Evidence-Based Outcomes to Detect Obstructive Sleep Apnea, Identify Co-Existing Factors, and Compare Characteristics of Patient Discharge Disposition

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Sleep Apnea Program of Research Update / Highlights
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Tyler, R., Burkard, J. F., and Jones, S.F. (2012). Stop-Bang tool to detect obstructive sleep apnea for the perioperative patient. Project completed at NMCSD 2012. Manuscript submitted to JOPAN 2012.

Jones, S.F., Burkard, J.F., and Connelly, C.D. (2013). Obstructive sleep apnea and the effects of co-existing factors on PACU time. Project completed at NMCSD 2012. Manuscript developed and being used to submit a Tri-Service Grant in 2014.

Lee, E.T., Rasmussen, B., Rolley, J., Burkard, J.F., and Daugherty, J.S. (2013). Correlational study of sleep apnoea patients' characteristics with discharge locations. Project completed at UCSD 2013. Manuscript in development and being used as foundation for 2014 pilot study.

Dixon, S.E., Haas, S.A., Kloop, A., Carlson, J., and Burkard, J.F. (2013). Identification and management of obstructive sleep apnea in a military population during surgical procedures: A quality improvement project. Project completed at Tripler Army Medical Center. Manuscript in development.

Burkard, J.F., Lee, E., Minokadeh, A. (2013, March). *Utilization of physiological monitoring to improve flow of patients with obstructive sleep apnea (OSA) with co-existing factors of hypertension and obesity.* Grant proposal submitted to the University of California Office of the President for the amount of $178,065. Current Status: Accepted for 20K Pilot Project.

There is no conflict of interest and there was no sponsorship for these studies from the Department of Defense or UCSD Medical Center

Problem

o   Currently, we do not utilize an obstructive sleep apnea (OSA) screening tool in our clinical setting to detect undiagnosed obstructive sleep apnea in patients.

o   The Gold Standard for obstructive sleep apnea diagnosis is by polysomnography using an apnea-hypopnea index (AHI).

o   Polysomnography or PSG is conducted during a sleep study (Chung, 2008).

o   PSG requires highly trained personnel and complex equipment and is costly to perform.

o   The American Society of Anesthesiologist (ASA, 2006) published guidelines recommending that patients be screened for the risk of OSA prior to surgery.

Symptoms of OSA

- Snoring- most common complaint

- Daytime sleepiness

- Hypertension and cardiovascular disease – heart failure, nocturnal cardiac dysrythmias, myocardial infarction

