximetry, or continuous oximetry without continuous observation, does not provide the same level of safety, and probably does not ↓ risk

CPAP is *not* a substitute for adequate postop monitoring

ASA-OSA Task Force 2006; CTS Guideline 2006

OSA: Discharge from Monitored Bed

- **no resp interventions required overnight** while resting/sleeping in an unstimulating environment, and
- **no other indicators** present for ongoing observation in a monitored bed

VA Department of Anesthesia & Perioperative Care – 2013

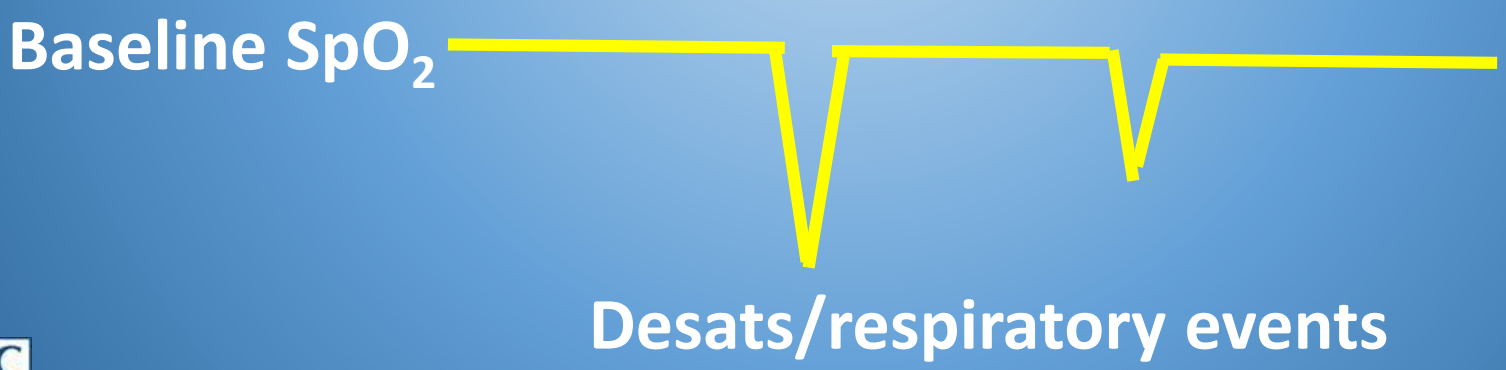
Sleep Apnea: O_2 therapy – less is more?

- May prolong apneas, exacerbate hypercapnia & hinder timely detection apnea & hypoventilation
- Titrate to minimum flow maintaining target baseline SpO_2, e.g.:
  1. O_2 @ 0 to 4 L/min by NP to maintain baseline SpO_2 at:
     a. ≥ 94%, or
     b. ≥ 90% (if hypercapnia)
  2. d/c O_2 if baseline SpO_2 maintained on room air

Sleep Apnea: Room air challenge

= 15 minutes of room air, to establish baseline SpO_2

- if baseline room air SpO_2 below 90%, patient is in hypoxemic respiratory failure, indicating ongoing need for a monitored bed, ABG & consideration of a Respirology consult
- number & severity of desats during this time should also be considered



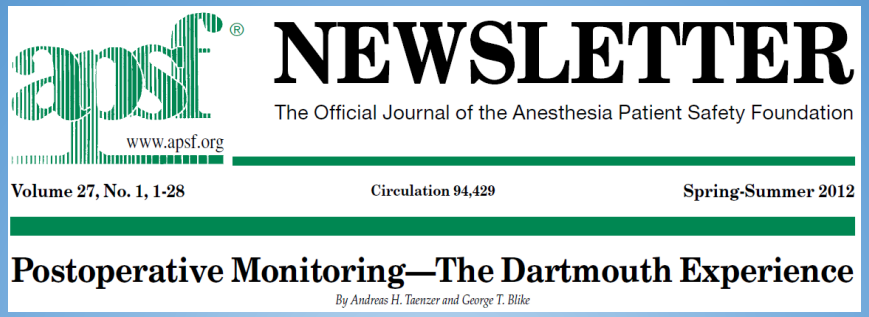
IX. Conclusion: 5 more slides…

Looking ahead…

OSA: Electronic monitoring

- Accoustic impedance
- Capnography
- Non-invasive ventilation
- Photoplethysmography

OSA: continuous SpO_2 with alarm system


apsf®
www.apsf.org

NEWSLETTER

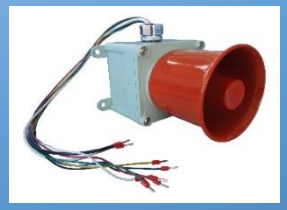
The Official Journal of the Anesthesia Patient Safety Foundation

Volume 27, No. 1, 1-28 | Circulation 94,429 | Spring-Summer 2012

Postoperative Monitoring—The Dartmouth Experience

By Andreas H. Taenzer and George T. Blike

- Taenzer at al. Anesthesiology 2011: ↓ rescue events & transfers to ICU with CPOX surveillance system of postop pts
- finger probes for continuous SpO_2 seem to be better tolerated than neck sensors for accoustic resp monitoring, nasal cannulas for capnography, or chest straps for RR monitoring



Sleep Apnea – Spectrum of Postop Risk...

?

?

Home/Ward

Ward
(? SpO_2 with alarm)

Monitored bed

Charles J Cote
Professor of Anesthesia
Harvard Medical School

“death due to apnea is preventable”