Perioperative Consideration and Mx of OSA

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Disclosure

- Research support
- Dept. of Anesthesia, University Health Network, University of Toronto
- University Health Network Foundation
- Physicians Services Incorporated Foundation
- ResMed Foundation

Conflict of Interest

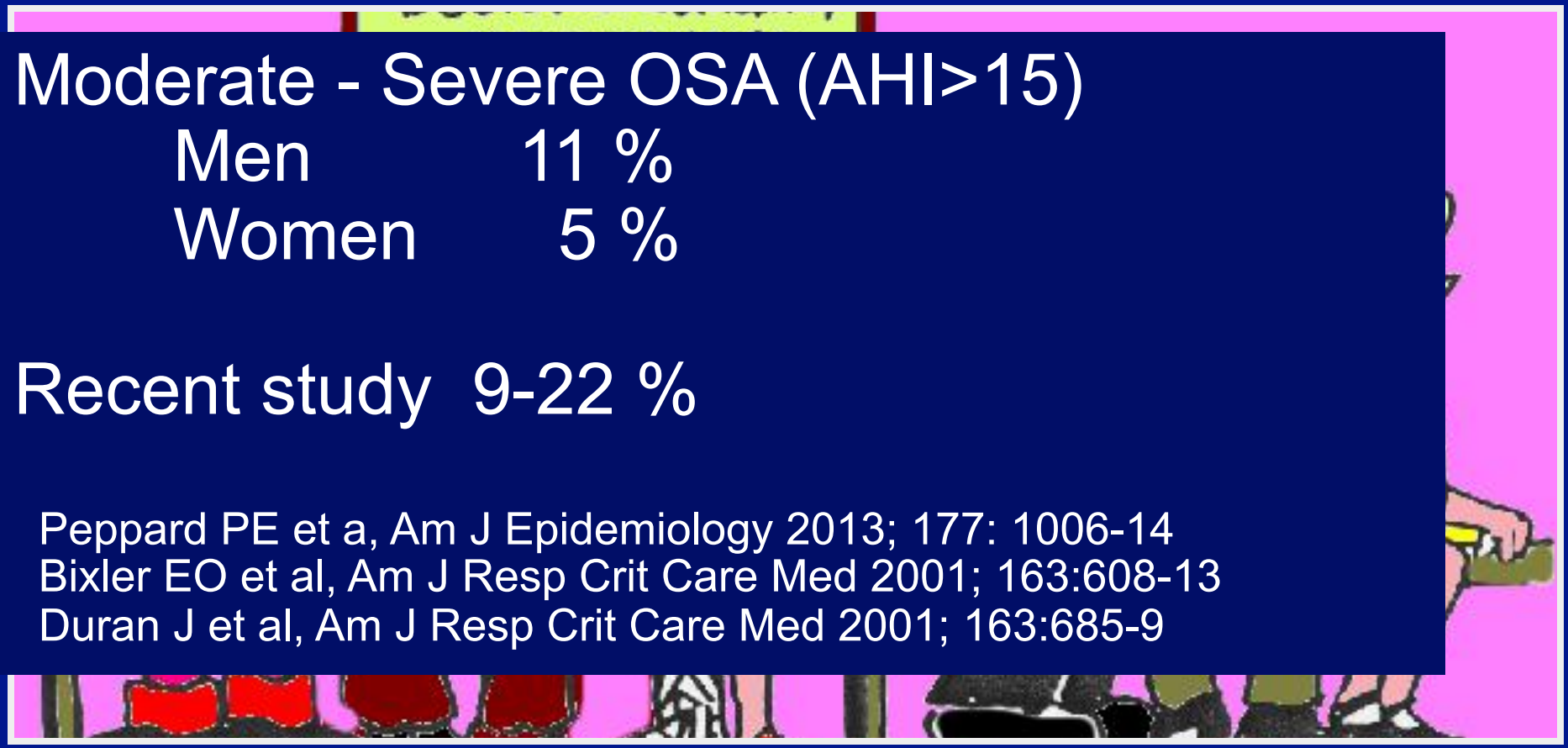
Updated STOP-Bang questionnaire: Proprietary to University Health Network

Pfizer research grant

Outline

- Adverse events of patients with OSA
- How do we identify patients with OSA?
- Perioperative management of OSA pt.
- CPAP treatment

Prevalence of OSA



Moderate - Severe OSA (AHI>15)

Men	11 %
Women	5 %

Recent study 9-22 %

Peppard PE et a, Am J Epidemiology 2013; 177: 1006-14
Bixler EO et al, Am J Resp Crit Care Med 2001; 163:608-13
Duran J et al, Am J Resp Crit Care Med 2001; 163:685-9

Meta-analysis: OSA and postop Cx. 13 and 17 studies

- Postop cardiac events OR 2.1
- Acute respiratory failure OR 2.4
- Desaturation OR 2.0
- ICU transfer OR 2.4

Hai et al. J Clin Anesth 2014;26:591-600.

Roop K BJA 2012; 109: 897-906

OSA and Complications

- 530,089 patients Premier Database
- THA and TKR
- Higher periop Cx
- Higher mortality
- Increased LOS
- Increased utilization of resource

Memtsoudis et al. Anesth Analg 2014;118:407–18

OSA as a Risk Factor for Postop Cx After Revision Joint Arthroplasty

- NIS, 258 455 pt. with revision THA or TKA
- 6.4% OSA
- Increased in-hospital mortality (OR 1.9)
- PE (OR 2.1)
- Wound hematomas (OR 1.36)
- Increased postop charges
- $61,044 vs. $58,813; P <0.001

D'Apuzzo J of Arthroplasty 2012; 27: 8:95-98

OSA and Postop Delirium

- An association between OSA and postop delirium

Flink BJ et al Anesthesiology. 2012; 116: 788–96

- Cardiac surgery pts.

  Preop AHI ≥ 19 associated with 6-fold increased risk of postop delirium

Roggenbach et al. Crit Care 2014 Sept

SDB and Postop Outcomes: Analysis of the Nationwide Inpatient Sample

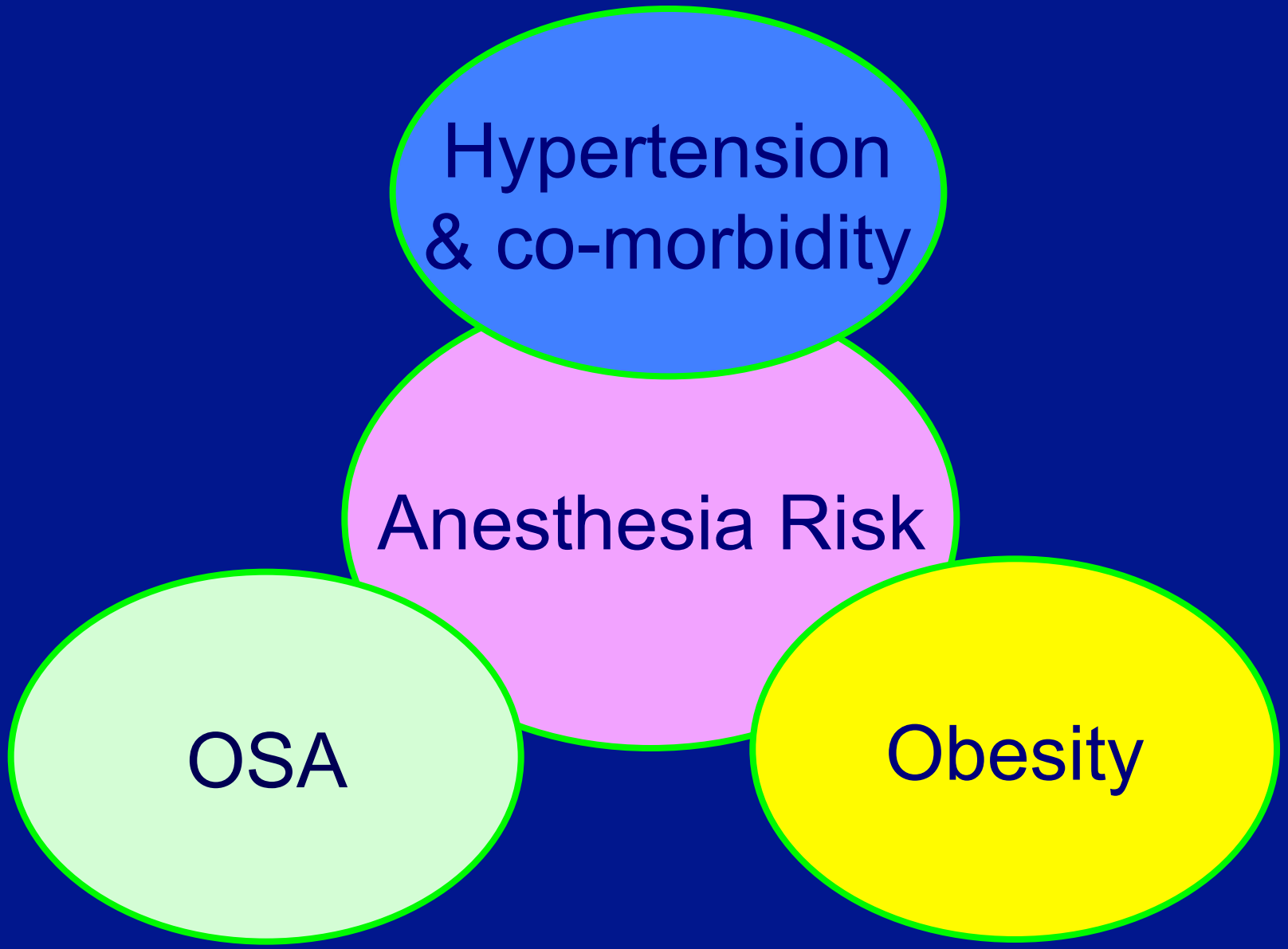
- 1 million pts: ortho, prostate, abd. & CVS
- OSA: increased risk of emergent ET intubation, noninvasive ventilation & A fib.
- OSA: not associated with clinically significant increases in in-hospital death, LOS, or total charges
- Similar results in bariatric surgical pts

Mokhlesi B et al Chest 2013 Mar 28. doi: 10.1378/12-2905

Mokhlesi B et al Obes Surg 2013; 23:1842-1851.

Periop risks for OSA

Anesthesia Risk of OSA Pt.



Clinical conundrum

- Many pt. with untreated or undiagnosed OSA are undergoing surgery everyday
- Why do not more pt. have death or adverse events ?

Which OSA pt. is at risk of periop Cx?

- Apnea Hypopnea Index?
- Degree of O2 desat.? Intermittent hypoxia? Cumulated time of desaturation? Lowest O_2 level at night?
- Lack of arousal due to respiratory depression by opioids?

- How great is the role of OSA in respiratory depression due to opioids?

Sudden Cardiac Death and OSA

- Sudden cardiac death in patients with OSA

- Related to lowest O2 sat. 78% and mean O2 sat. < 93%

- Gami et al J Am Clin Cardiology 2013

Preop Over-night Oximetry Predict Postop Cx

Chung F et al Minerva Anestesiol 2014

- Mean preop over-night SpO2 < 93%
  ODI > 29 events/h
  Cumlated time overnight <90% >7%
- Higher risk for postop adverse events
- Odds ratio for Cx 2.2

- Over-night oximetry: A useful tool to stratify patients for the risk of postop Cx

Society of Anesthesia & Sleep Medicine

SASM

http://www.sasmhq.org

Obstructive Sleep Apnea Registry

Collaboration between SASM and AQI

Outline

- Adverse events of patients with OSA
- How do we identify patients with OSA?
- Perioperative management of OSA pt.
- CPAP treatment

Obstructive sleep apnea and anesthesia

- Recognition of OSA patients:

  Known, unknown

  Treated and untreated

Prevalence of unDx OSA among adult surgical pt.

- 82% of men and 93% of women with moderate-severe OSA are undiagnosed

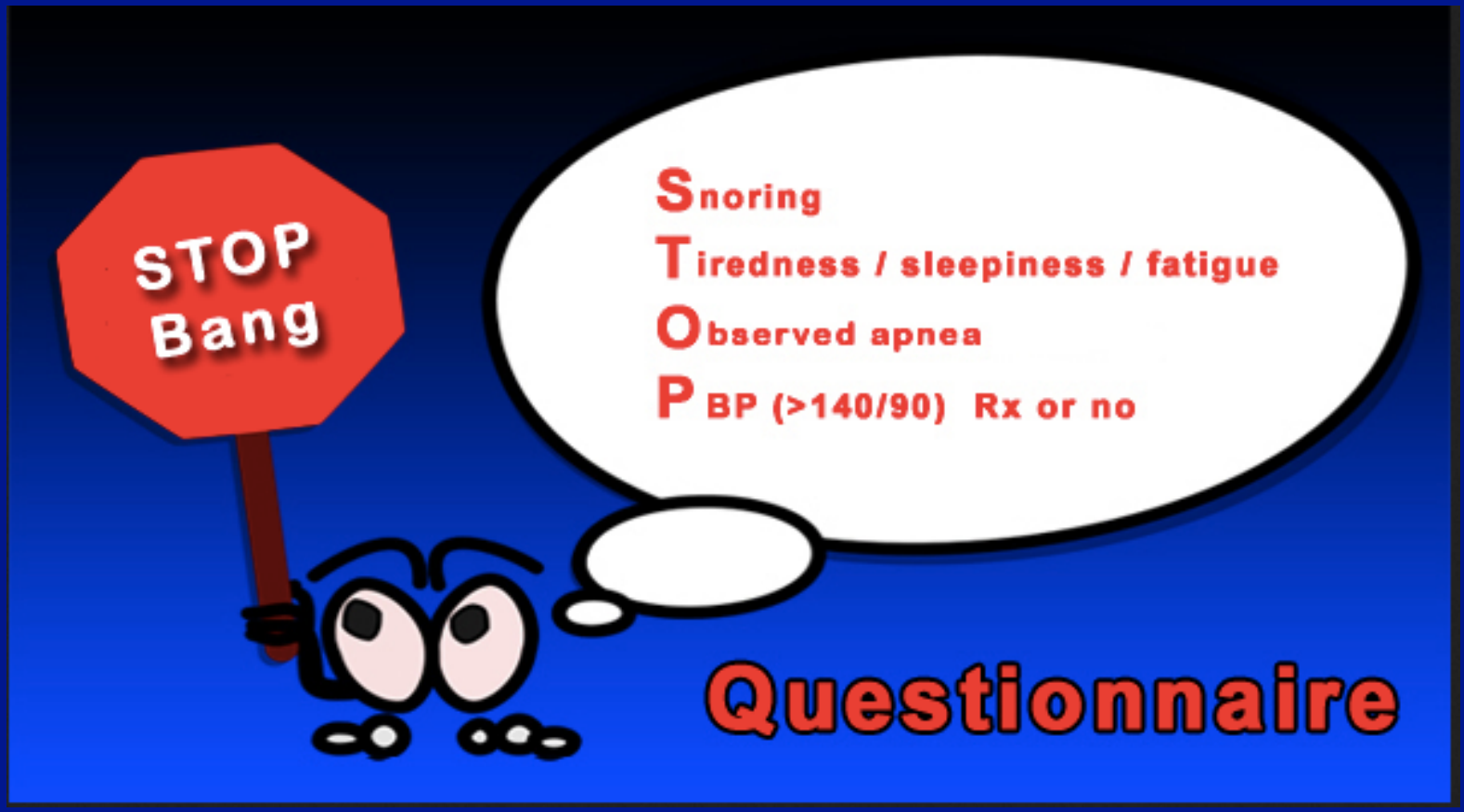
Young T et al. Sleep 1997; 20: 705-6

Finkle KJ et al Sleep Med 2009;10:753-8

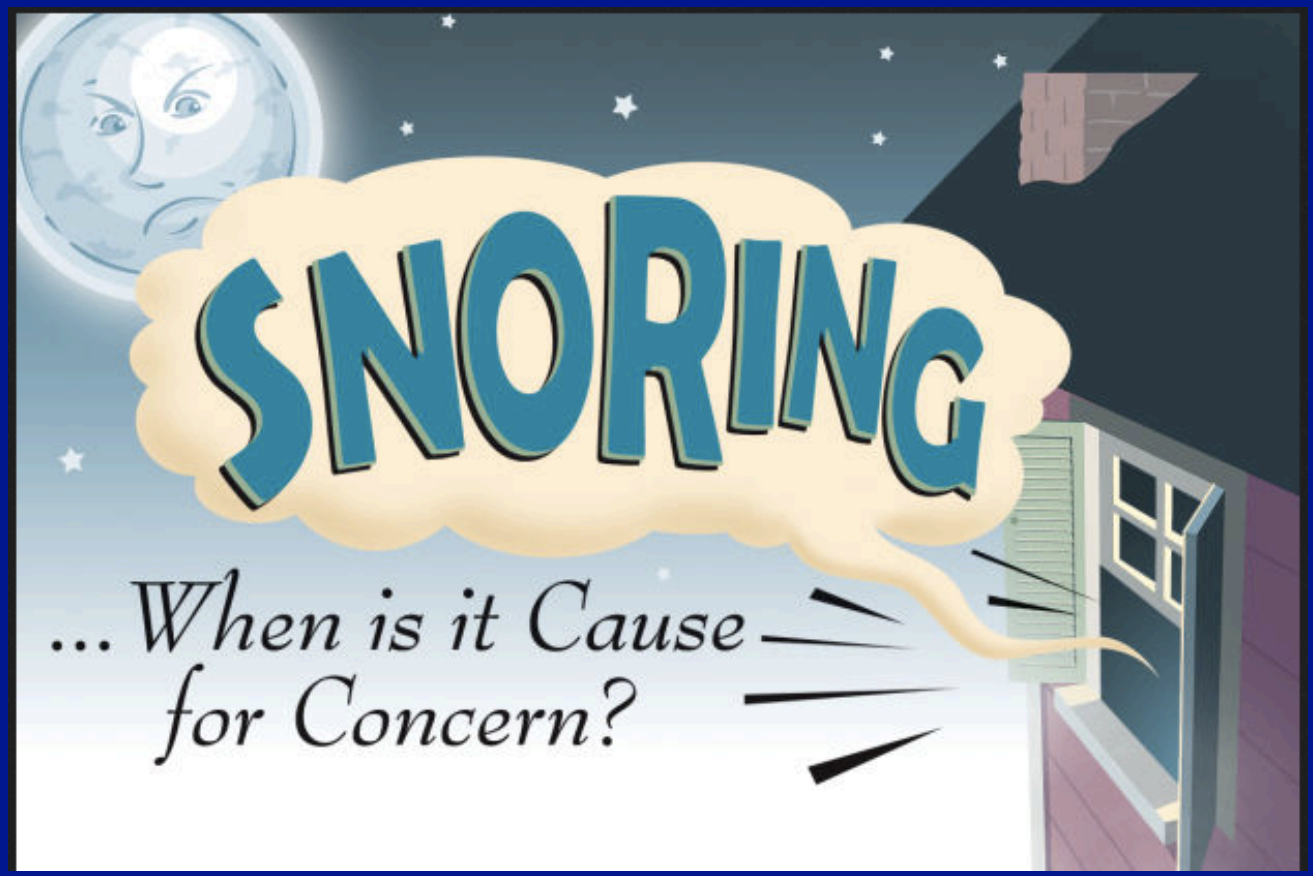
Singh M et al BJA 2013; 110: 629-36

STOP-Bang questionnaire

F Chung et al. Anesthesiology 2008; 108:1-10



1. Snoring



Do you **Snore Loudly** (loud enough to be heard through closed doors)?