- Pulmonary disease - pulmonary hypertension

- Ischemic stroke

- *The combination of intermittent hypoxia and hypercapnia, arousals, increased sympathetic tone, altered baroreflex control during sleep and cardio-vascular changes induced by increased negative intrathoracic pressure contribute to all these complications.*
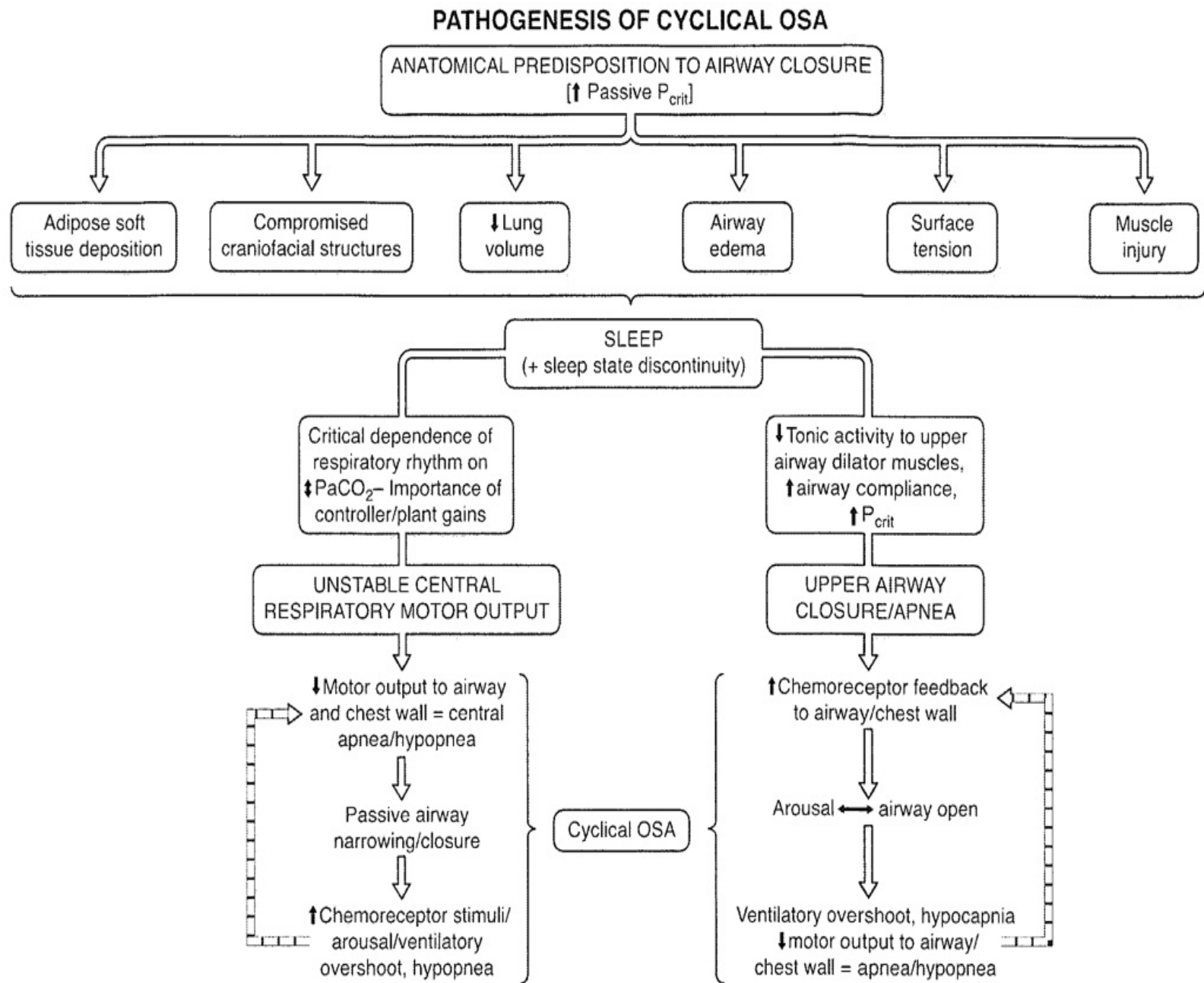
PATHOGENESIS OF CYCLICAL OSA

FIG. 2. Road map for the discussion of pathogenesis of cyclical obstructive sleep apnea.

Epidemiology

- According to the American Heart Association, fifteen million adults are affected by obstructive sleep apnea (Sommers, 2008).

- The obstructive sleep apnea diagnosis is more prevalent in men that are obese and patients suffering from cardiovascular disease (Sommers, 2008).

- The National Sleep Foundation proposes that one in four Americans are at high risk for OSA (Sommers, 2008).

- Recently, obstructive sleep apnea (OSA) is the most prevalent sleep disorder. According to Chung, 82% of men and 92% of women have not been diagnosed with severe to moderate OSA. Peri-operatively, patients that have undiagnosed OSA may experience increase complications. Unfortunately, patient deaths and adverse outcomes related to surgery are receiving tremendous attention in the media.

Stop-Bang Tool

✦ Do you have sleep apnea?

✦ Do you use CPAP at home?

