MICHIGAN
OTOLARYNGOLOGIC SOCIETY

The Role of Tonsillectomy and UPPP for OSA

Kathleen Yaremchuk, MD, MSA,

Chair, Department of Otolaryngology/Head and Neck Surgery
Senior Staff Sleep Medicine
Henry Ford Hospital - Detroit, Michigan

Henry Ford Health System all for you

Conflict of Interest Disclosure
Kathleen Yaremchuk, MD, MSA

■ 1. I do not have any relationships with any entities **producing**, **marketing, re-selling, or distributing** health care goods or services consumed by, or used on, patients, **OR**

■ 2. I have the following relationships with entities **producing**, **marketing, re-selling, or distributing** health care goods or services consumed by, or used on, patients.

Type of Potential Conflict	Details of Potential Conflict
Grant/Research Support	
Consultant	
Speakers' Bureaus	
Financial support	
Other	

■ 3. The material presented in this lecture has no relationship with any of these potential conflicts, **OR**

■ 4. This talk presents material that is related to one or more of these potential conflicts, and the following objective references are provided as support for this lecture:

1.
2.
3.

Henry Ford Health System all for you

Subspecialty Board Certification in Sleep Medicine-ABIM

- ABMS Sleep Medicine provided subspecialty certifications for the following specialties
  - Anesthesia
  - Family Medicine
  - Internal Medicine
  - **Otolaryngology**
  - Neurology
  - Pediatrics
  - Psychiatry

Great Opportunity for Otolaryngologists

- Sleep Medicine fellowship
  - 1 year fellowship
  - 8 programs in the country that have ENT's as part of faculty
    - Time in OR performing procedures
    - Time in sleep lab reading studies
    - Clinic time
- **Most wanted** subspecialty within ENT

Evaluating a Patient with OSA

- Chief Complaint
  - Usually the bed partner
    - Travel with friends
  - Snoring, gasping for breath, apneas
  - Not feeling well rested after an adequate night's sleep
  - Cognitive deficits

Evaluating a Patient with OSA

- **HPI**
  - How long has the patient been snoring, gasping, unrefreshing sleep?
  - Why are they coming in **now**?
  - How much sleep do they get?
    - Time to bed and time up for the day
    - How many times do they get up at night?
  - Do they take naps?
- **Epworth Sleepiness Scale (ESS)**
  - Hypersomnolence
  - Not an indicator of OSA
- **Stop Bang**
  - Screening for OSA
  - Pre op
- **FOSQ-10**
  - Functional Outcomes of Sleep Questionnaire
  - Quality of life

Epworth Sleepiness Scale (ESS)