Do you **Snore Loudly** (your bed-partner elbows you for snoring at night)?

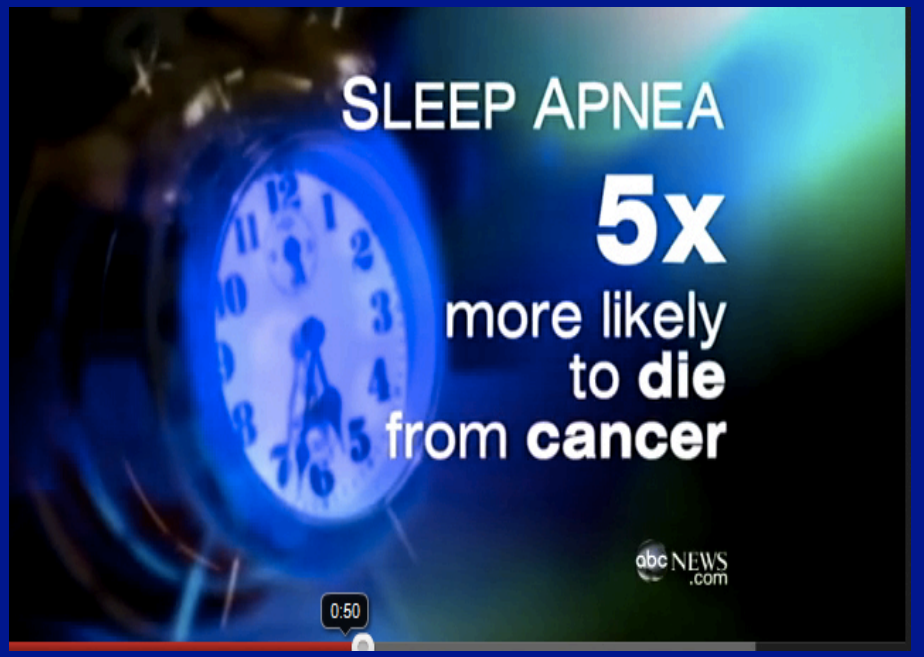
2. Tired


TIRED.
JUST TIRED.
more awesome pictures at THEMETAPICTURE.COM

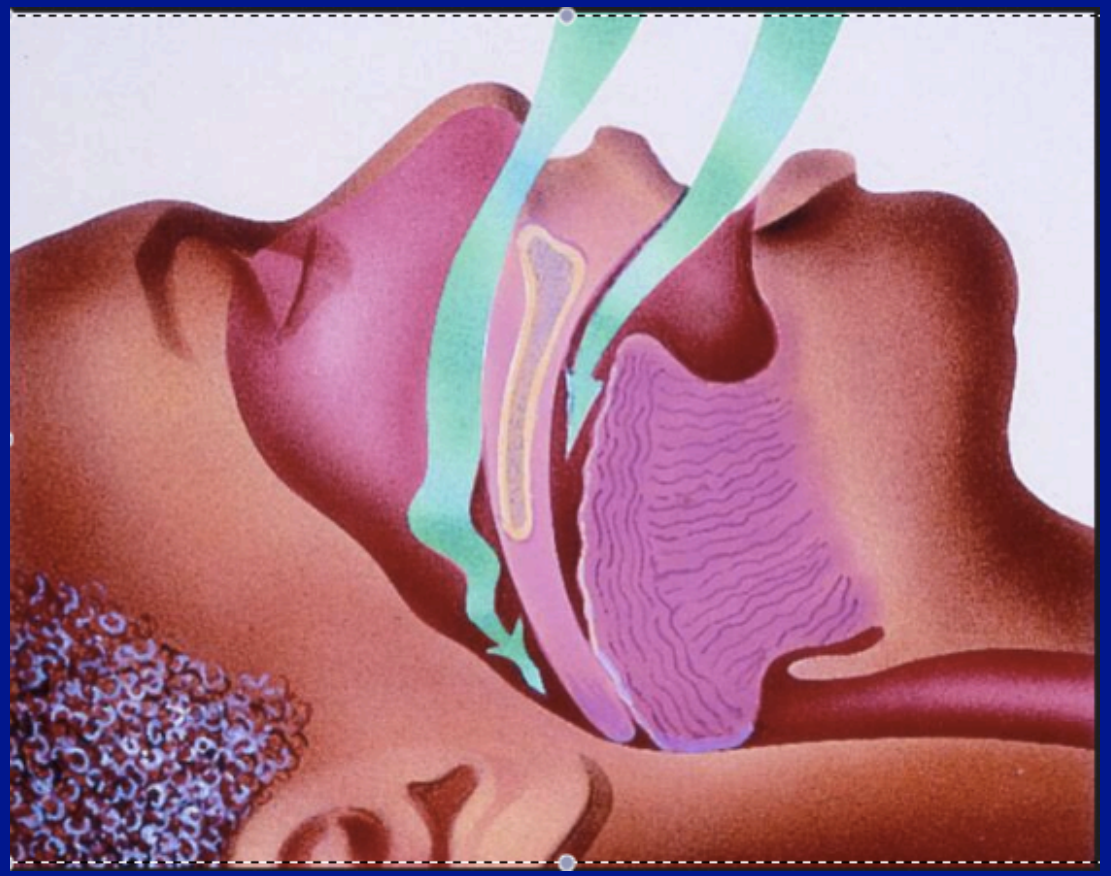
Do you often feel **Tired, Fatigued, or Sleepy** during the daytime (such as falling asleep during driving)?

Do you often feel **Tired, Fatigued, or Sleepy** during the daytime?

Do you often feel **Tired, Fatigued, or Sleepy** during the daytime (such as falling asleep during driving)?

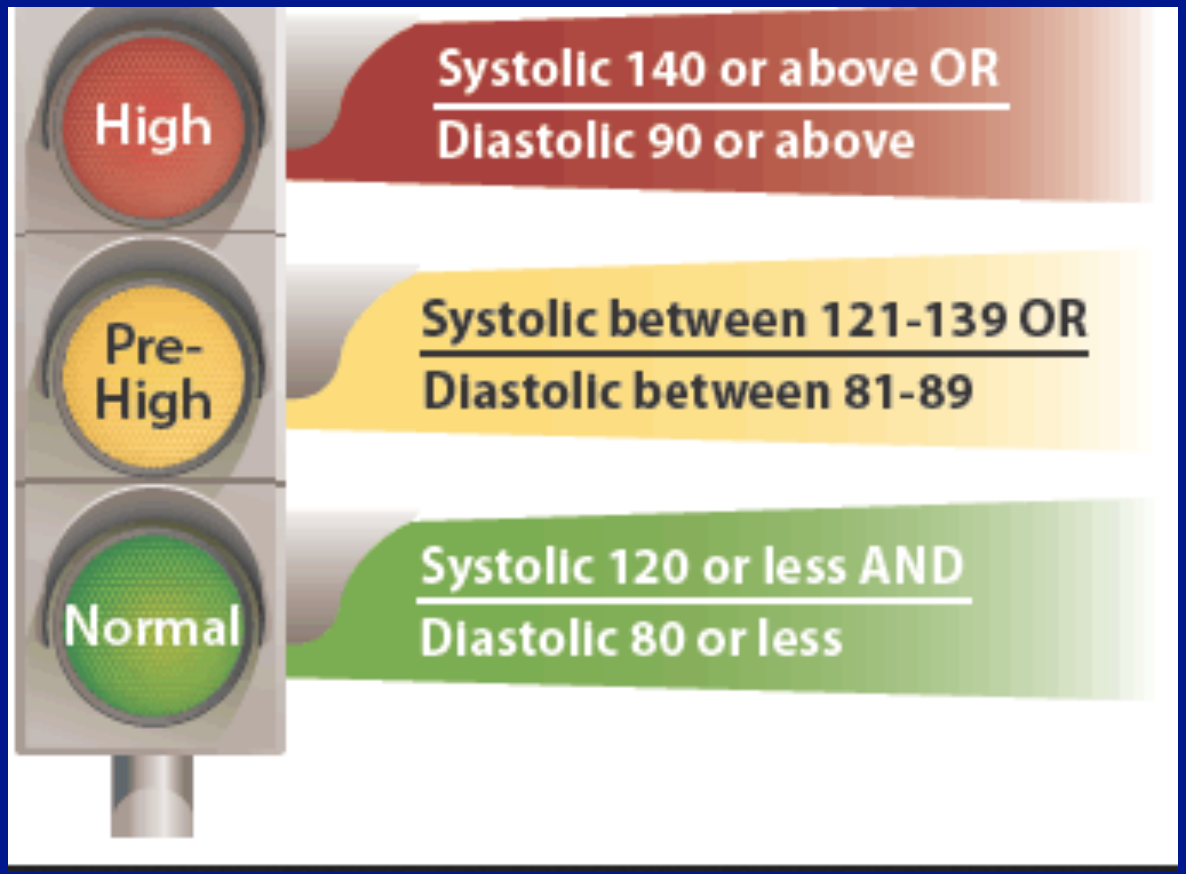


3. Observed not breathing?



Has anyone **Observed** you **Stop Breathing** or **Choking/Gasping** during your sleep?

4. Do you have or are being treated for **High Blood Pressure**?



5. BMI > 35 kg/m² ?

6. Age older than 50 year old?

7. Neck size large?

17 inches for male; 16 inches for female

8. Gender: male

STOP- Bang

- **S** Snoring
- **T** Tiredness / sleepiness / fatigue
- **O** Observed apnea
- **P** BP (>140/90) Rx or no Rx
- **B** BMI >35
- **A** Age >50
- **N** Neck circumference >40 cm
- **G** Gender male
- 3 / 8 questionnaire positive

Chung et al. Anesthesiology 2008; 108:1-10

Predictive Parameters for STOP-Bang Score of 3 or greater

Cutoff	Sensitivity	Specificity	PPV	NPP
AHI>5	84	56	81	61
A				0
A				0

SnNout

(high Sensitivity, Negative test = rule out)

STOP-Bang 0-2

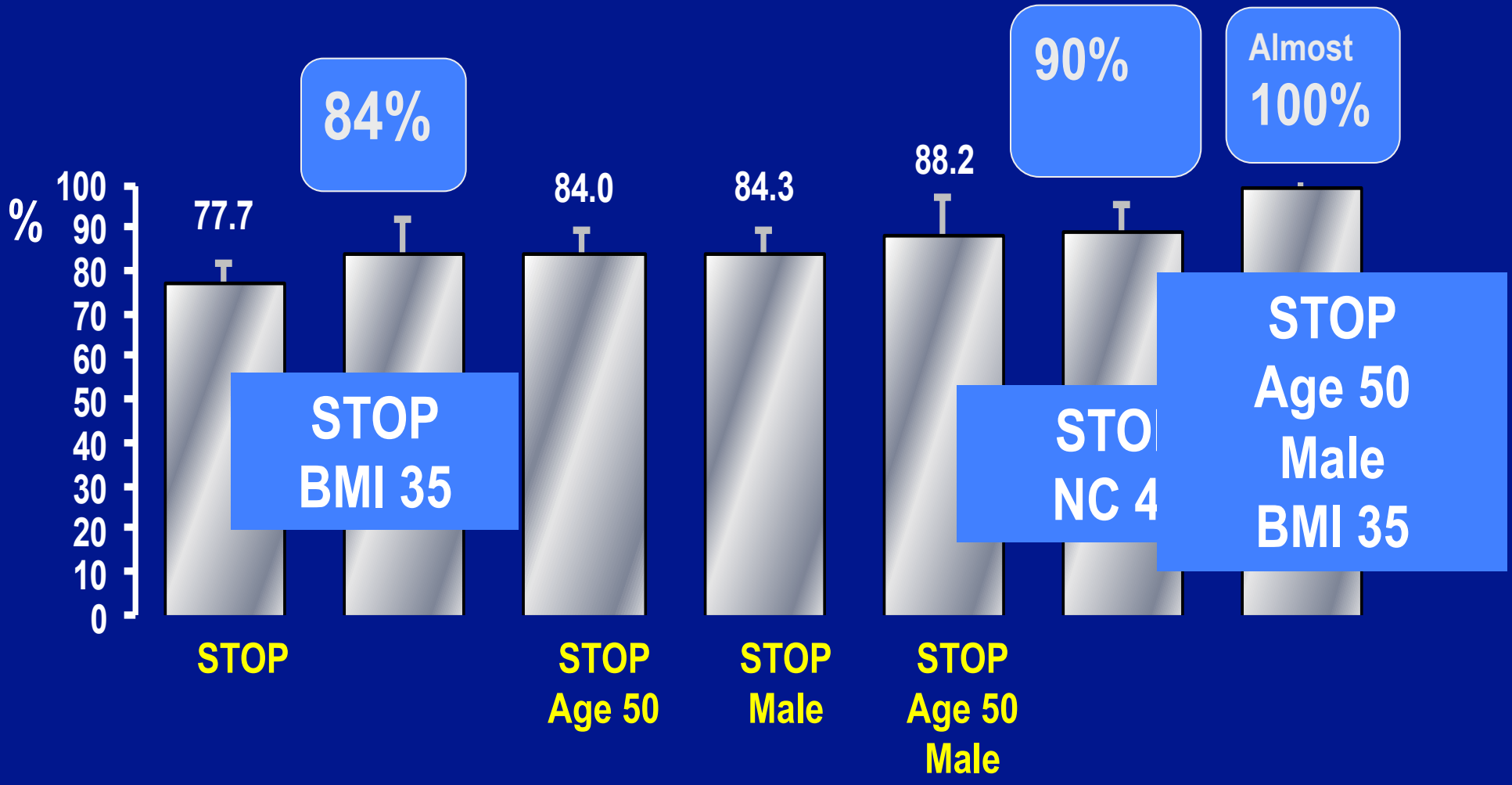
* Value expressed as percentage with 95% confidence interval

Predictive parameter of different pattern of factors in screening pt. with mod/ severe OSA

Chung F et al J Clin Sleep Med 2014

	N	Sensitivity %	Specificity %	Cutoff
STOP ≥2 + BMI >35	41	21	85	
STOP ≥2 + Age >50	117	59	56	
STOP ≥2 + Neck >40	66	34	79	
STOP ≥2 + Male	79	40	78	