✦ Scored Questions

✦ 1. Do you snore loudly? (louder than talking or loud enough to be heard through closed doors)

✦ 2. Do you often feel tired, fatigued or sleepy during the daytime?

✦ 3. Has anyone observed you stop breathing during your sleep?

✦ 4. Do you have or are you being treated for high blood pressure or have you been

✦ advised to be treated for high blood pressure?

✦ High risk of OSA: Yes to 2 or more questions   Low risk of OSA: Yes to fewer than 2 questions

✦ Additional questions:

✦ Height cm _____   Weight kg _____   BMI kg/m^2_____(35 kg/m^2)

✦ Age_____ (50)   Gender_____(M)   Neck Circumference cm_____ (40cm)

✦ Values $\geq$ those in parentheses increase sensitivity and decrease specificity of test if included in determining likelihood of OSA

Intervention

- Implement of the Stop-Bang Tool

- Every surgery patient is provided a pre-operative packet that will include the Stop-Bang tool.

- The pre-operative clinic nurse performs the final review of the patient's paperwork for completion.

- The nurse will insure the form completion and measure the patient's neck circumference at the level of the cricoid cartilage.

STOP-BANG TOOL TO DETECT OBSTRUCTIVE SLEEP APNEA FOR THE PERIOPERATIVE PATIENT

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CATALYST & ASKING

Problem Statement

The STOP-BANG tool has been found to effectively detect obstructive sleep apnea (OSA) in the undiagnosed patient. Currently, Naval Medical Center SD does not utilize an OSA detection tool. This study was designed to evaluate the effects of implementing the STOP-BANG tool and to determine whether the use of this process increases pre-operative undiagnosed OSA detection, thus increasing patient safety for the individual undergoing anesthesia.

Background

•The American Society of Anesthesiologists (ASA, 2006) published guidelines recommending that patients be screened for the risk of OSA prior to surgery. OSA is diagnosed by polysomnography using an apnea-hypopnea index (AHI).

STOP-BANG Scoring Tool –Answer Y or N
Age _____ Height _____ inches/cm Weight _____ lbs/kg
_____ 1. Snoring Do you snore loudly (louder than talking or loud enough to be heard through closed doors)?
_____ 2. Do you often feel tired, fatigued, or sleepy during daytime? Yes No
_____ 3. Has anyone observed you stop breathing during your sleep?
_____ 4. Blood pressure - Do you have or are you being treated for high blood pressure?
_____ 5. BMI more than 35 kg/m2?
_____ 6. Age over 50 yr old?
_____ 7. Neck circumference greater than 40 cm (16 inches) ?
_____ 8. Gender male?
High risk of OSA: answering yes to 3 or more items Low risk of OSA: answering yes to less than 3 items

Significance

•According to the American Heart Association, fifteen million adults are affected by OSA (Sommers, 2008). The OSA diagnosis is more prevalent in men who are obese and patients suffering from cardiovascular disease (Sommers, 2008). The National Sleep Foundation proposes that one in four Americans are at high risk for OSA (Sommers, 2008). The national incidence of sleep apnea is 25% for men and 10% for women.

Design

•Pre and post quasi-experimental time series design project included two phases: Phase One, Pre-data collection: retrospective review of anesthesia charts to collect: age, gender, height, weight, blood pressure and if the patient suffers from OSA. Phase Two: anesthesia preoperative clinic identified each patient's OSA risk/ treatment profile utilizing the questionnaire and placed it on the anesthesia pre-operative assessment form. The sleep apnea risks documentation was reviewed with all anesthesia providers. Post-data collection occurred quarterly in a time design fashion to include data sets on sleep apnea outcomes.

Outcomes: Measures

◆To determine if utilization of the STOP/BANG questionnaire by the pre-operative clinic nurses will increase identification of patients with suspected OSA during the preoperative visit.
◆To determine prevalence of OSA at baseline and after implementation of education program regarding OSA and the STOP-BANG questionnaire.
◆To determine frequency of anesthesia consultation for OSA at baseline and after educational program regarding OSA and the STOP-BANG questionnaire implementation.