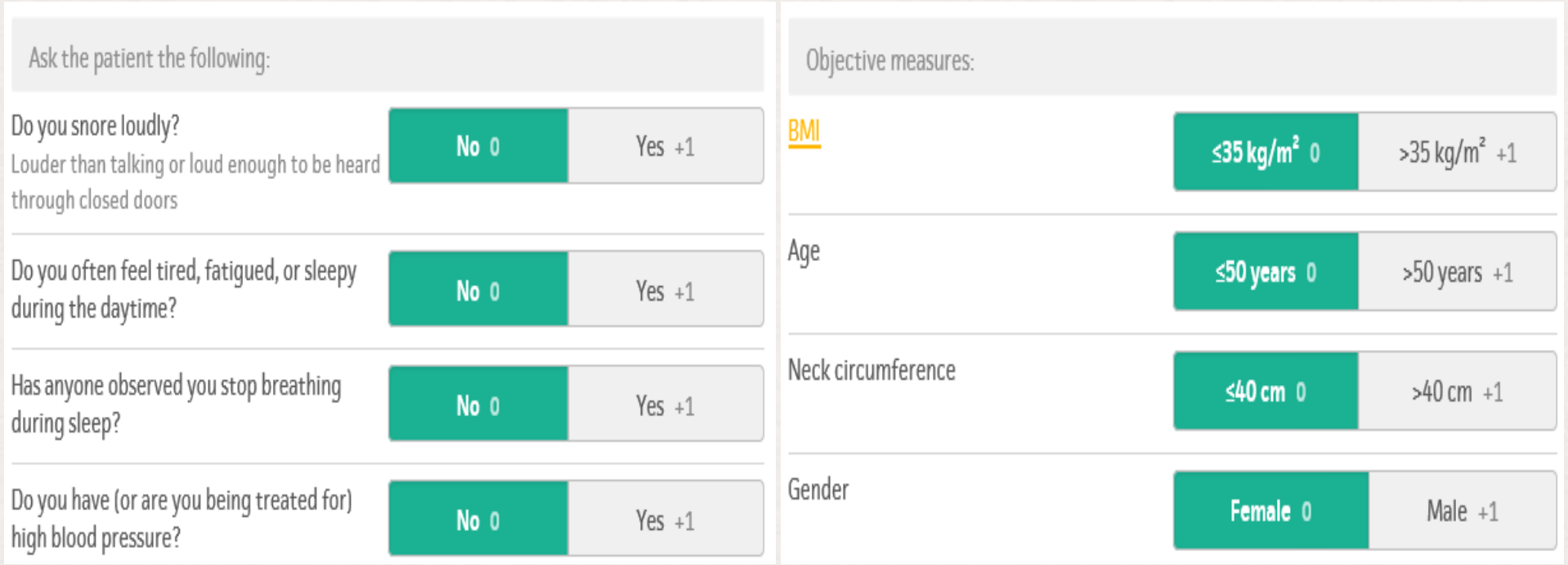
- Any patient being evaluated for OSA should have this information collected
- Should be done before and after intervention
- Diagnosis of **hypersomnolence** is important
  - Continued ESS >18 after intervention should be evaluated for an additional sleep disorder
    - Narcolepsy

Situation	Chance of dozing or sleeping			
	0	1	2	3
Sitting and reading	○	○	○	○
Watching TV	○	○	○	○
Sitting inactive in a public place	○	○	○	○
Being a passenger in a car for an hour	○	○	○	○
Lying down in the afternoon	○	○	○	○
Sitting and talking to someone	○	○	○	○
Sitting quietly after lunch (no alcohol)	○	○	○	○
Stopping for a few minutes in traffic while driving	○	○	○	○
Total Epworth score				

UNDERSTANDING YOUR SCORE

0–10	Normal range in healthy adults
11–14	Mild sleepiness
15–17	Moderate sleepiness
18 or higher	Severe sleepiness

Stop-Bang



Ask the patient the following:		
Do you snore loudly? Louder than talking or loud enough to be heard through closed doors	**No 0**	Yes +1
Do you often feel tired, fatigued, or sleepy during the daytime?	**No 0**	Yes +1
Has anyone observed you stop breathing during sleep?	**No 0**	Yes +1
Do you have (or are you being treated for) high blood pressure?	**No 0**	Yes +1

Objective measures:		
BMI	**≤35 kg/m² 0**	>35 kg/m² +1
Age	**≤50 years 0**	>50 years +1
Neck circumference	**≤40 cm 0**	>40 cm +1
Gender	**Female 0**	Male +1

Mild-Moderate-Severe OSA

- **OSA is a risk factor**
  - Similar to HTN, DM, hyperlipidemia, obesity
  - We try to **mitigate/eliminate** risk factors
  - OSA does not mean people stop breathing and die in their sleep