PPV for STOP Combined With Other Factors



F Chung et al Anesthesiology 2008;108:1-10

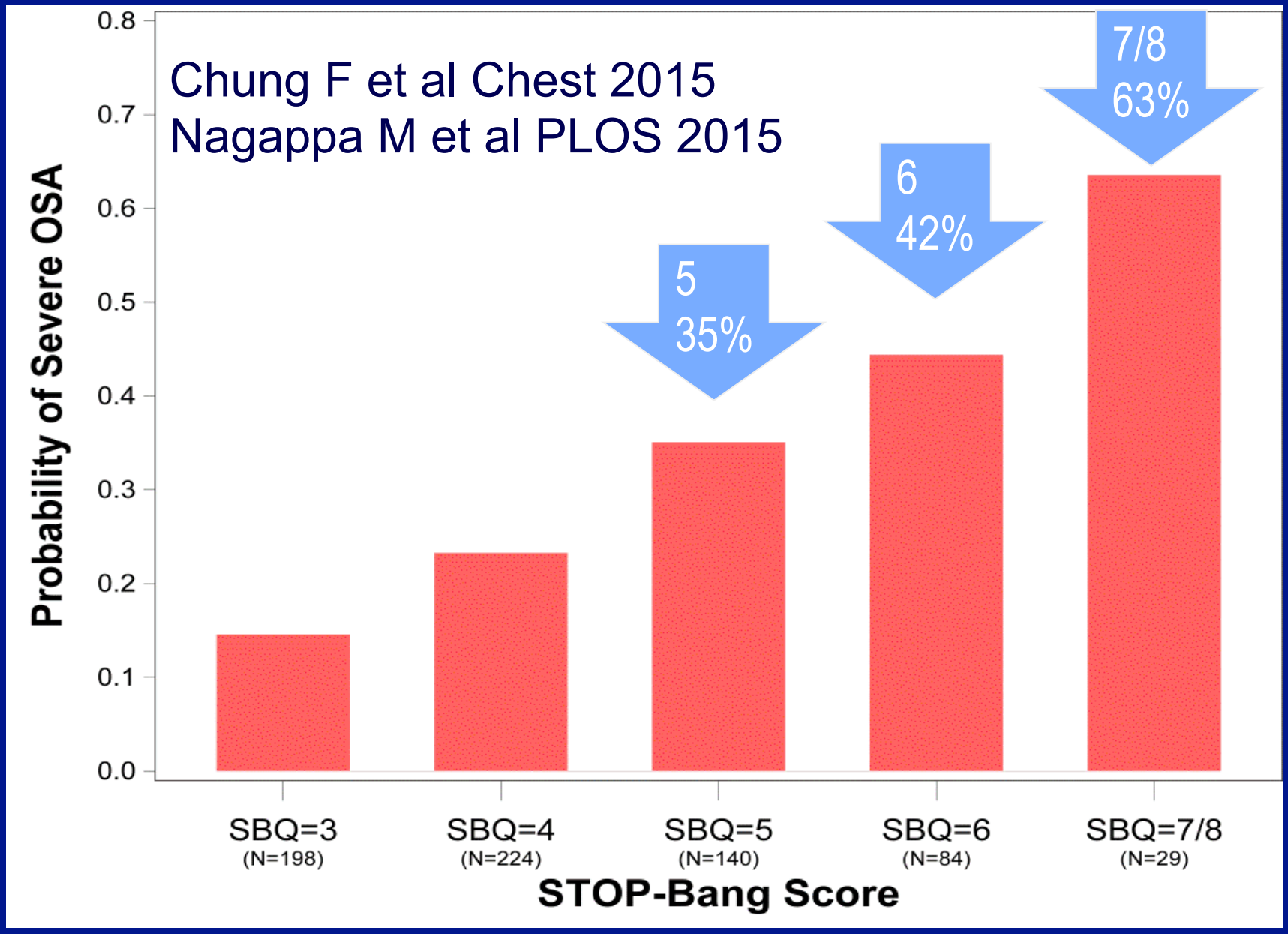
A higher STOP-Bang Score predicts mod/ severe OSA

	Sen (%)	Specificity (%)
STOP-Bang ≥ 5	56	74
STOP-Bang ≥ 6	28	**88**
STOP-Bang ≥ 7	12	**96**
STOP-Bang ≥ 8	0	99

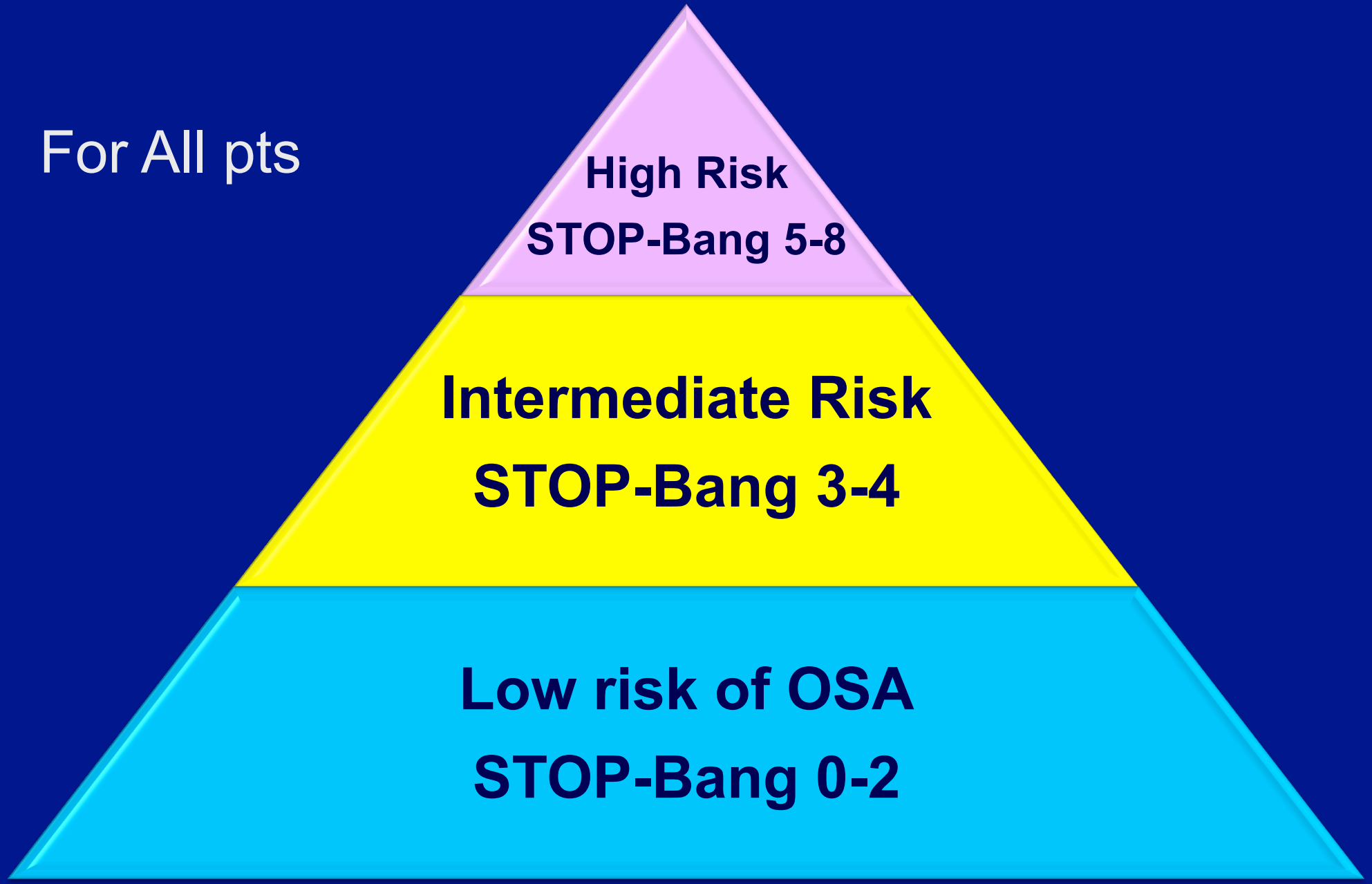
SpPin
High Specificity, +ve test, rule in

SN: Sensitivity; SP: Specificity

Chung F et a Br J Anaesth 2012; 108:768-75

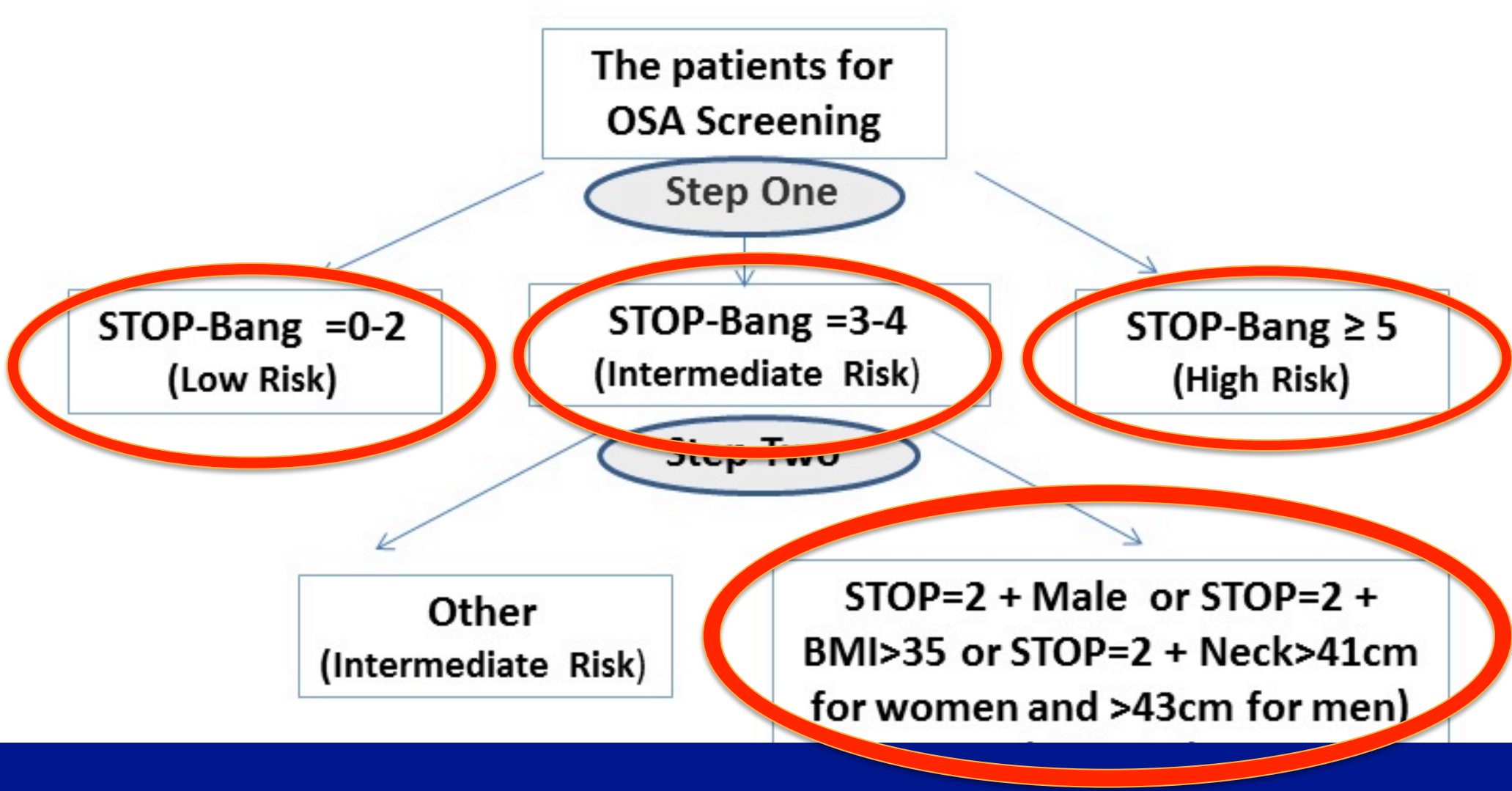

Chung F et al Chest 2015
Nagappa M et al PLOS 2015
Probability of Severe OSA
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
5
35%
6
42%
7/8
63%
SBQ=3
(N=198)
SBQ=4
(N=224)
SBQ=5
(N=140)
SBQ=6
(N=84)
SBQ=7/8
(N=29)
STOP-Bang Score

For All pts


High Risk
STOP-Bang 5-8
Intermediate Risk
STOP-Bang 3-4
Low risk of OSA
STOP-Bang 0-2