IMPLEMENTATION

Retrospective chart review of 505 charts to determine baseline prevalence of patients at high risk for OSA using the STOP-BANG.
Pre-op clinic nurses were taught about OSA and how to administer the STOP-BANG. Thirty days after implementation of the STOP-BANG tool, a second retrospective chart review of 505 charts was conducted to determine the prevalence of OSA based on the STOP-BANG questionnaire.

Groups	Pre-OSA Data	Post-OSA Data
Pts. with OSA Pre-op %	7.5%	37.6%
% Difference	30.1% p<0.001	
Male Patients	61%	65%
Female Patients	39%	35%
Hypertension	24%	43%
Significance	P<0.001	
Snoring	2.6%	30.9%
Medications	1.13%	1.92%
PACU Time	235.75%	283.77%
Significance	P<0.05	

RESULTS

Pre-Sleep Apnea Data / Post-Sleep Apnea Data (Positve / Negative)
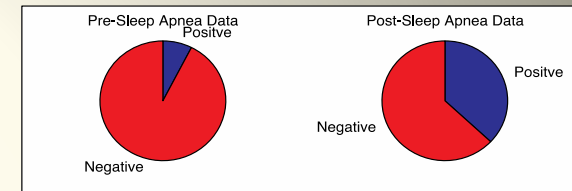
Chi-Square Tests		
	Value	Exact Sig. (2-sided)
McNemar Test		.000[a]
N of Valid Cases	100	

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.698	.268		6.344	.000
	PoHTN	.321	.095	.328	3.391	.001
	PoBMI	-.110	.044	-.215	-2.478	.015
	PoAge	-.107	.042	-.243	-2.569	.012

a. Dependent Variable: PoSA

DISCUSSION

◆The overall goal of pre-operative screening was to ensure the best possible patient outcome.
◆To screen patients for OSA has an important health impact. The STOP-BANG tool has a moderately high level of sensitivity and specificity.
◆Use of the STOP-BANG tool increased the OSA detection within our setting by 30.1%.

IMPLICATIONS

◆ Anesthesia and surgery can affect sleep in combination with the post-operative effects of anesthesia. Clinical suspicion of OSA may not be clear to the anesthesia provider. Use of the STOP-BANG tool is an easy addition to the anesthesia pre-screening to increase patient safety.

OBSTRUCTIVE SLEEP APNEA:
AND THE EFFECTS OF COFACTORS ON PACU STAY TIME

Background and Significance

- Obstructive Sleep Apnea is the most common disturbance during sleep and it affects up to 26% of the general population. (Chung et al, 2008)

- The occurrence of (moderate to severe) Obstructive Sleep Apnea is 11.4% in men and 4.7% in women. (Seet et al, 2010)

- Obstructive Sleep Apnea occurs in up to 9% individuals presenting for surgery, yet is frequently undiagnosed due to the lack of awareness of this disorder. (Kaw et al, 2006)

Background and Significance

- Obesity, gender, snoring, and age are all strong indicators for occurrence of Obstructive Sleep Apnea. (Netzer et al, 2003)

- Hypertension, coronary artery disease, and diabetes are prevalently reported as confounding and co-existing factors of Obstructive Sleep Apnea.(Dykes & Vanninen, 1996, Duran et al, 2001)

- Undiagnosed Obstructive Sleep Apnea patients are at greater risk of developing coronary artery disease, HTN and arrhythmias (Bixler et al, 2000 & Hung et al, 1990)

Literature Review

☐ A 2010 study by Arhonson indicated a high prevalence of OSA in patients with diabetes Type 2. The existence of a graded relationship between OSA severity and glucose control in patients with Type 2 diabetes was indicated after controlling for the other criteria's of obesity (BMI), age and gender.