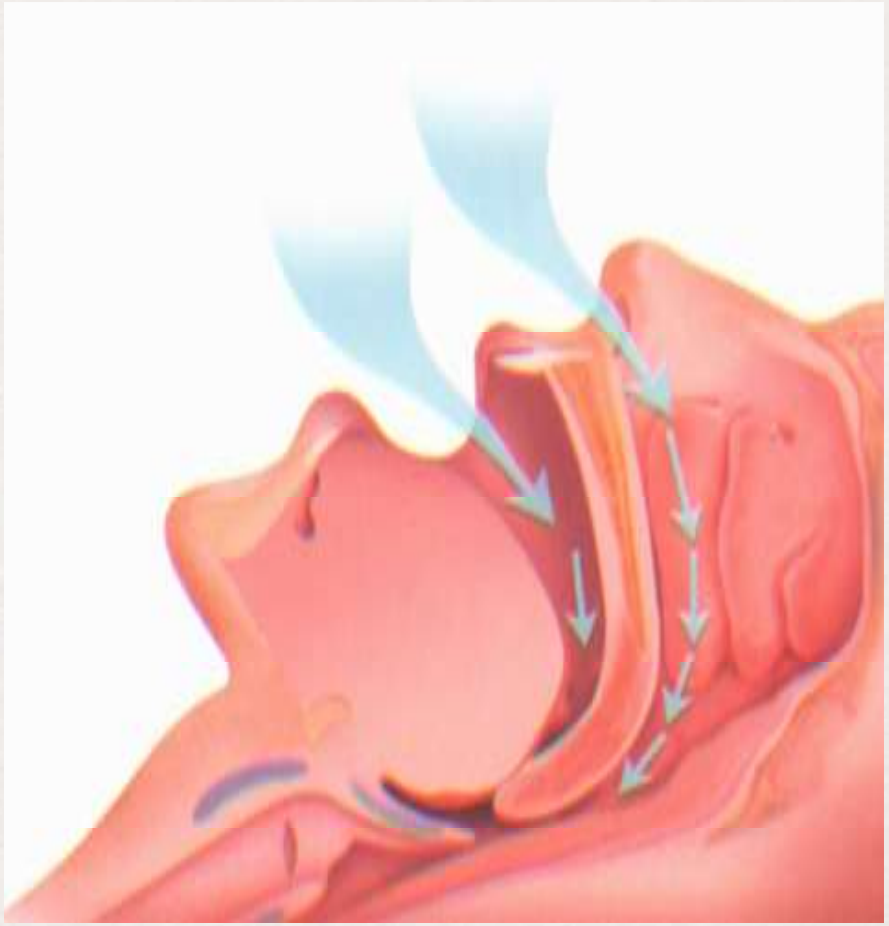
- OSA Classification
  - Normal AHI <5
  - Mild AHI 5-15
  - Moderate 15-30
  - Severe >30
- Mild OSA alone has not been shown to have an impact on life expectancy unless there is hypersomnolence (ESS)
- Most insurances **will not pay** for CPAP if **mild OSA**, no comorbidities or hypersomnolence

OSA Treatment Options

- Lifestyle
  - Lose weight
  - ↓10% body weight=↓30% in AHI
- **CPAP**
- Oral Appliances
- **Anatomy Altering Surgery**
- Upper Airway Stimulator

Uvulopalatopharyngoplasty

- Described in Japan by Ikematsu for snoring
- Fujita (HFH) performed on patients with OSA (1981)
- **Responders vs. non-responders**
- Anatomical differences



Surgical correction of anatomic abnormalities of OSA-UPPP

- 12 patients
  - 11 men
  - 10 were obese with short and thick neck
- Each patient had a history of EDS (8.8 years) and loud, habitual snoring for many years (9 since childhood)
- 8 patients reported nasal obstruction
  - Otolaryngology Head Neck Surg 1981;89; 923-934.

Degree of OSA

Pre Op PSG

- Average AHI
  - **60**
- Average lowest SaO_2
  - **46%**
- Min SaO_2 (<85% of TST)
  - **20%**
- Mean apneas duration
  - **25 sec**
- Waking SaO_2
  - **93%**

Post op Results

- 8 patients required no further treatment
  - AI 50→10
  - **66% success**
- 2 patients showed a mild decrease in AI
  - 76→61
- 2 patients showed an increase in AI
  - 48→64

Responders vs. Non-responders

"Since there is a variable response to UPPP, it is important to determine what **subgroup** of the sleep apnea patients would benefit from this procedure or whether **another factor** might influence the surgical results."