STOP-Bang Algorithm

Chung F et al. Chest 2016

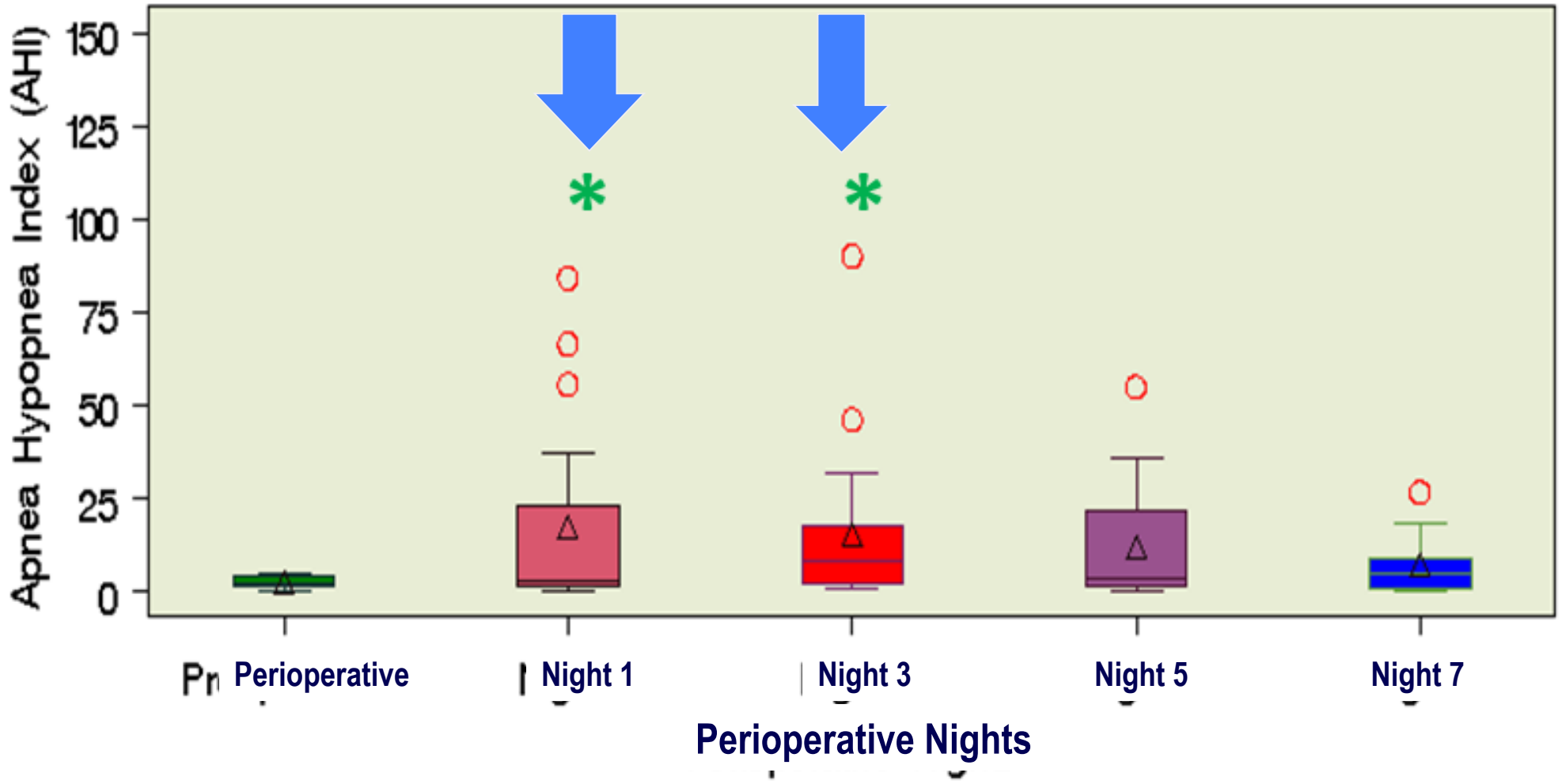


www.stopbang.ca

OSA, STOP- Bang, Anesthesia

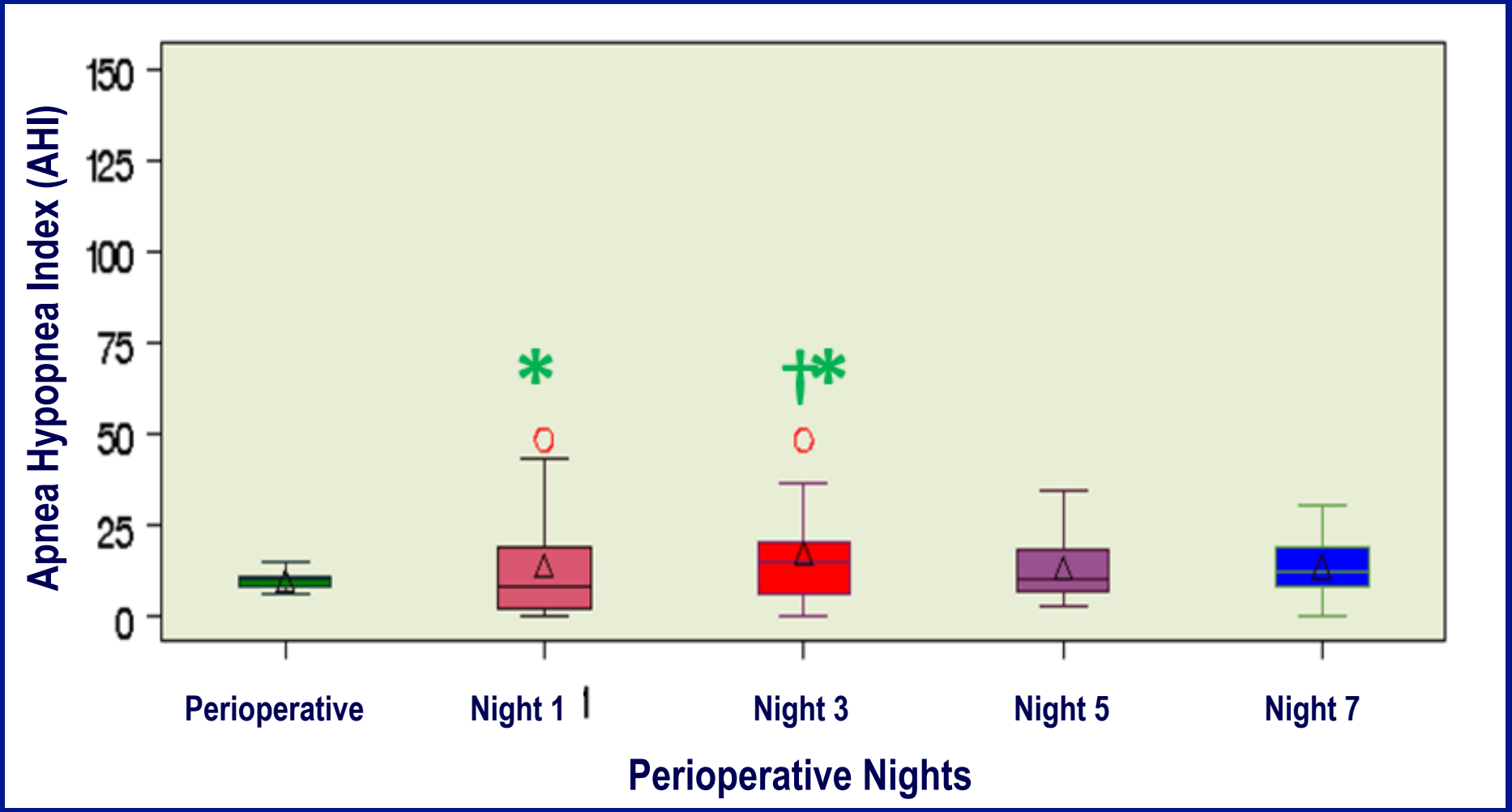
- Screening
- Anesthesia

Non-OSA



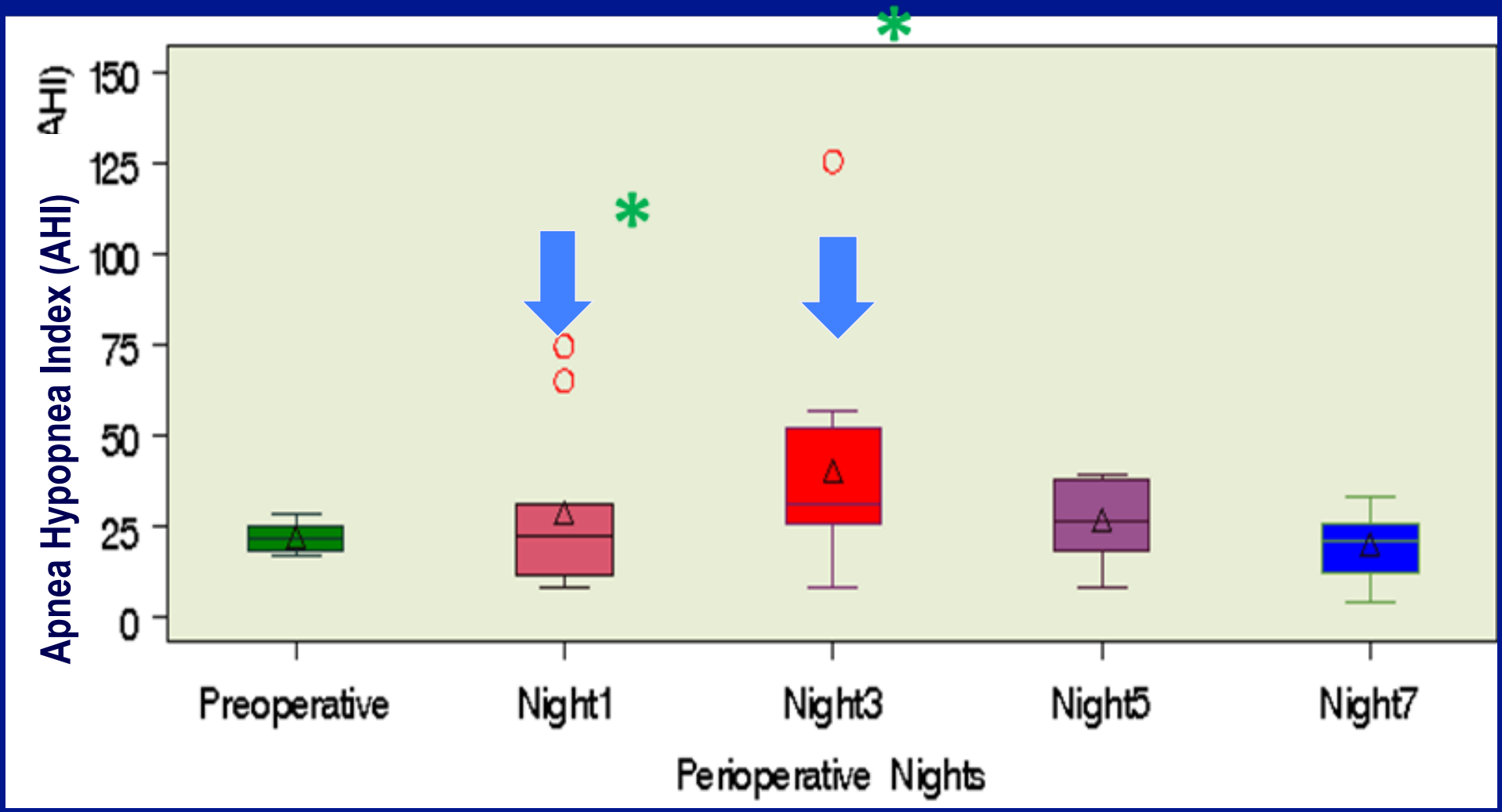
* : p<0.05 vs. Preop night ; †: p<0.05 vs. postop Night 1 Chung F et al, Anesthesiology 2014

Mild-OSA



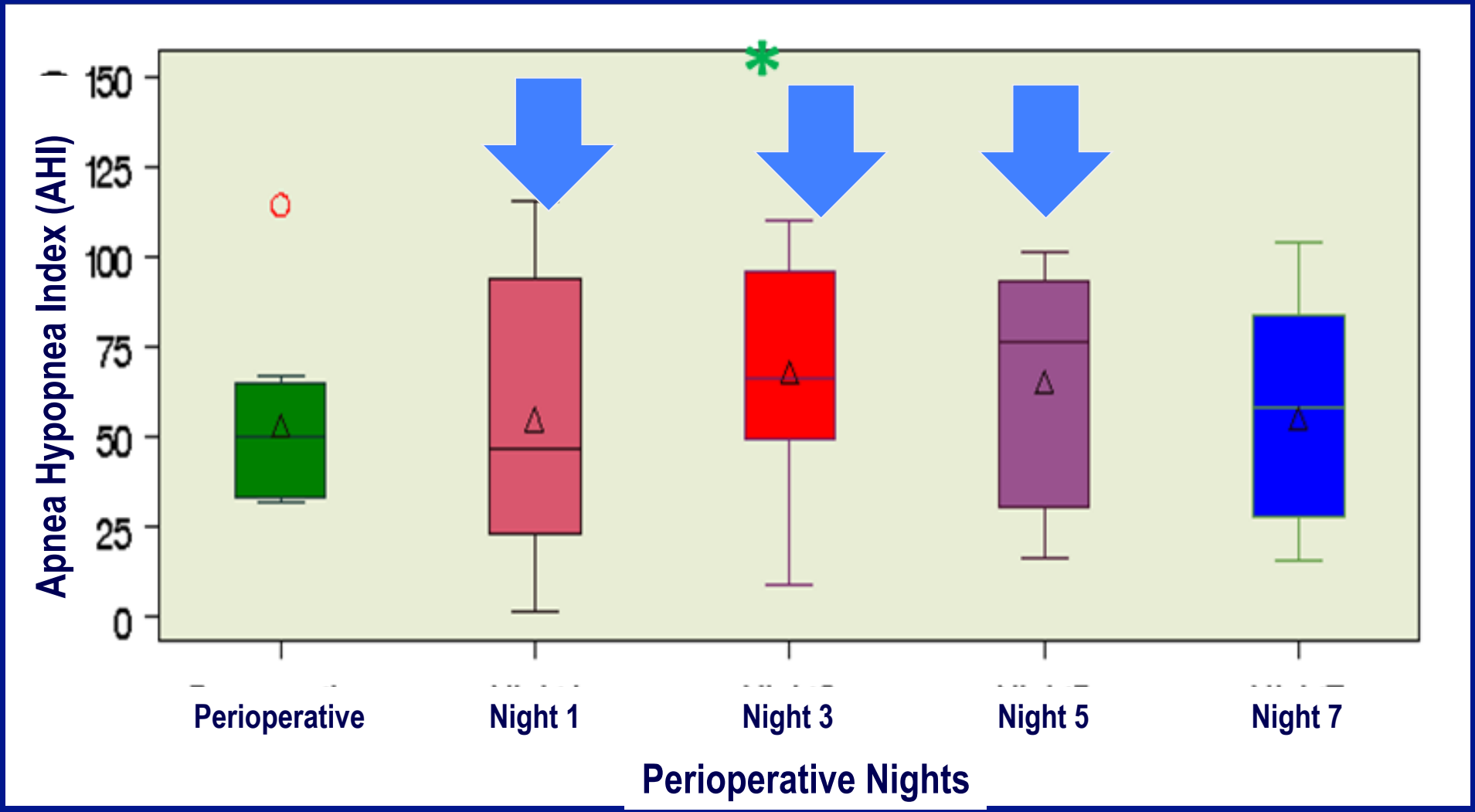
* : p<0.05 vs. Preop night; †: p<0.05 vs. postop night 1 Chung F et al, Anesthesiology 2014

Moderate-OSA



* : p<0.05 vs. Preop night; †: p<0.05 vs. postop N 1 Chung F et al, Anesthesiology 2014

Severe-OSA



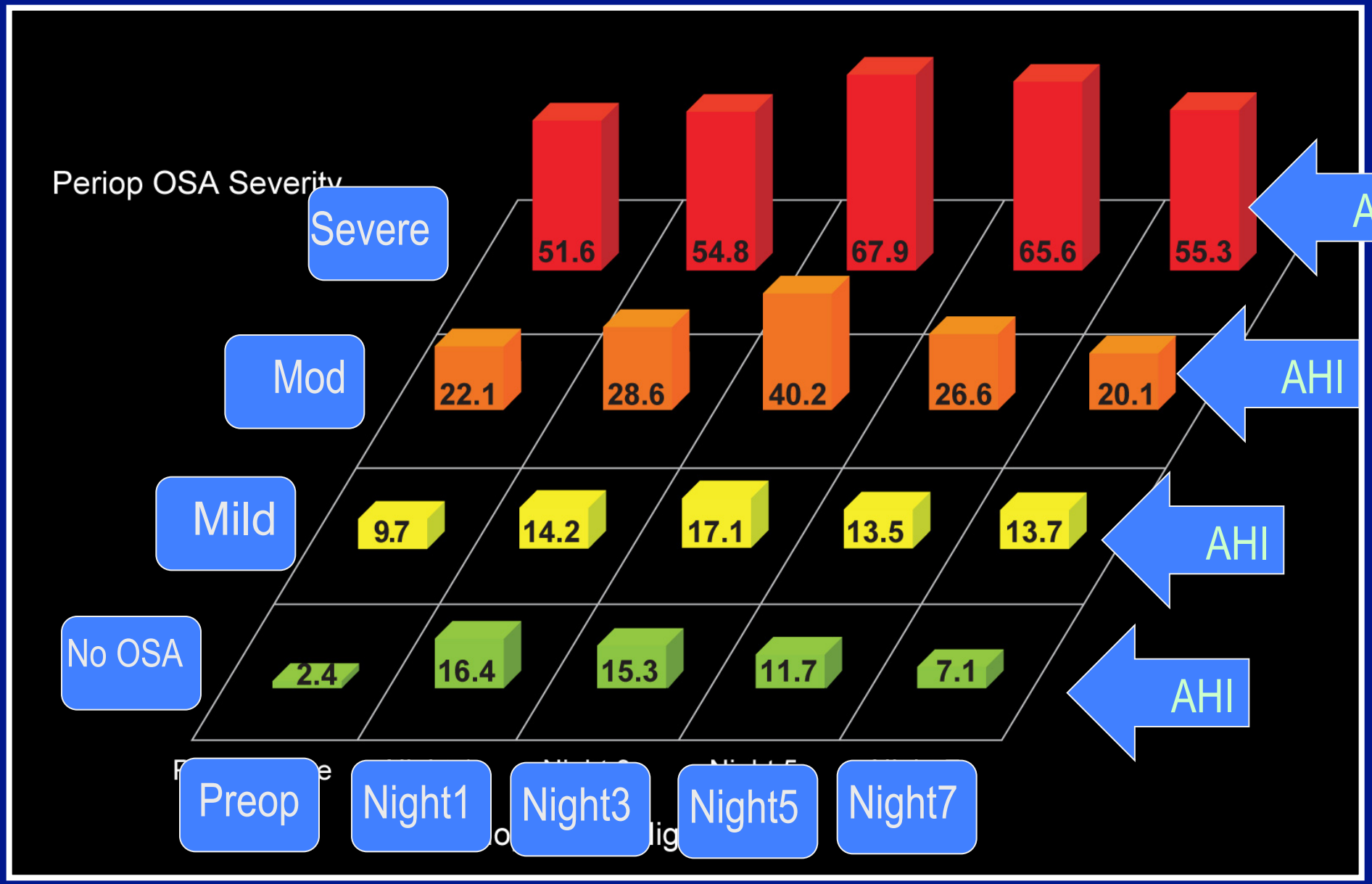
* : p<0.05 vs. Preop night ; †: p<0.05 vs. postop N1 Chung F et al, Anesthesiology 2014

Respiratory arrests occurs on first 24h

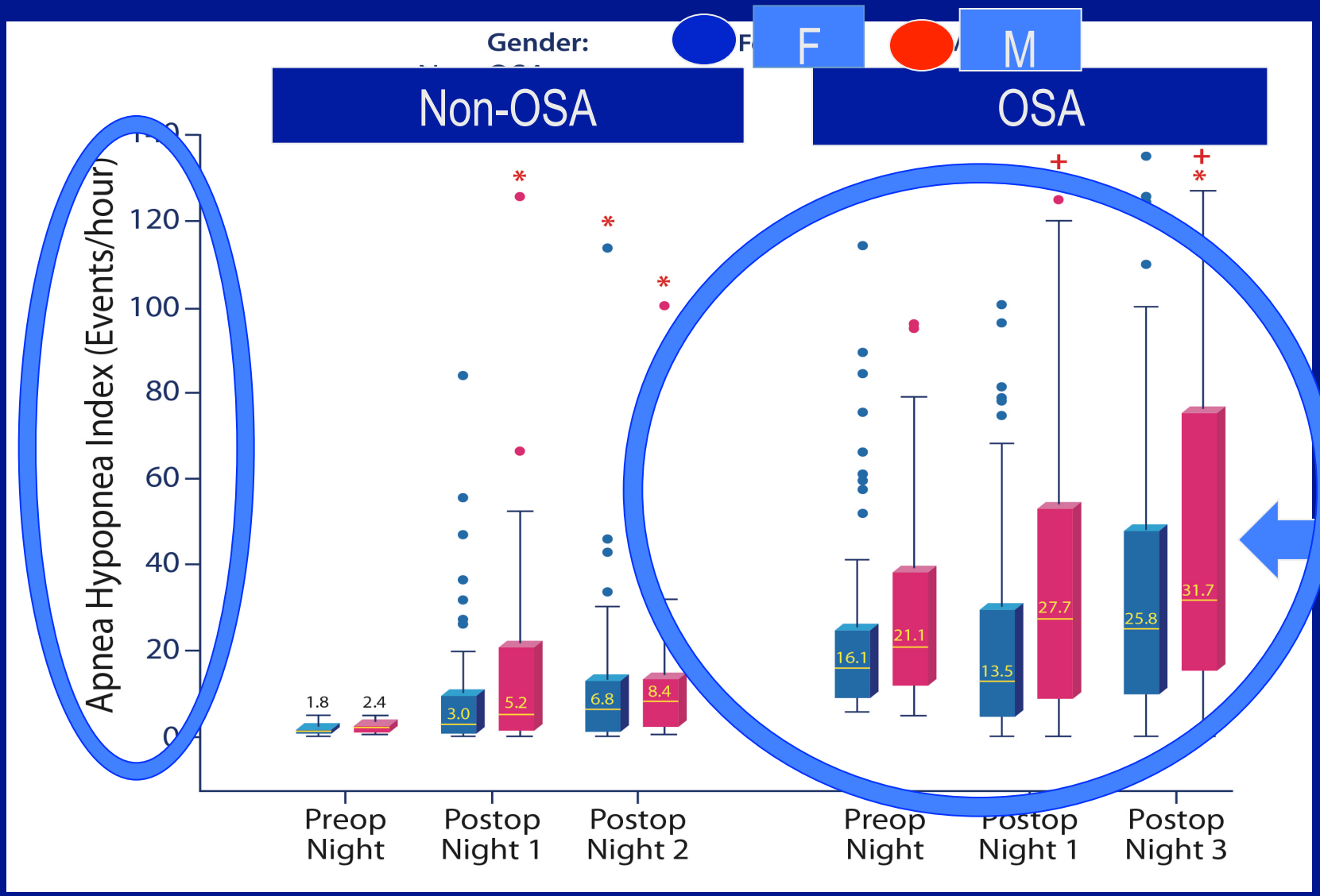
- Majority of respiratory depression or arrests occur 1st 24h
- Majority of emergent re-intubation 1st 24h
- OSA pt.: 85% re-intubation occur 1st 24h

Ramachandran SK et al. Anesthesiology 2011
Mokhlesi B et al Chest 2013
Lee L Anesthesiology 2015