Literature Review

- In 2001 Lavie et al, estimated that approximately 40 to 60 percent of individuals diagnosed with obstructive sleep apnea in sleep labs had concurrent hypertension. This rate of hypertension was two to three times higher than the general population.

Literature Review

❑ Severe hypoxemia during REM sleep may predispose OSA patients to abnormal heart rhythms such as extreme bradycardia, sinus pauses or conduction blocks. Evidence from studies also supports an independent association of OSA and atrial fibrillation. (Lavie et al, 2008)

Objective

- The purpose of this study is to identify the preexisting factors that significantly affect post operative recovery times between 2 groups.

- Patients with Obstructive Sleep Apnea (OSA) compared to patients without OSA undergoing abdominal surgical procedures.

Theoretical Framework
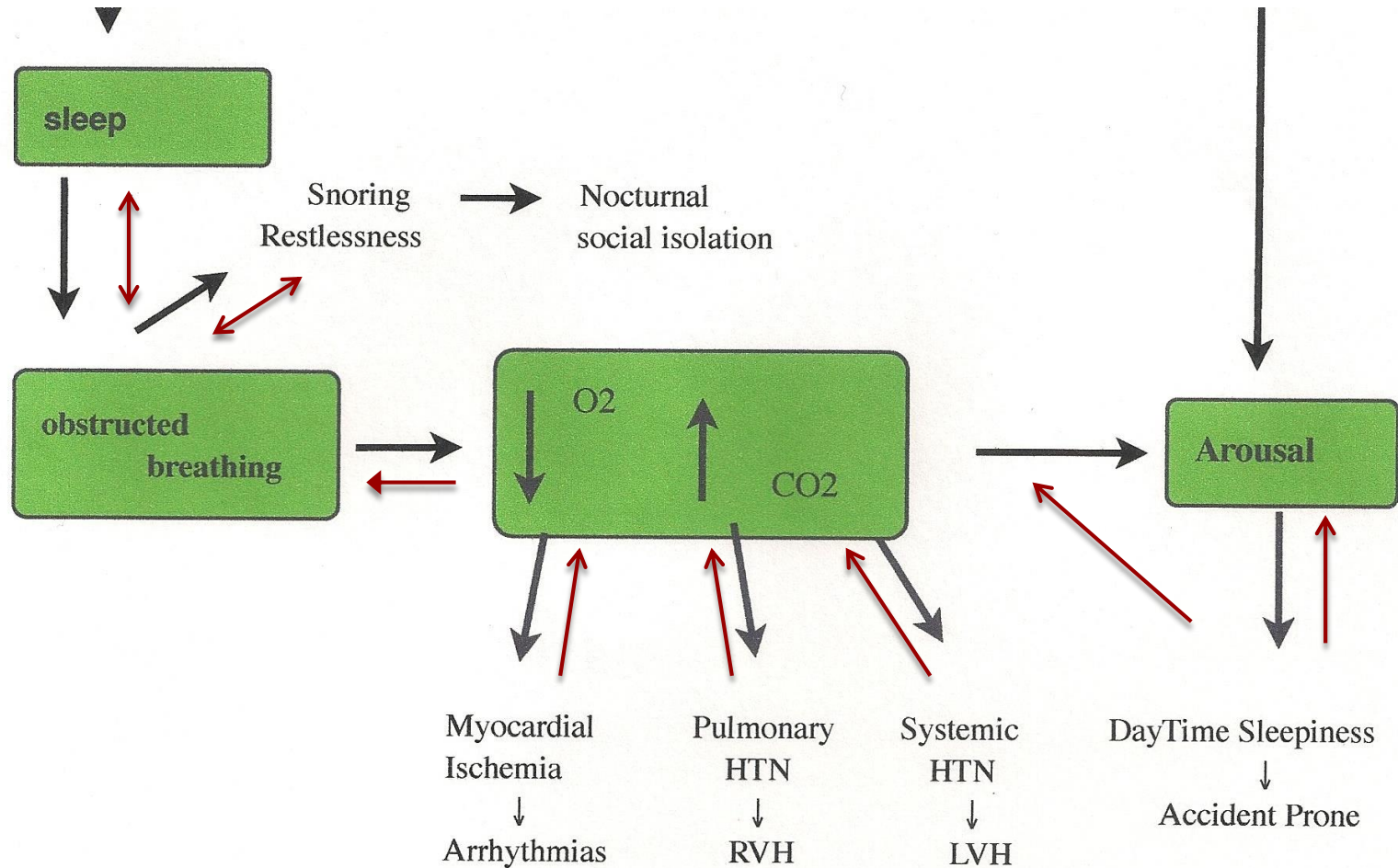
Results: Independent T-Test