Fujita, Oto/HNS 1981,89; 923-934

The Efficacy of Surgical Modifications of the Upper Airway in Adults With Obstructive Sleep Apnea Syndrome*

- Meta-analysis of articles from January 1966 through April 1993
- Nasal, UPPP, laser midline glossectomy, lingualplasty, inferior sagittal mandibular osteotomy and genioglossal advancement , tracheotomy, maxillomandibular osteotomy and advancement
  - Sher, Sleep 1996:19(2):156-177
- Analysis of the UPPP papers revealed that this procedure is effective in treating **less than 50%** of patients with OSA.
- The studies to support the use of the surgical treatment of obstructive sleep apnea contain biases related to **small sample size, limited follow-up and patient selection.**

Upper Airway Surgery Does Not have a Major Role in the Treatment of Sleep Apnea*

Journal of Clinical Sleep Medicine, Vol. 1, No. 3, 2005

Otolaryngologists have failed to demonstrate clear cut benefits of treating sleep apnea with upper airway surgery. The reasons for this are:

1. Outcome variables reported in surgical trials are subjective and trivial. Polysomnography (PSG) is rarely done.
2. When PSG IS done it is not well-interpreted
3. Surgical "success" leaves patients with deadly levels of sleep-disordered breathing (SDB).
4. Only uvulopalatopharyngoplasty (UPPP) has been evaluated extensively enough to draw conclusions about its outcomes, and it is ineffective in the treatment of sleep apnea.
5. Long-term follow-up is rare and incomplete
6. Surgical solutions are sometimes applied indiscriminately.
7. If CPAP doesn't work or isn't tolerated, other treatments are at least as good as upper airway surgery.

CPAP

- CPAP is the **best studied** and most **effective** form of treatment of OSA
- CPAP compliance is burdensome and *compliance remains around 50%*
  - *Journal of Clinical Sleep Medicine, Vol. 1, No. 3, 2005*

Efficacy vs Effectiveness

- Efficacy
  - Is the effect in the lab or under ideal circumstance, regardless of treatment compliance
- Effectiveness
  - Is the effect in daily life, which depends on patient compliance with therapy
    - Surgery does not depend on compliance

CPAP vs UPPP

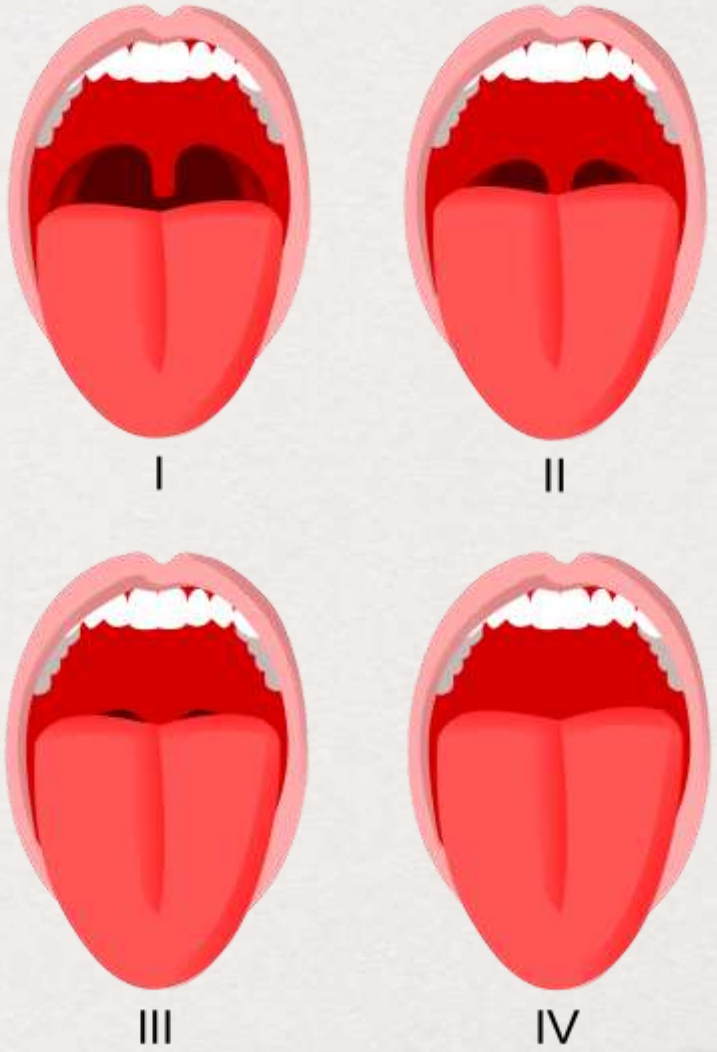
- CPAP
  - 100% efficacious, but 30-60% compliance
- UPPP
  - 50% efficacious
  - 100% compliance