Apnea Hypopnea Index: no of apnea, hypopnea /h

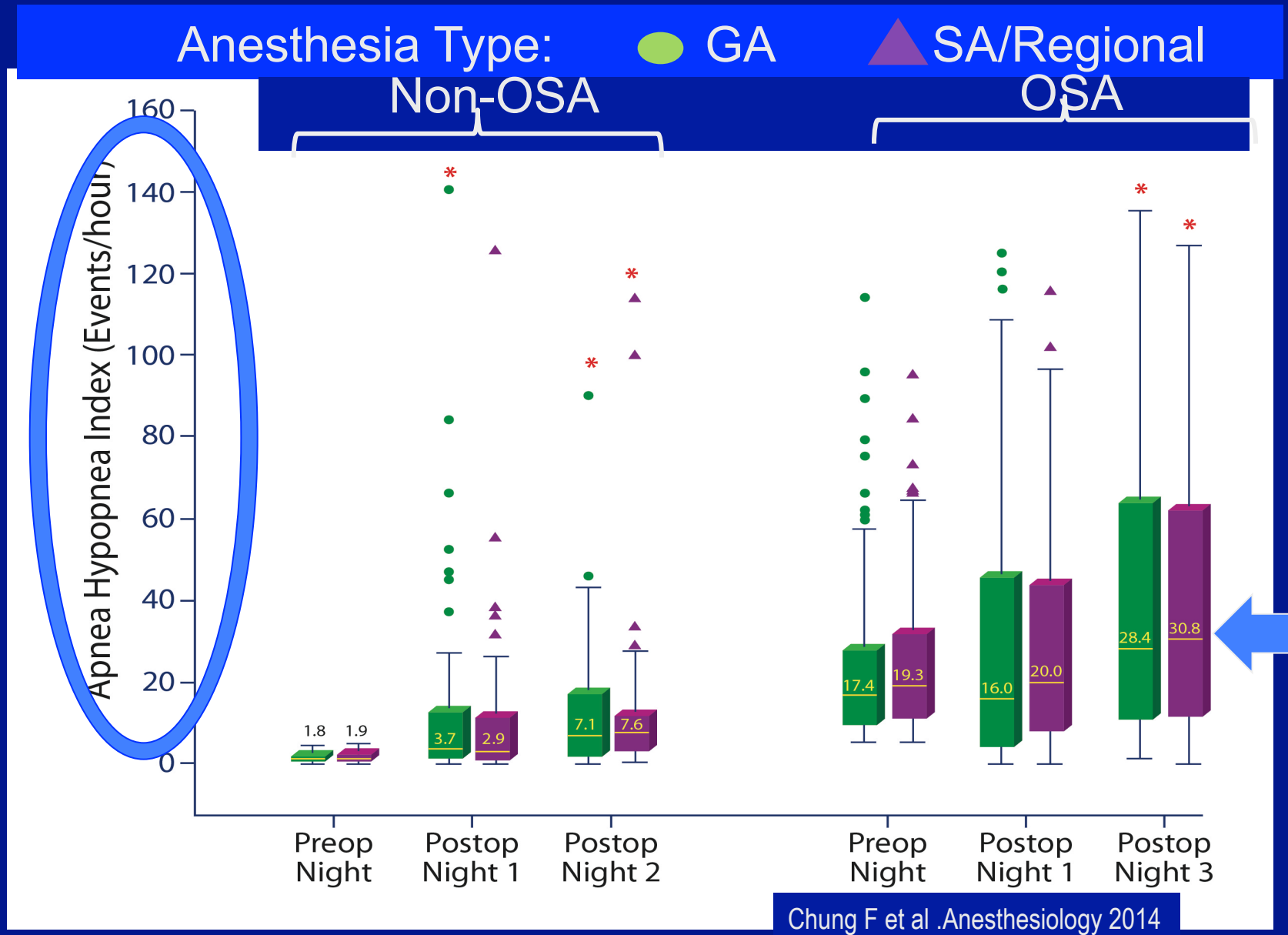


Apnea Hypopnea Index in Male and Female



Chung F et al. Anesthesiology 2014

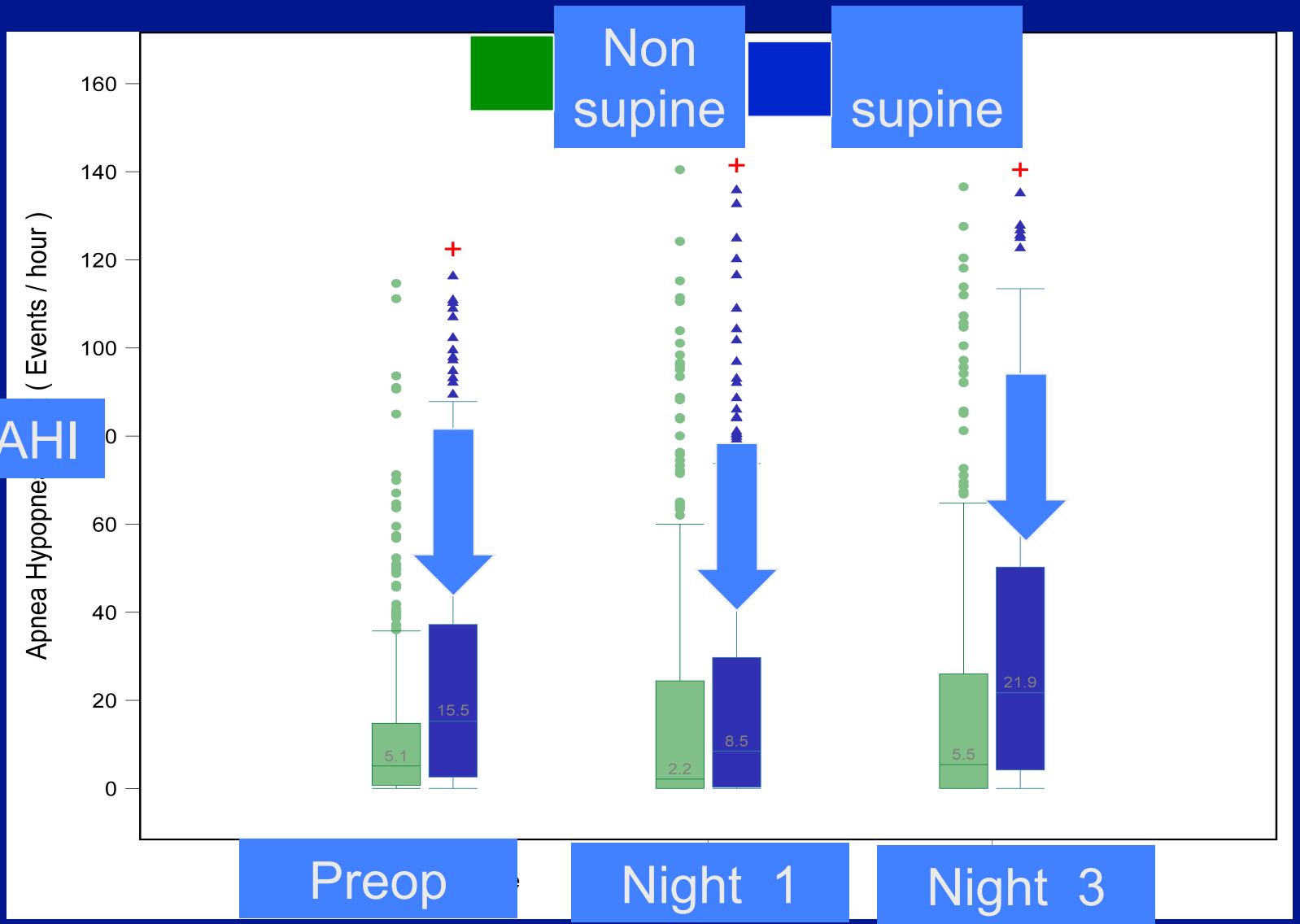
Apnea Hypopnea Index in OSA patients with GA vs. RA



Chung F et al .Anesthesiology 2014

AHI in supine & non-supine position

Chung et al. Anesthesiology 2014



OSA and anesthesia

- Higher preop AHI, age and 72h opioid dose
- Associated with increased postop AHI

- Higher preop central apnea index, male and GA
- Associated with increased postop central apnea index

F Chung et al. Anesthesiology 2014

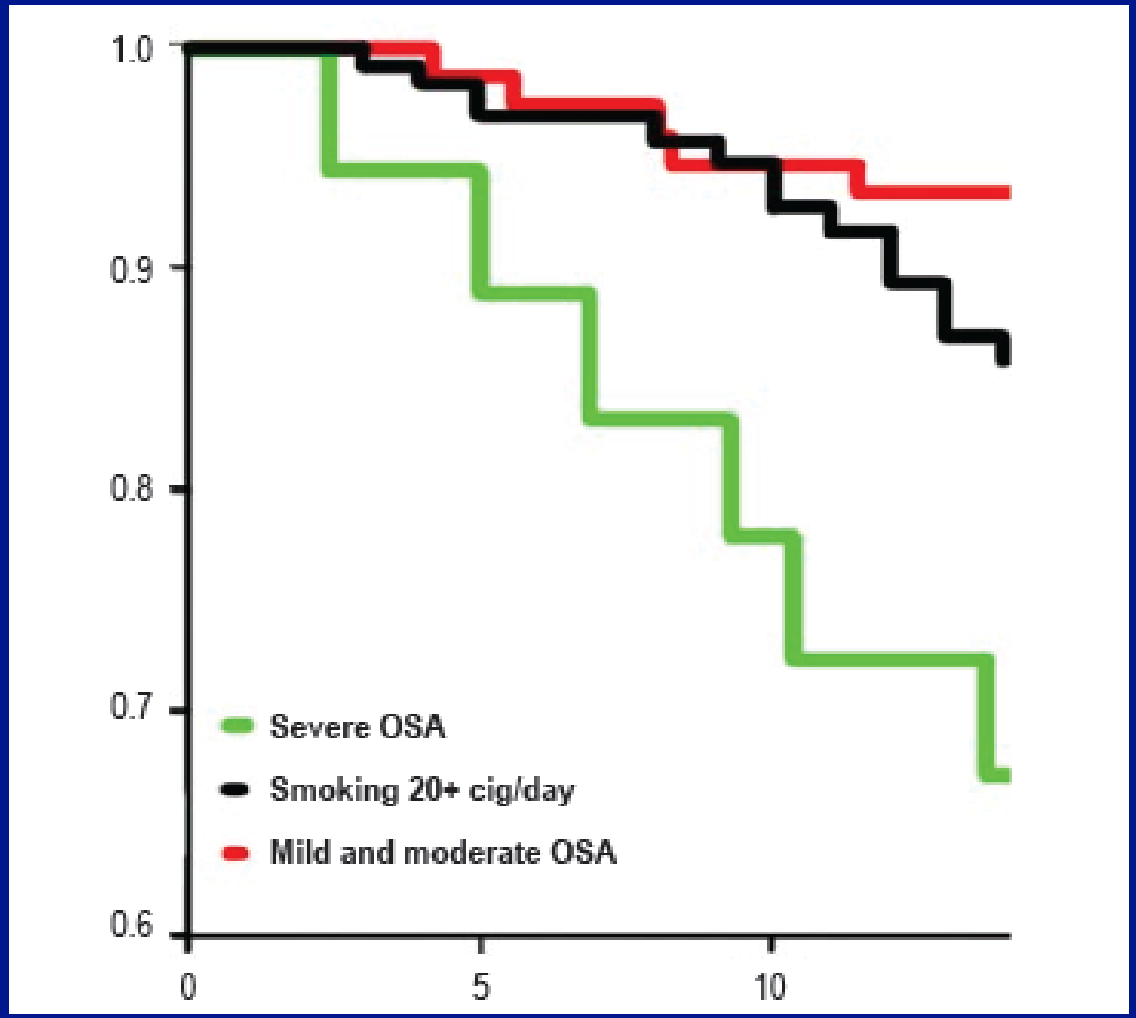
Preop Suspicion

- Recognize the problem
  - OSA is common

Anesthesiologists and PACU nurses: Airway specialists

We may be the1st one to identify pt. having OSA

10 yr. life expectancy due to smoking vs. pt. with non-treated OSA



Mild & mod OSA

Smoker

Sev OSA

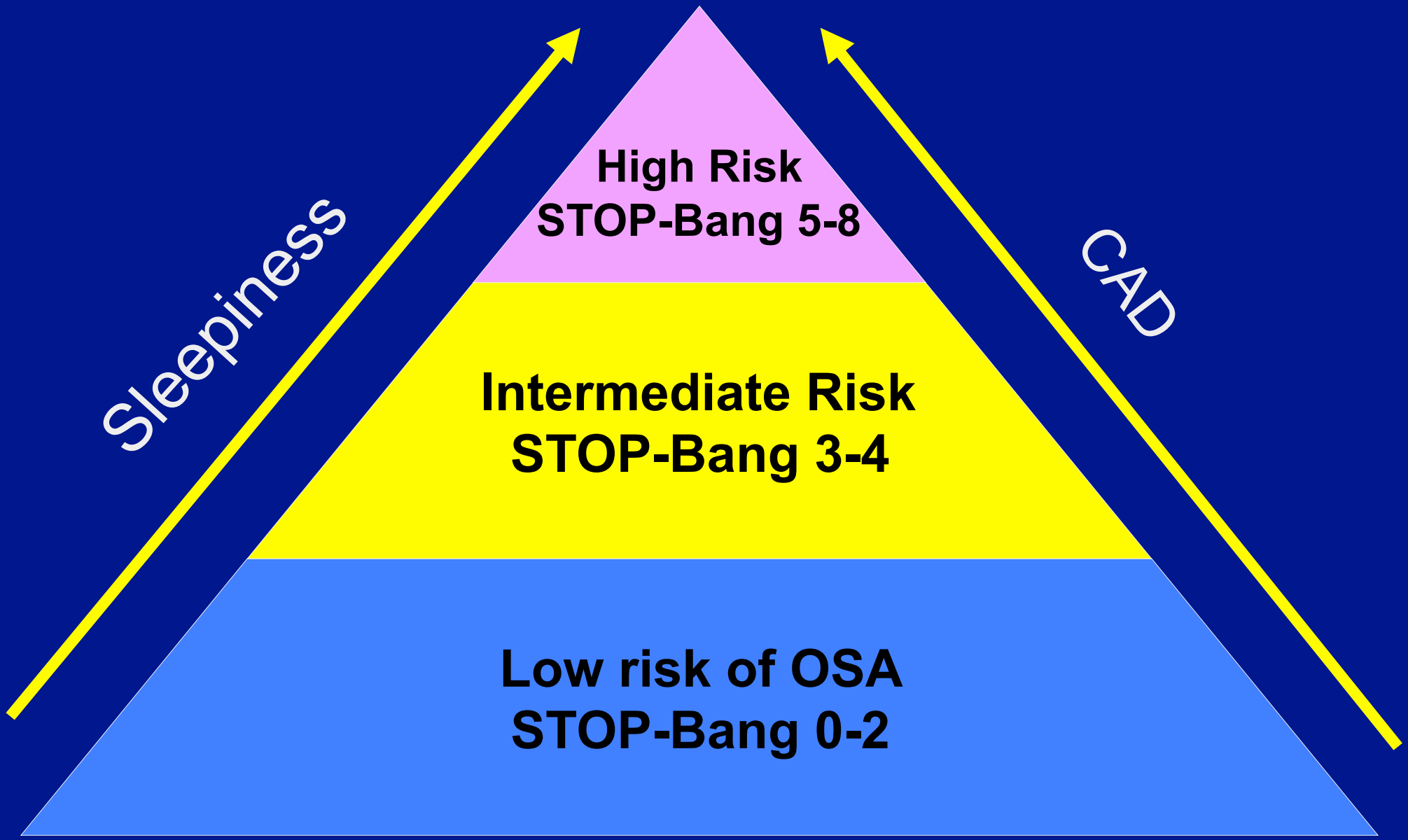
Yegneswaran B, et al. J Clin Sleep Med 2011; 7:315-16

Perioperative Surgical Home

- We refer pts for Rx of unDx hypertension, DM, angina.
- Should we refer suspected OSA pt.?
- Prolong life span by 20 yrs.

Should we screen for OSA in preop clinic and what should we do if +ve?

- What do we do if pt. are screened positive?
- When should we refer our patients?
- More research is needed


High Risk
STOP-Bang 5-8
Intermediate Risk
STOP-Bang 3-4
Low risk of OSA
STOP-Bang 0-2
Sleepiness
CAD

SASM Guideline on Preop Preparation of OSA pt noncompliant to PAP therapy or suspected OSA

Chung F et al. Submitted to Anesth Analg 2016

- Additional evaluation for preop optimization
- i) Hypoventilation syndromes
- ii) Severe pulmonary hypertension
- iii) Resting hypoxemia in the absence of other cardiopulmonary disease

Canadian Thoracic Society Guideline for urgent referral of OSA pt.