- OSA patients had mean PACU stay time of 388.9 min. A sample of 35 patients diagnosed with OSA.

- Non-OSA patients had mean PACU stay time of 215.1 min.

- Results indicate that PACU stay times differed significantly between the two groups ($t35=4.31, p< .05$)

- Patients diagnosed with OSA spent longer in the PACU than Non-OSA patients.

Results: Chi Square

- Examination of the relationship between individual cofactors for both OSA and non-OSA diagnosed patients demonstrated that hypertension was significant with a $p < .05$.

- 56% of patients with OSA had a diagnosis of hypertension, while only 27% of non-OSA patients had hypertension.

- OSA patients have a 3.36 greater chance of having hypertension as an additional cofactor.

- None of the other cofactors were found to be significant following individual chi square testing.

Results: Chi Square

- Interesting relationship between GERD and OSA patients:

- 56% of OSA patients had diagnosed GERD as compared to 36% of non-OSA patients.

- The relationship between OSA patients diagnosed GERD is very close to being significant with a p-value of .057.

- OSA patients had a 2.26 greater occurrence of GERD as compared to non-OSA patients.

- An assumption could be made that with a more robust sample, significance could actually be determined.

Implications

Future research should explore the role of these and other variables in predicting length of PACU stay in sleep apnea patients.

Nursing Implications

- Preoperative assessment of all surgical patients using validated instruments would aid in the identification of surgical patients with both known; and more importantly unknown OSA.

- Cofactors can be identified and appropriate optimization measures can be applied.

- Intraoperative management could be streamlined and specified for the OSA patient in a manner that minimizes complications.

- Postoperative measures and protocols could be developed to improve the care for the OSA patient; eliminating the risk factors and provide for safe analgesia that inhibits heavy sedation while promoting optimum oxygenation and pressure to support airways and eliminate adverse events.

OBSTRUCTIVE SLEEP APNEA:
AND THE EFFECTS OF COFACTORS ON PACU STAY TIME

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Background

Obstructive Sleep Apnea (OSA) is the most common disturbance during sleep affecting 26% of the general population (Chung et. al, 2008). The occurrence of moderate to severe OSA is estimated to be 11.4% in men and 4.7% in women (Seet et. al, 2010).

OSA is caused by repetitive partial or complete obstruction of the upper airway with apnea periods during sleep lasting greater than 10 seconds. OSA is a prevalent problem in western society, but is frequently undiagnosed due to lack of awareness or knowledge of this disorder. This patient population presents a unique challenge during the peri-operative period due to increased risk for several complications. Of particular interest to the Nurse Anesthetist, are the respiratory complications that can result in delayed emergence from anesthesia, delayed post operative recovery, increased apneic episodes, hypoxemia, and death in this patient population. Examining duration of recovery periods between these two groups will help to determine if patients with OSA and additional cofactors of hypertension, cardiovascular disease and diabetes can benefit from a longer post operative monitoring or change in Anesthetic management.