- Critical patients with safety issue
- Pt. with high risk of OSA + daytime sleepiness
- Pt. with high risk of OSA +

  Resistant hypertension

  Nocturnal angina

  CHF

  COPD, hypercapnic resp failure

Fleetham J et al Can Respir J 2011;18:25-47

Outline

- Adverse events of patients with OSA
- How do we identify patients with OSA?
- Perioperative management of OSA pt.
- CPAP treatment

American Society of Anesthesiologists

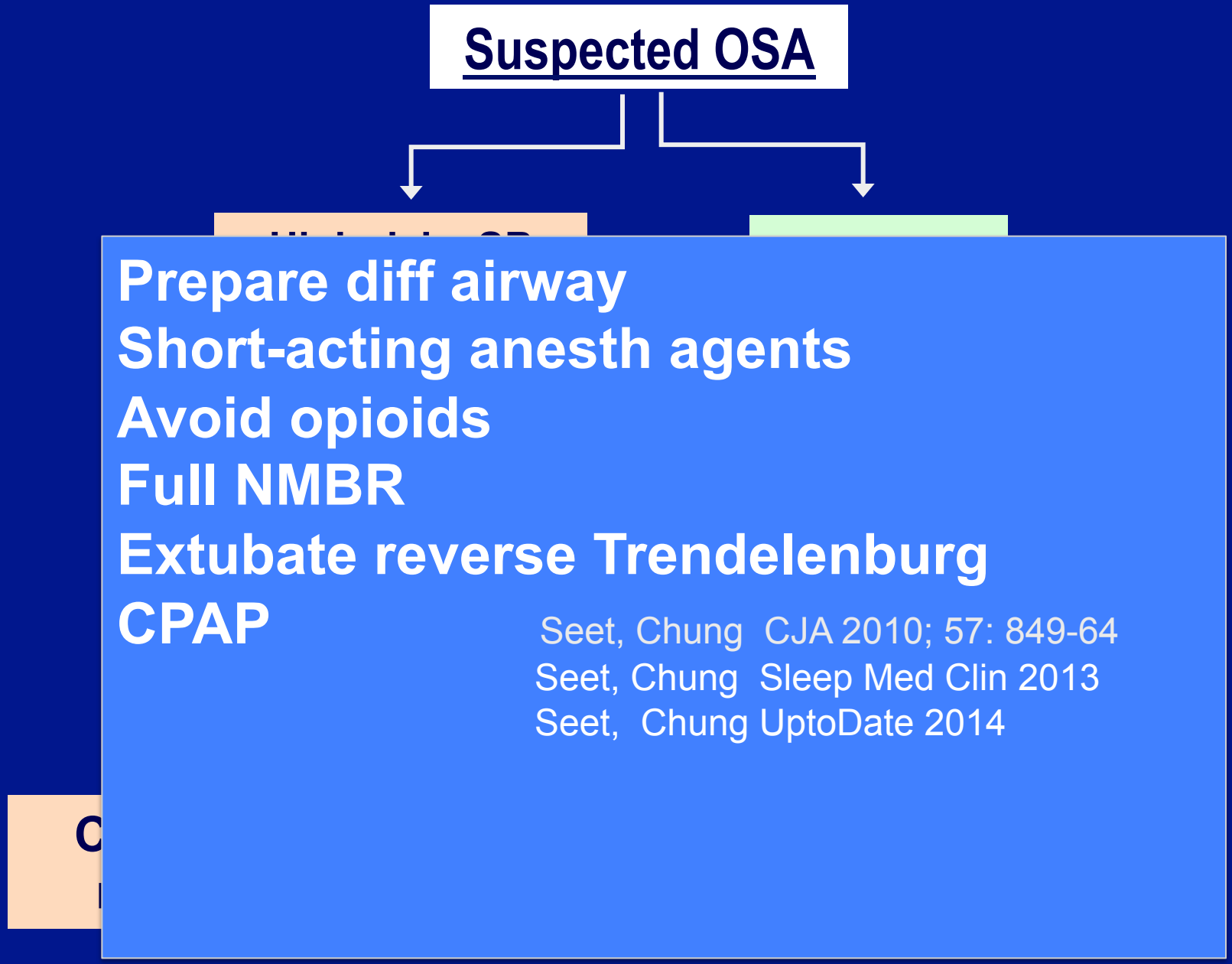
- Practice guideline for the periop Mx of pt. with OSA

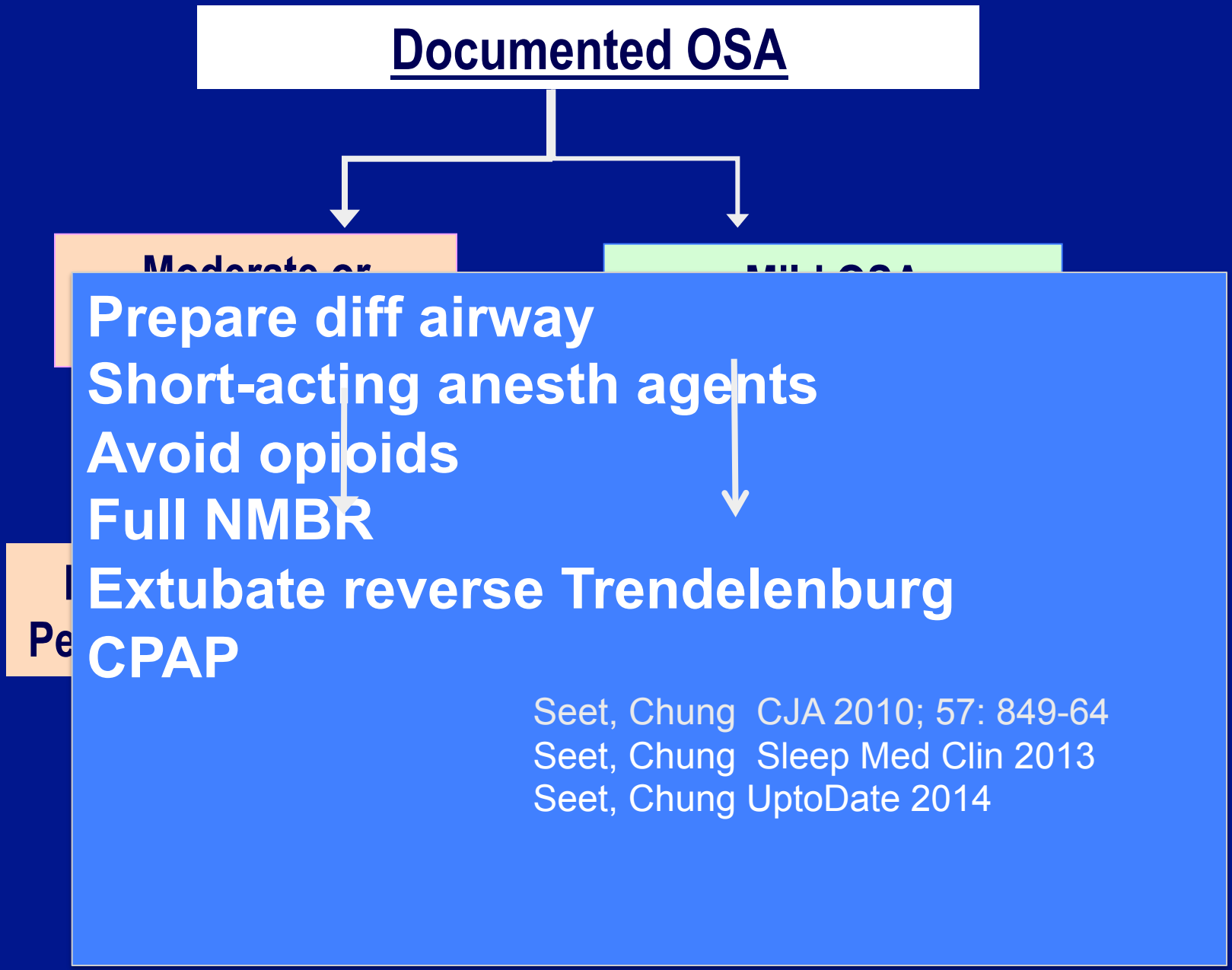
Anesthesiology 2014;120:268-86

Preoperative Screening

Seet, Chung Sleep Medi clinic 2013 8: 105-120

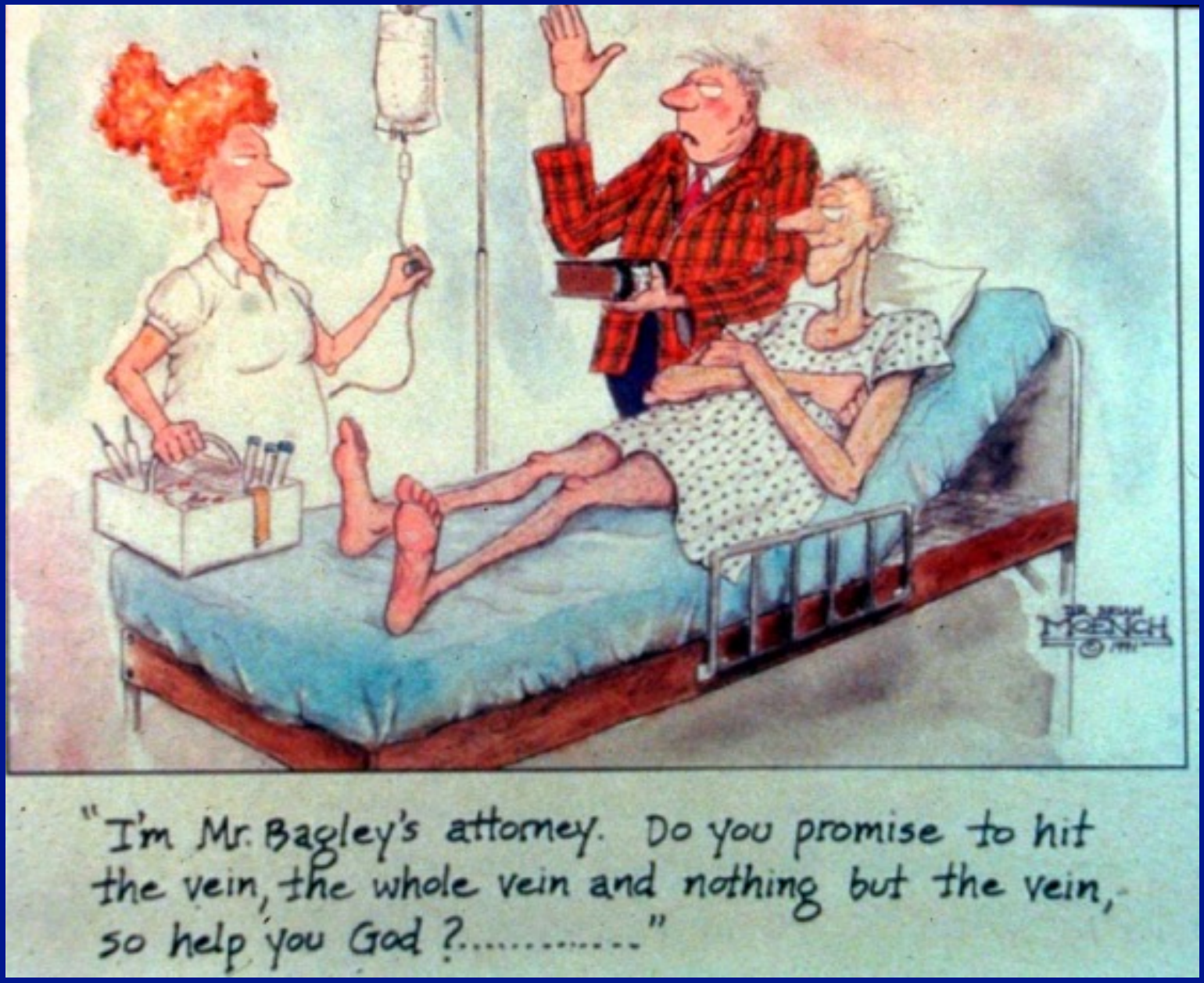
Seet, Chung Can J Anesth, 2010; 57: 849-64


Suspected OSA
Prepare diff airway
Short-acting anesth agents
Avoid opioids
Full NMBR
Extubate reverse Trendelenburg
CPAP
Seet, Chung CJA 2010; 57: 849-64
Seet, Chung Sleep Med Clin 2013
Seet, Chung UptoDate 2014


Documented OSA
Prepare diff airway
Short-acting anesth agents
Avoid opioids
Full NMBR
Extubate reverse Trendelenburg
CPAP
Seet, Chung CJA 2010; 57: 849-64
Seet, Chung Sleep Med Clin 2013
Seet, Chung UptoDate 2014

What should we do with a preop pt. at high risk for sleep apnea?
What should we do if a patient with OSA is not compliant with CPAP?

- Is CPAP effective to reduce postop Cx or shorten LOS?


"I'm Mr. Bagley's attorney. Do you promise to hit the vein, the whole vein and nothing but the vein, so help you God?....."

Anesth Analg 2015

Perioperative Complications in Obstructive Sleep Apnea Patients Undergoing Surgery: A Review of the Legal Literature

Nick Fouladpour, MD,* Rajinish Jesudoss, MD,† Norman Bolden, MD,‡ Ziad Shaman, MD,† and Dennis Auckley, MD†

BACKGROUND: Obstructive sleep apnea (OSA) is common in patients undergoing surgery. OSA, known or suspected, has been associated with significant perioperative adverse events, including severe neurologic injury and death. This study was undertaken to assess the legal consequences associated with poor outcomes related to OSA in the perioperative setting.

METHODS: A retrospective review of the legal literature was performed by searching 3 primary legal databases between the years 1991 and 2010 for cases involving adults with known or suspected OSA who underwent a surgical procedure associated with an adverse perioperative outcome. OSA had to be directly implicated in the outcome, and surgical mishaps (i.e., uncontrolled bleeding) were excluded. The adverse perioperative outcome had to result in a lawsuit that was then adjudicated in a court of law with a final decision rendered. Data were abstracted from each case regarding patient demographics, type of surgery, type and location of adverse event, associated anesthetic and opioid use, and legal outcome.

RESULTS: Twenty-four cases met the inclusion criteria. The majority (83%) occurred in or after 2007. Patients were young (average age, 41.7 years), male (63%), and had a known diagnosis of OSA (96%). Ninety-two percent of cases were elective with 33.3% considered general procedures, 37.5% were ears, nose and throat procedures for the treatment of OSA, and 29.1% were considered miscellaneous interventions. Complications occurred intraoperatively (21%), in the postanesthesia care unit (33%), and on the surgical floors (46%). The most common complications were respiratory arrest in an unmonitored setting and difficulty in airway management.

OSA and Anesthesia

- Perioperative management

American Society of Anesthesiologists

- Practice guideline for the periop Mx of pts. with OSA

Anesthesiology 2014; 120:268-86

Anesthetic Mx is determined by 4 factors:

- Severity of OSA
- Mx of OSA: CPAP or not
- Surgical procedure: major or minor
- Postop analgesic requirement: opioids or not

Anesthesiology 2014; 120: 268-86

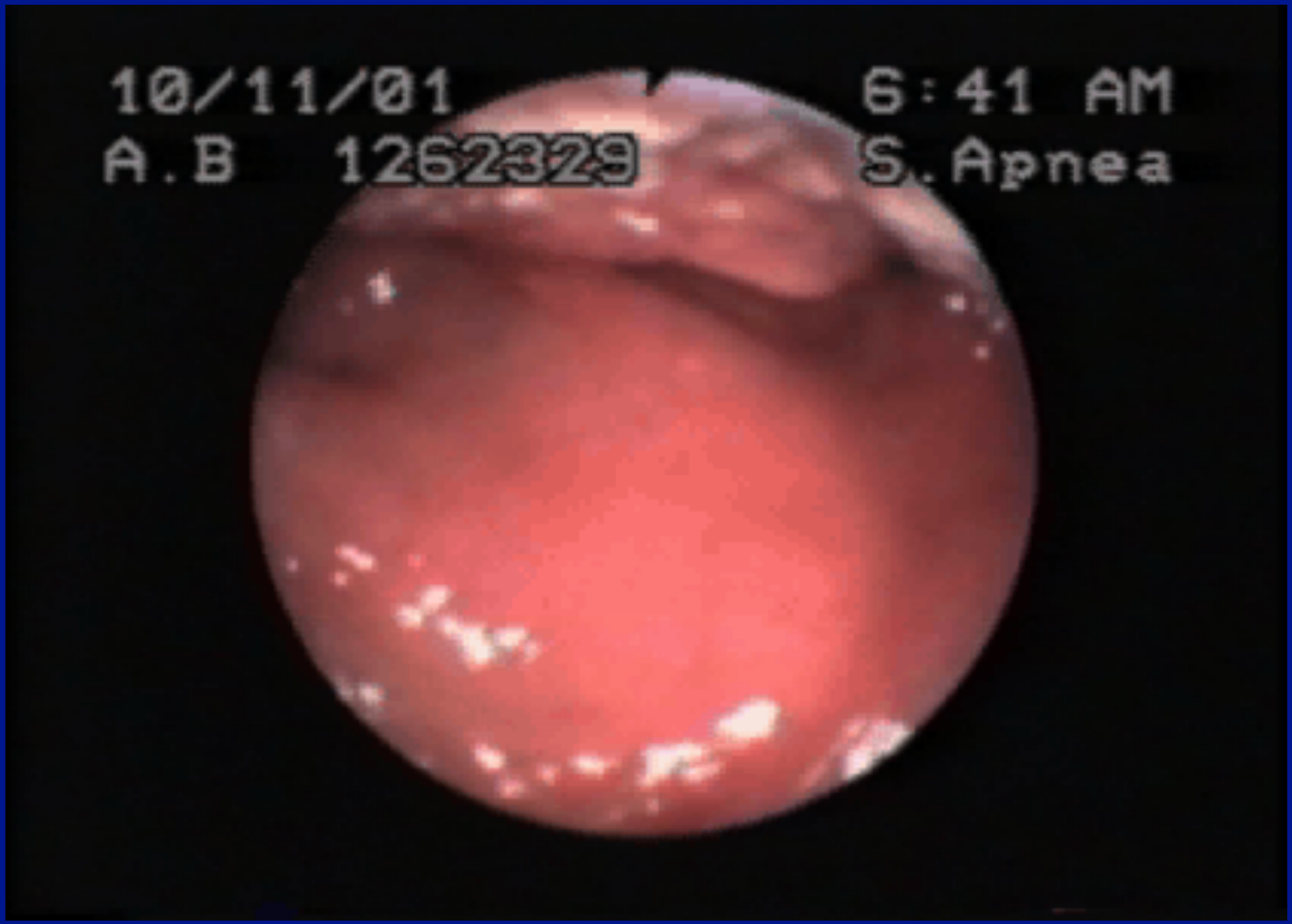
Sleep Apnea and difficult intubation

- Difficult endotracheal intubation in pts with OSA.
- 22% incidence

]MA Siyam, Anesth Analg 2002; 95:1098-1102

Kim JA, Lee JJ, CJA;2006:53:393-7

Neligan PJ et al Anesth Analg 2009;109:1182-86


10/11/01
6:41 AM
A.B 1262329
S.Apnea

RA better in OSA pt.

- 40,316 hip and knee arthroplasty pt. with obstructive sleep apnea
- RA: Decreased need for mechanical ventilation, ICU, LOS and cost

Memtsoudis SG et al. Reg Anesth Pain Med 2013

Patient controlled analgesia

- Patient central apnea
- Patient cardiac arrest
- Please call attorney

Perioperative Management

Seet, Chung Can J Anesth, 2010; 57: 849-64
Seet, Chung Sleep Med Clin 2013; 8: 105-120
Seet, Chung Uptodate 2014

Anesthesia Pt. Safety Foundation Recommendations

- Continuous monitoring of oxygenation and ventilation should be available for all postop pts.

APSF newsletter Sept 2011

Postop Mx of OSA

Patient position

- A sitting or lateral position
- Use of a pillow for sniffing position

Isono S Anesthesiology 2002; 97

Isono S Anesthesiology 2005;103:489-94

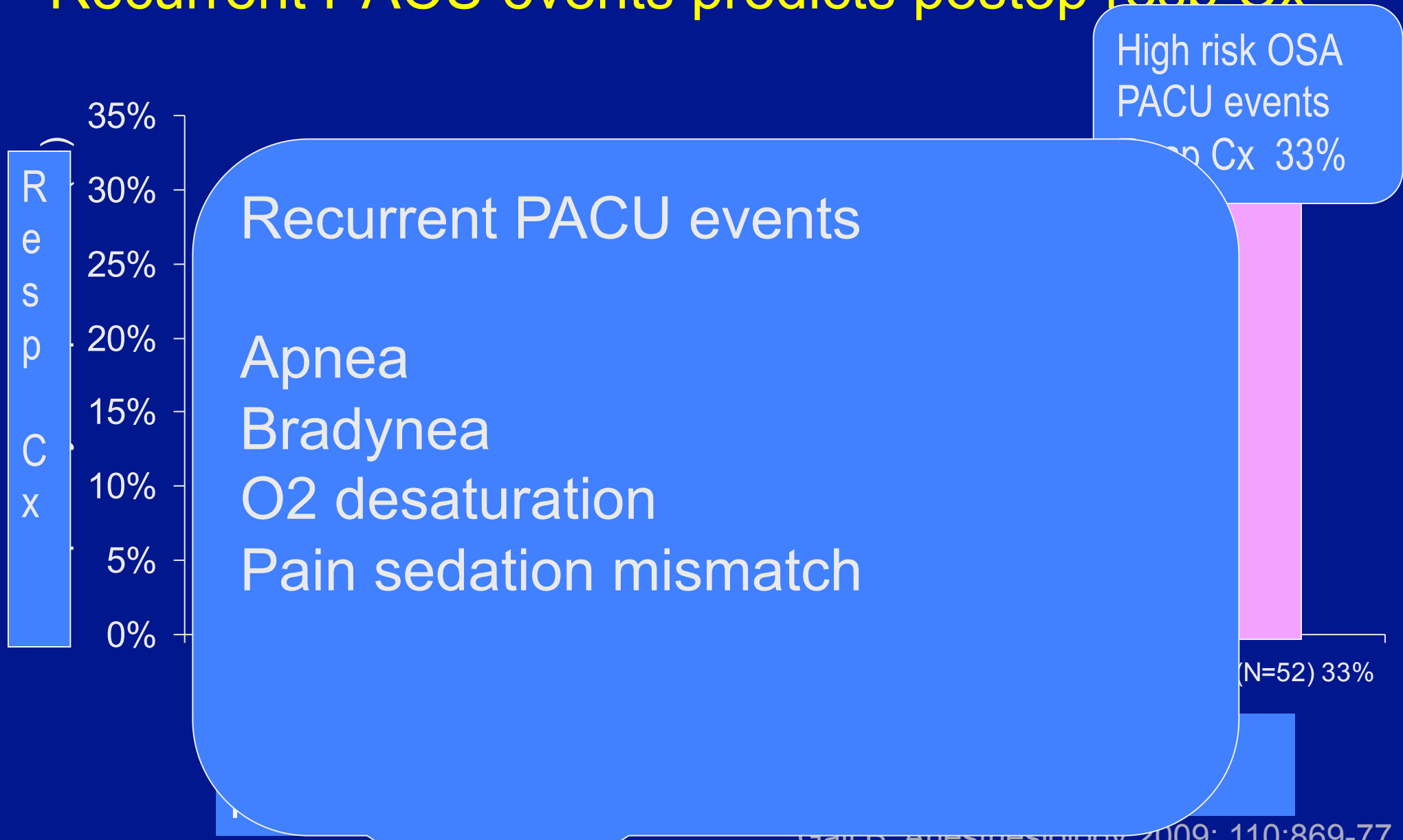
■ 2008 JOURNAL SYMPOSIUM: A PRECARIOUS BREATH: DIAGNOSIS AND MANAGEMENT OF DIFFICULT AIRWAYS AND OBSTRUCTIVE SLEEP APNEA

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.§*

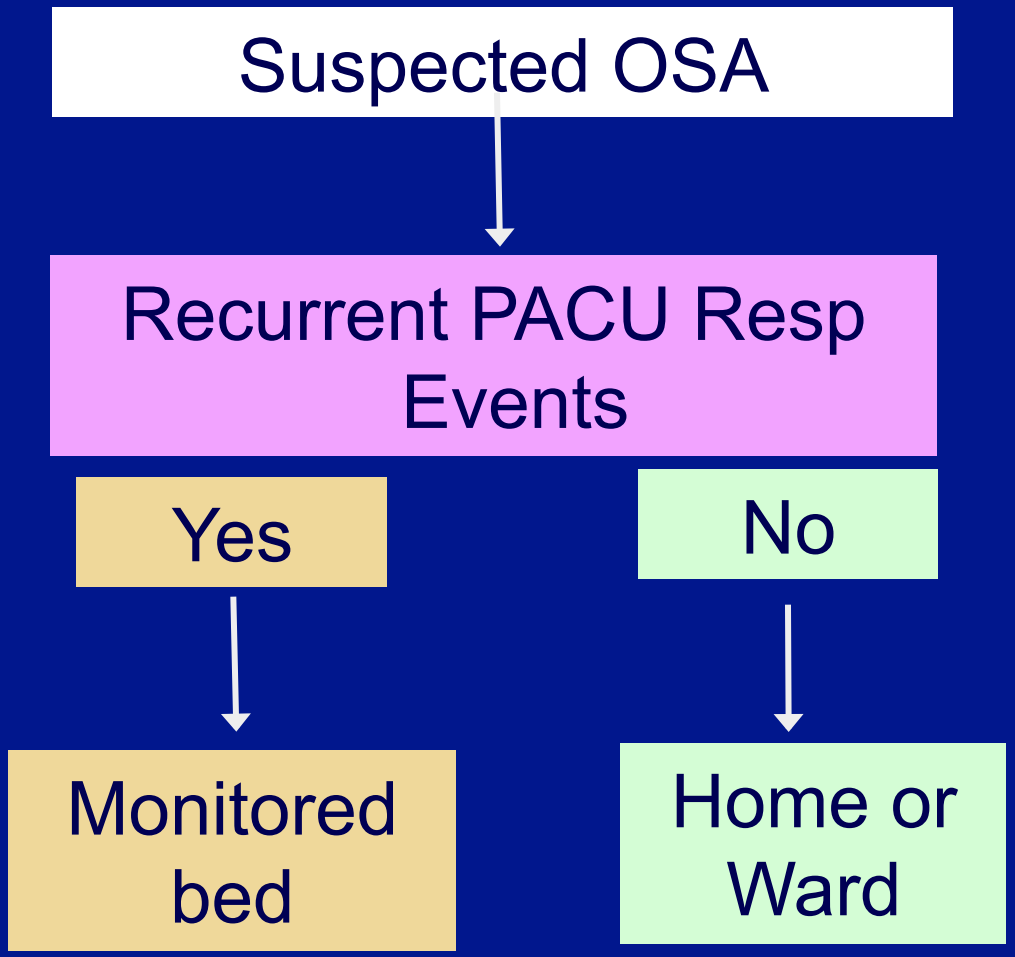
Recurrent PACU events predicts postop resp Cx



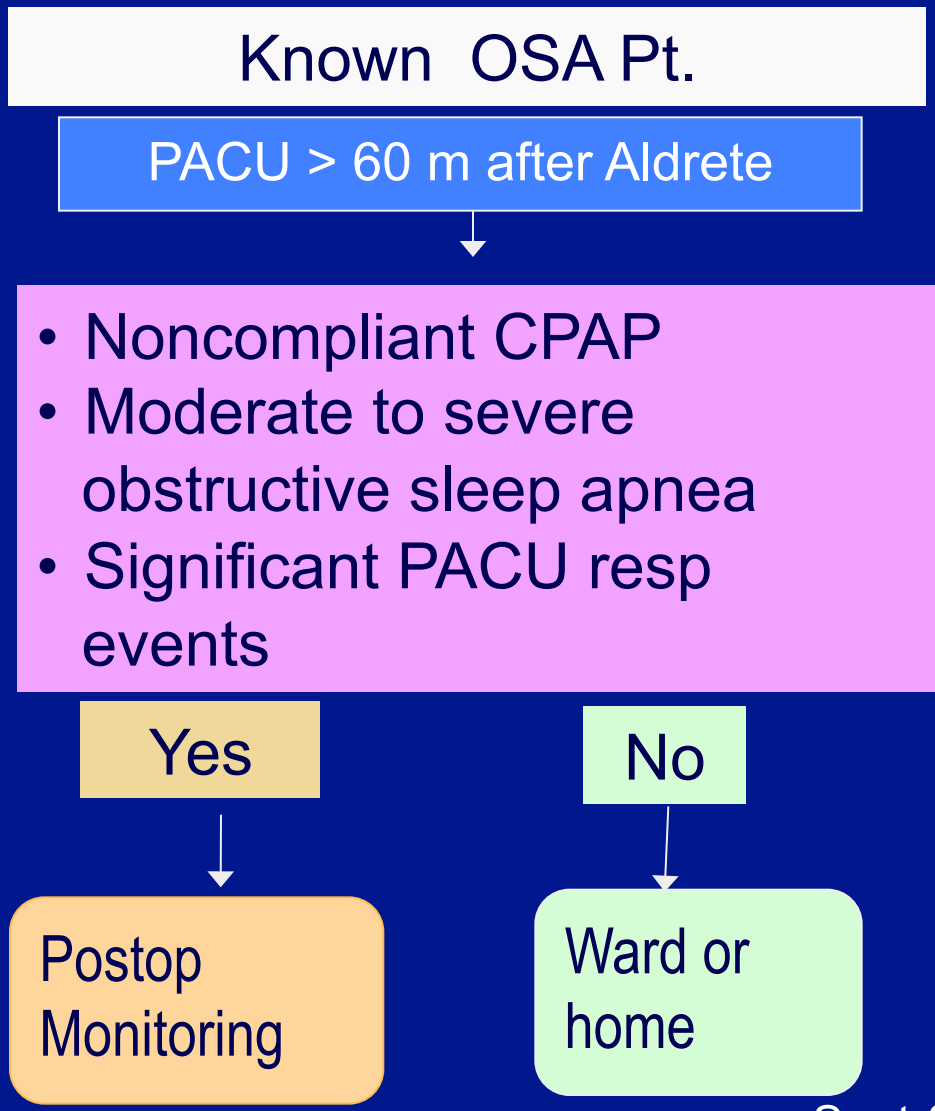
Recurrent PACU events

Apnea
Bradynea
O2 desaturation
Pain sedation mismatch

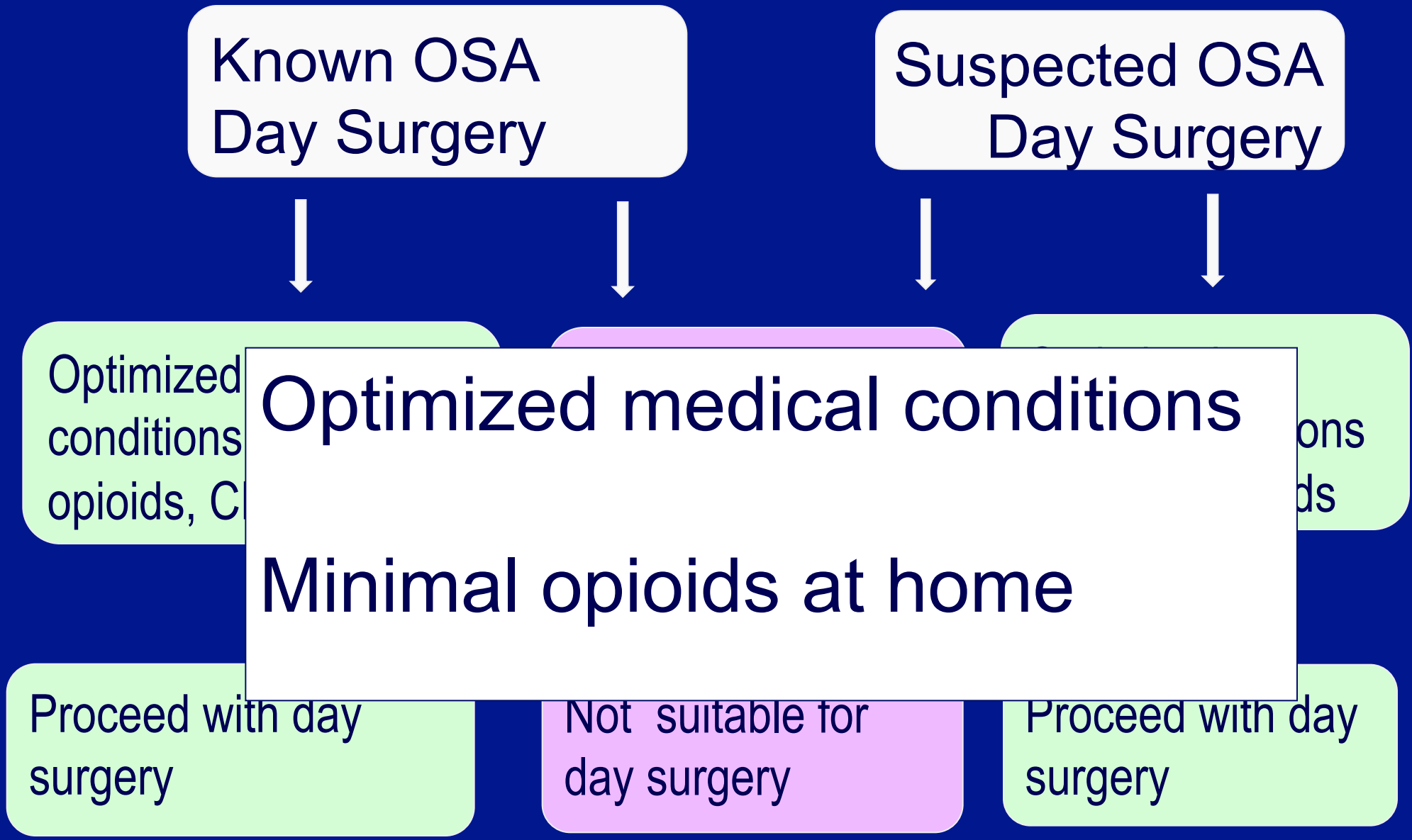
Gali B, Anesthesiology 2009; 110:869-77



E Seet & F Chung Can J Anesth 2010; 5 849-64
E Seet & F Chung Sleep Med Clin 2013
E Seet & F Chung UptoDate 2014



Seet & Chung Can J Anesth 2010
Seet & Chung Sleep Med Clin 2013
Seet & Chung UptoDate 2014



Joshi GP et al Anesth Analg 2012

Obstructive sleep apnea pt. for ambulatory surgery

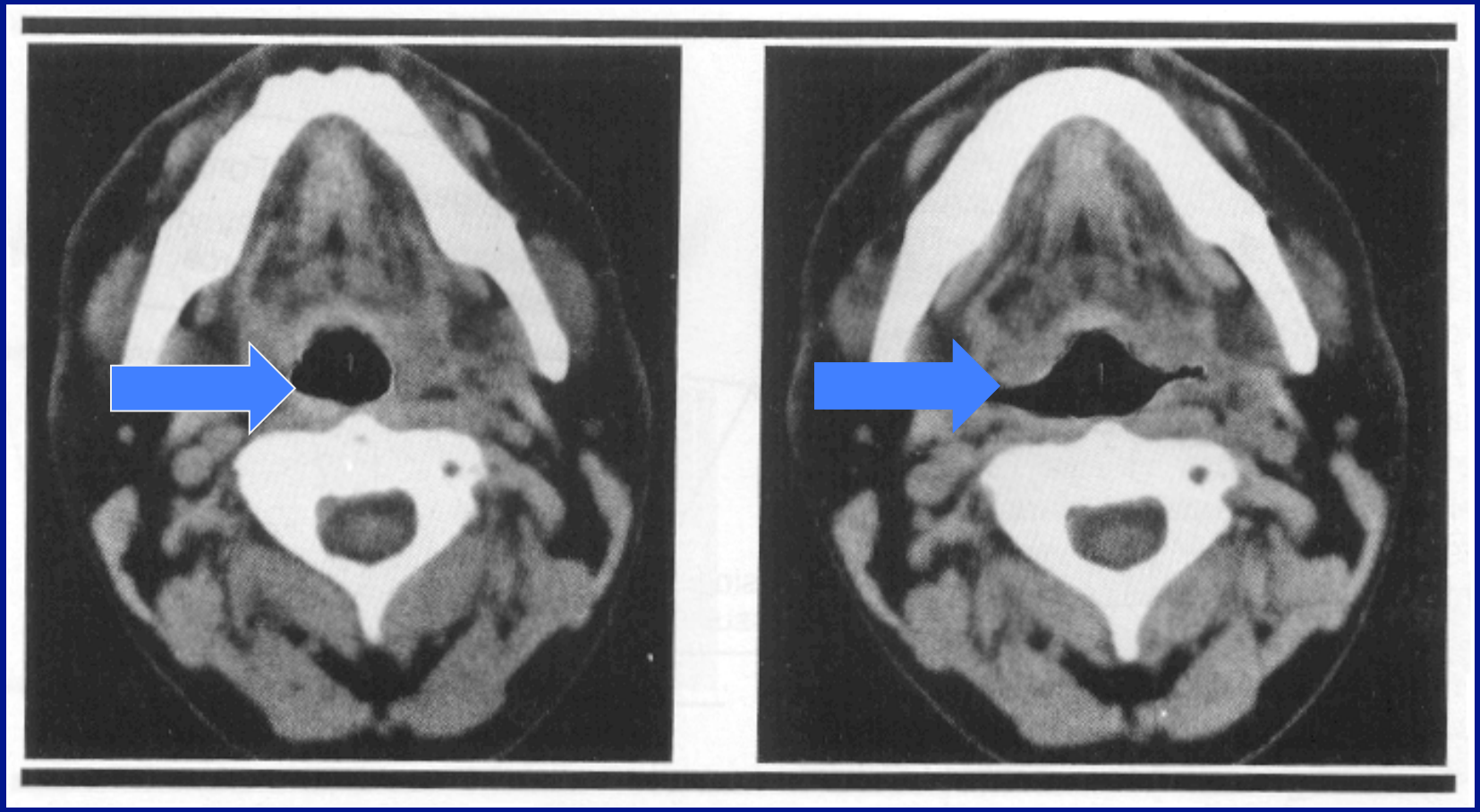
- Communication is essential
- Inform surgeons, nurses, patients of risks
- Home prescription: Avoid opioids
- Inform pt. and family
- Sleep in recliner
- Cut narcotic pill in half