Measurements

STOP-BANG Scoring Tool –Answer Y or N
Age _____ Height _____ inches/cm Weight _____ lbs/kg
_____ 1. Snoring Do you snore loudly (louder than talking or loud enough to be heard through closed doors)?
_____ 2. Do you often feel tired, fatigued, or sleepy during daytime? Yes No
_____ 3. Has anyone observed you stop breathing during your sleep?
_____ 4. Blood pressure - Do you have or are you being treated for high blood pressure?
_____ 5. BMI more than 35 kg/m2?
_____ 6. Age over 50 yr old?
_____ 7. Neck circumference greater than 40 cm (16 inches) ?
_____ 8. Gender male?
High risk of OSA: answering yes to 3 or more items Low risk of OSA: answering yes to less than 3 items

Design

An experimental design to include a non-randomized convenience sample with two groups including males and females 18 to 65 years old. Comparisons will be made between subjects on duration of postoperative recovery times and other discharge criteria with patients identified as having OSA or no OSA utilizing the STOP-BANG Tool.

Framework

1. IRB APPROVED STUDY
2. THREE PHASE STUDY
3. SAMPLE SIZE CALCULATED TO BE 505 PATIENTS PER PHASE
4. PHASE ONE AND PHASE TWO COMPLETED; 1010 Patients enrolled
5. Phase three pilot completed: 50 patients

Data Sheet

Results

Column1	Column2	Column3	Column4
Correlation	OSA DX YES	OSA DX NO	SIGNIFICANCE
PRESTOP DATA	7.50%	92.50%	NS
POST STOP DATA	37.60%	62.40%	P< 0.001
COFACTOR DATA	32.60%	67.40%	P< 0.001

Column1	Column2	Column3	Column4	Column5
DEMOGRAPHICS	AGE	WT	MALE	FEMALE
PRE STOP BANG DATA	40.06	80.69	61%	39%
POST STOP BANG DATA	51.5	84.97	65%	35%
COFACTOR DATA	47.86	86.11	48%	52%

Cofactor Significance	OSA PTS	Non OSA PTS	t	df	P-value
COFACTOR	2.07	1.53	1.93	41	P< 0.05
MEDICATIONS	1.92	1.13	2.64	40	P< 0.01
TIME	283.76	235.75	1.76	40	P< 0.05

Implications for Clinical Practice

If a significant difference in recovery time between groups is found, recommendations for appropriate postoperative monitoring and recovery measures could be implemented. Additionally, alternate forms of anesthesia can be studied to prevent extended postoperative periods and minimize complications. Minimizing patient hospital stay and decreasing hospital cost.
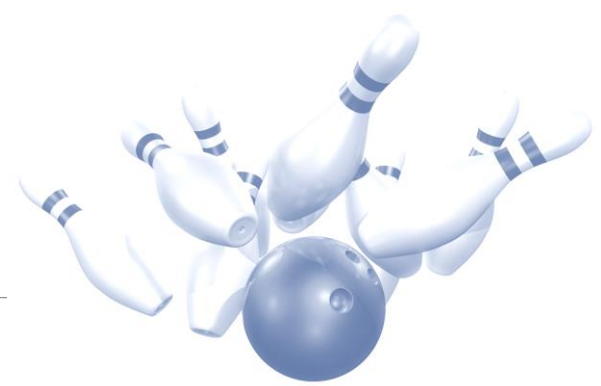
CORRELATIONAL STUDY OF SLEEP APNEA PATIENTS' CHARACTERISTICS WITH DISCHARGE LOCATION

- Project leader(s): Esther Lee, MBA, MNP, RN
  - Email: e19lee@ucsd.edu

STUDY AIMS

1. To determine if there is a correlation between OSA characteristics and the PACU discharge location in an academic medical center

2. To learn the characteristics of the patients at risk of low saturation levels, number of desaturations and longer length of stay in the PACU

Literature Review

- **Variable selections**
  - Patients-related characteristics
    - Age; Gender; Ethnicity
  - ASA Guidelines and Physical Status Classifications
    - Categories 1- 4, 4 being highest acuity and or comorbidities
  - Comorbidities
    - Hypertension, diabetes, obesity
  - Perioperative risks
    - Anesthesia types; types of surgery; pain management ; narcotic use

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RESEARCH QUESTION/HYPOTHESIS

1. Was there a correlation between OSA characteristics and the PACU discharge location in an academic medical center?

2. What were the characteristics of the patients "at risk" for lowest oxygen saturation levels, number of oxygen desaturations and length of stay in the PACU?

RESULTS

Spearman Rho Analysis

DCLOC	r_s VALUE	p VALUE[1]
AGE	.195	.015
ASA	.190	.019
Anaesthesia Type	.244	.002
Narcotic Use	.471	.000
BMI [2]	.096	.237
OSA Treatment [2]	.141	.082
Surgical Type [2]	-.096	.237
Diabetes [2]	.122	.132

1. P $\leq$ .05
2. Denotes approaching significance

Variables - Statistically Significance, Admitted To IMU

Age
- 62.5%: => 60 years old

Anesthesia Type
- 58.7%: General anesthesia
- 31.8%: MAC

ASA Classification (see next slide)
- Approach significance - Pearson Chi Square
- Significance – Spearman Rho

Narcotic Use
- Yes: 69.8%
- No : 21.6%

RESULTS

Characteristics of 3 Continuous Variables

		TIMEDC	NOOFDESAT	LOWESTSAT
N	Valid	153	153	153
	Missing	0	0	0
Mean		1.5418	1.25	.9280
Median		1.3800	0.00	.9400
Mode		1.00	0	.94
Std. Deviation		.77077	3.594	.04971
Variance		.594	12.915	.002
Skewness		1.373	3.858	-2.338
Std. Error of Skewness		.196	.196	.196
Range		4.03	20	.38
Minimum		.50	0	.62
Maximum		4.53	20	1.00
IQR		1.00	0	.04

SUMMARY

Time Discharge from PACU (TIMEDC)

- 4.6% - 5.2%: =<45 min
- 47%:1-hr
- 16%: 1.5 hrs
- 20%: 2 hrs

Number of Desaturation (NOOFDESAT)

- None: 75%
- 1-2 episodes: 17%
- 20 episodes: 2%

Lowest Oxygen Saturation (LOWESTSAT)

- =>91%: 77.1%

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STUDY LIMITATIONS

- **Retrospective nature, a small, non-randomized study**
- **Confounding variables**
  - Rate of oxygen saturation in PACU – bedside nursing care in PACU; absence of data from IMU and monitoring at home
  - Some variables may be overlooked in chart review, e.g. neck circumference
  - samples over-represented by a single ethnic type, generalization to general population impractical
  - Contrary to most research findings, BMI a non-risk factor, attributable to selection of BMI>30 vs. BMI>40
  - Treatment biases, absent of research protocol, more variability in treatment decisions; Individual comfort level guides MD's clinical decision making

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IMPLICATIONS FOR FUTURE RESEARCH

Future Research

– More research required to understand patient's post transfer clinical conditions and management after transfer from PACU to IMU

– Additional studies required for patients with abnormally high episodes of oxygen desaturation

– Cost benefit studies of supplementing pulse oximetry monitoring with capnography monitoring

– Examine use of regional block anesthetics for OSA patients to provide evidence-base for developing future practice protocols to decrease narcotic use in PACU for OSA patients

IMPLICATIONS FOR CLINICAL PRACTICE

Clinical Practice

– Recommend consistent and complete use of STOP-BANG questionnaire to enhance care

– Follow-up phone calls to understand discharged OSA patients' health status

  • Focus on patients >60 years age with ASA Class III, received general anesthesia and narcotic use in PACU

  • Feedback facilitates development of effective postoperative policies and protocols for enhanced postoperative care and patient management

Questions???

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