Outline

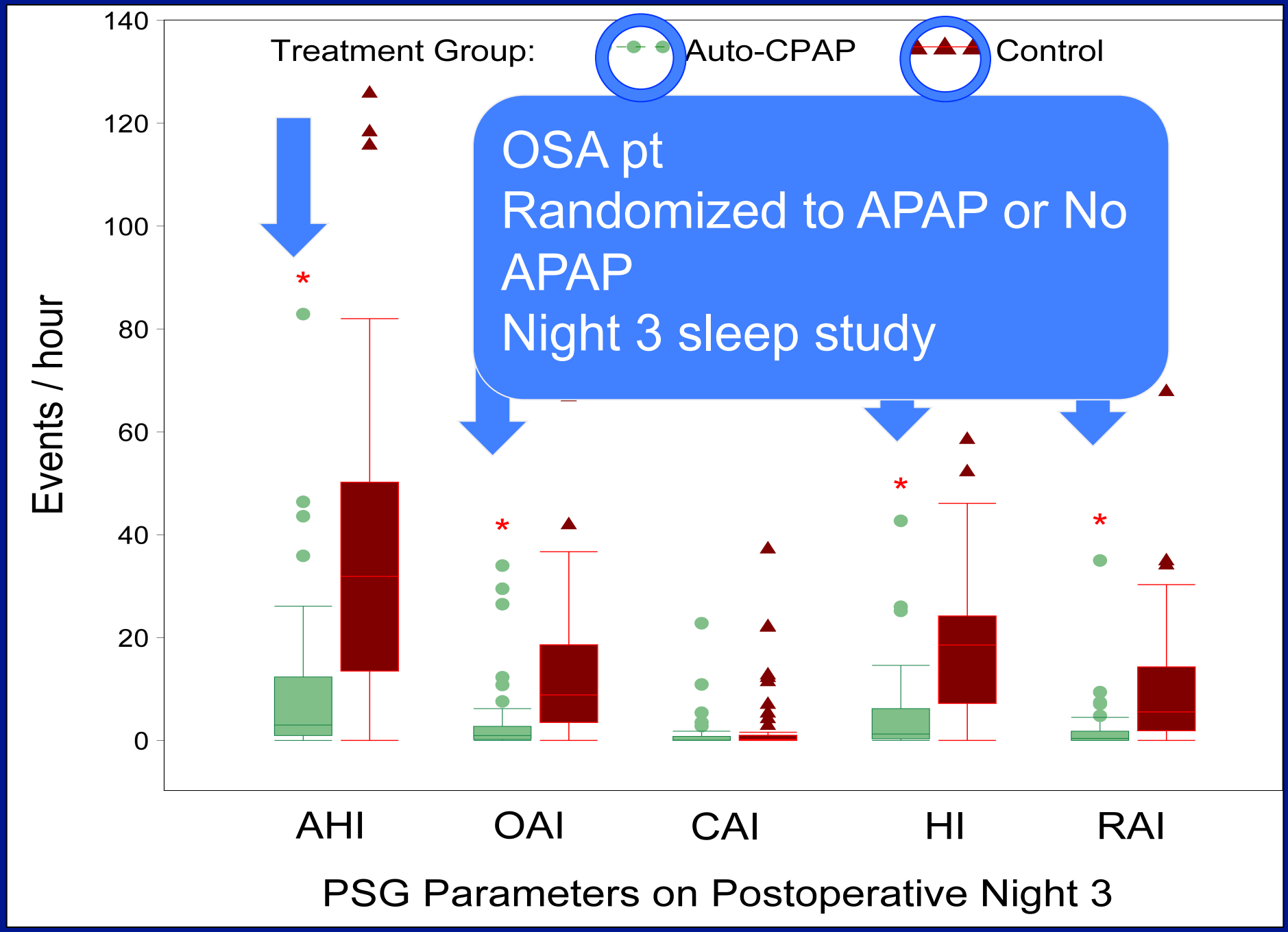
- Adverse events of patients with OSA
- How do we identify patients with OSA?
- Perioperative management of OSA pt.
- CPAP treatment

Can CPAP help?

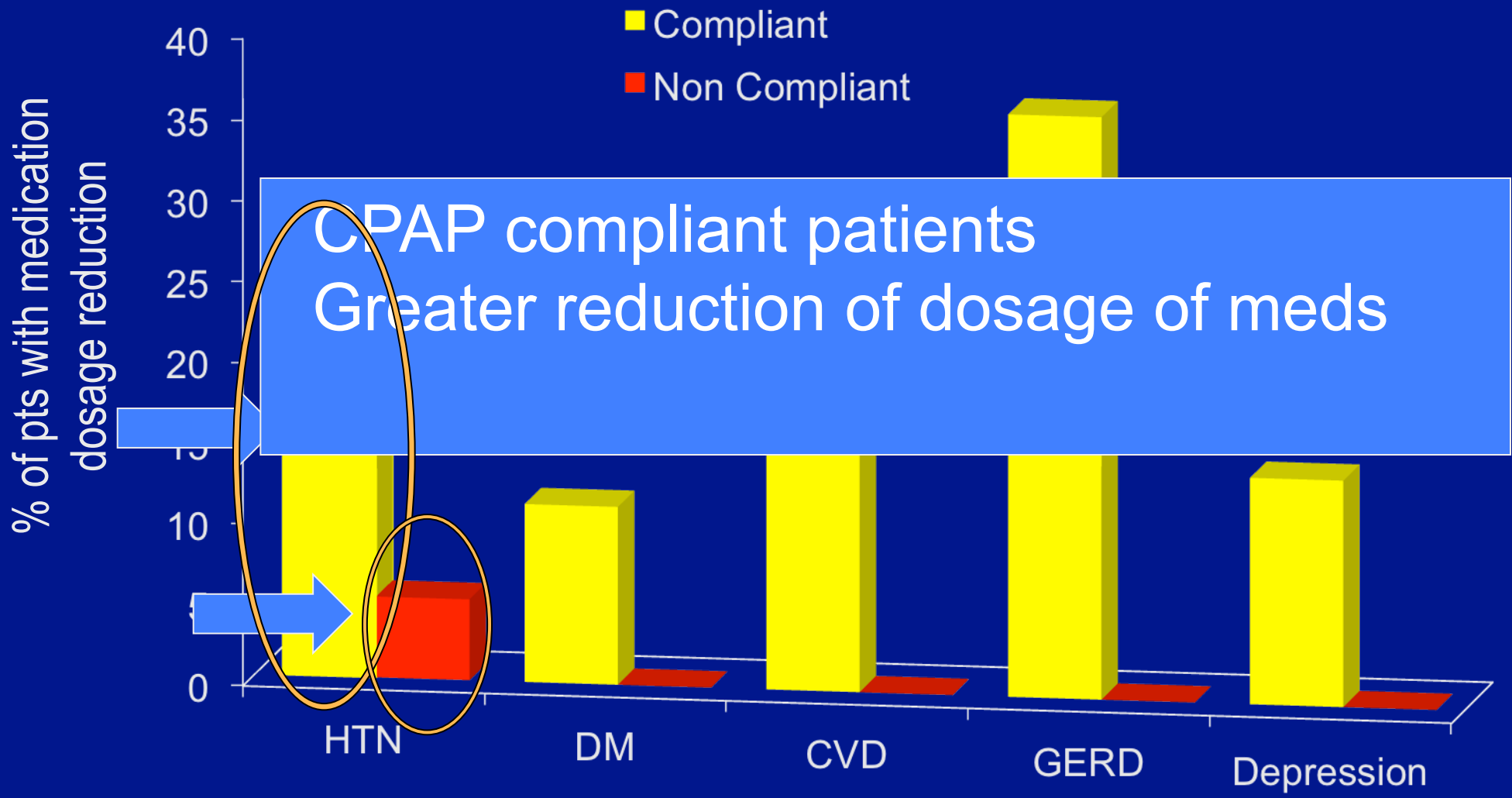
Is it effective to reduce postop adverse events? LOS? AHI? Respiratory function?



ST Kuna, G Sang' Ambrogio, JAMA 1991; 266:1384-9


Treatment Group:
Auto-CPAP
Control
OSA pt
Randomized to APAP or No APAP
Night 3 sleep study
Events / hour
140
120
100
80
60
40
20
0
AHI
OAI
CAI
HI
RAI
PSG Parameters on Postoperative Night 3

CPAP compliant pt. have greater reduction of medication dosage



Vehta M et al. Can Anesth J 2012; 59: 544-55

Forest plot of postop adverse events

Nagappa M et al. Anesth Analg 2015

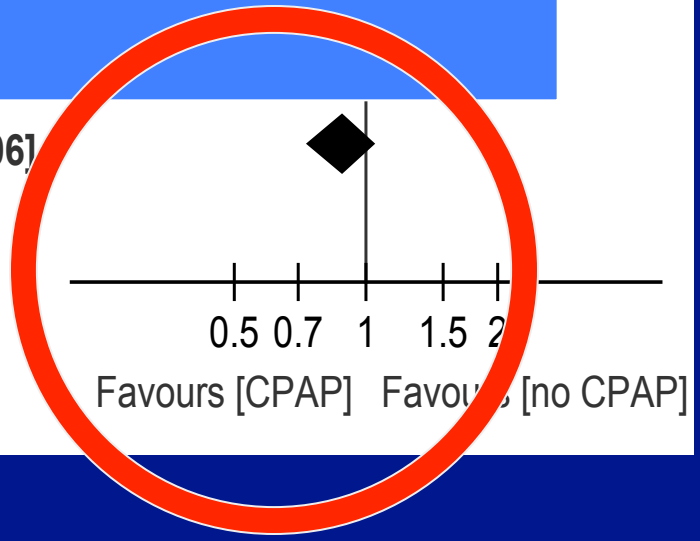
904 pt.
6 studies

No statistically signif… n the adverse events betw… ps (P=0.19)
12% reduction in risk

Study or Subgroup	CPAP Events	CPAP Total	No CPAP Events	No CPAP Total	W	Risk Ratio M-H, Fixed, 95% CI
Gupta 2						
Jensen						
Liao 20						
Liao 20						
O'Gorm						
Rennott						
Total (95% CI)		**471**		**433**	**100.0%**	**0.88 [0.73, 1.06]**
Total events	134		133			

Heterogeneity: Chi² = 5.45, df = 5 (P = 0.36); I² = 8%

Test for overall effect: Z = 1.32 (P = 0.19)



Apnea-Hypopnea Index

Nagappa M et al. Anesth Analg 2015

Study	Preop AHI	Postop AHI	P value
	Mean ±	Mean ± SD	
Liao 2			
Renno 1995			
Total	37 ± 19	12 ± 16	<0.001

Use of postop CPAP

AHI reduced by 25 events/h

Postop AHI still elevated (12 events/h)

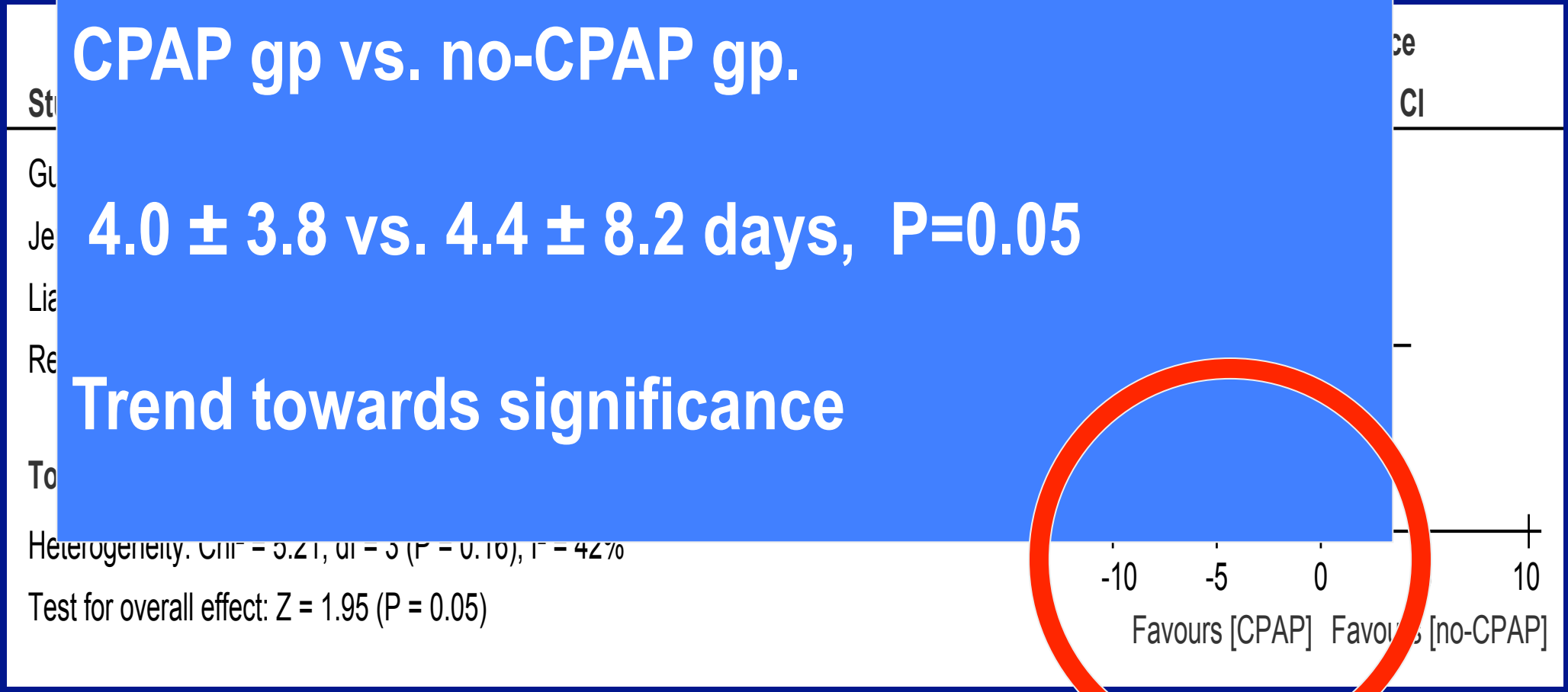
Forest plot of length of hospital stay

Nagappa M et al. Anesth Analg 2015

CPAP gp vs. no-CPAP gp.

4.0 ± 3.8 vs. 4.4 ± 8.2 days, P=0.05

Trend towards significance



Preop Dx and CPAP Rx reduces postop cardiac complications

- Matched cohort analysis of sleep study data and Manitoba health administrative database

Risk of CVS Cx

- UOSA vs. No OSA: risk 2.2 P=0.02
- DOSA vs. UOSA: risk 0.34 P=0.009

- Preop Dx and CPAP Rx reduces postop cardiac Cx

Mutter TC et al. Anesthesiology 2014; 121:707-18

OSA + CPAP less postop Cx

- Cohort study 2012-13
- 52 Community and Academic Michigan hospitals
- 26,842 pt.: General or vascular surgery
- 2,649 (9.9%) OSA pt.
- UnRx OSA (1465) vs. OSA + CPAP (1184)
- Cardiopulmonorary Cx 6.7 vs. 4% aOR=1.8 P=0.001

Abdelsattaar ZM et al. Sleep 2015


STOP
IN THE
NAAAAME
OF LOVE

It is time to take action

- Preoperative screening for OSA: One death is too many

Chung F J Clin Sleep Med 2012

Postoperative Cx associated with OSA: Time to wake up

Chung F Anesth Analg 2014

Undiagnosed OSA

- OSA pt.
- Likely to have better periop monitoring

- The unDx OSA, unrecognized OSA or unRx OSA pt.
- Get into trouble

Malignant Hyperthermia Scenario

- Ask Hx of OSA and screen for UOSA
- Family Hx of OSA
- Rule out suspected OSA pts
- CPAP Rx

5 Principles in the anesthetic Mx of OSA pt.

- RA when possible
- Be prepared: Boy Scout's motto
- GA: tracheal intubation and ventilation
- Postop care: monitoring, early mobilization
- Judicious use of any opioids by any route

OSA pt. : 5 tips

- STOP-Bang questionnaire to screen OSA, OHV
- Use Troop pillow for intubation
- RM + PEEP to prevent atelectasis
- Use short acting agents
- Reverse trendenlenburg position for extubation

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