Clinical Staging for Sleep Disordered Breathing*

- Identify prognostic indicators that would lead to stratification of patients likely to have successful surgery for SDB
- Retrospective study of 134 patients to correlate palate position and tonsil size to the success of the UPPP
- Success defined as 50% decrease in preop AHI **AND** AHI<20
    - **Friedman, Otolaryngology HNS 2002;127,13-21**

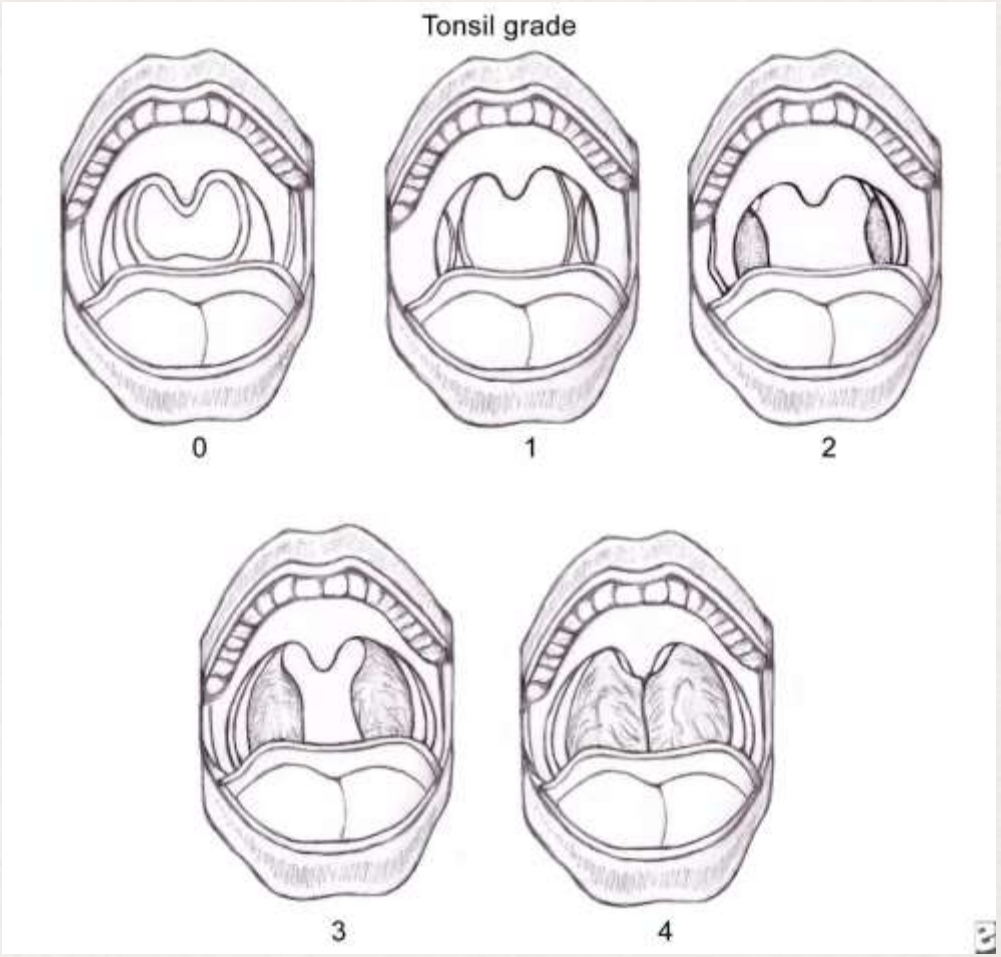
Oral Cavity-Mallampati

- I-Posterior pharyngeal wall+soft palate+uvula+hard palate
- II-Posterior pharngeal wall +soft palate+part of uvula
- III-Soft palate + hard palate
- IV-Hard palate



Tonsils

- Zero or 1-can't see
- 2+ evident on exam
- 3+ large
- 4+ Kissing tonsil



Modified Friedman Staging System for Patients with OSA

	Friedman Palate Position	Tonsil Size	BMI
Stage I	1	3,4	<40
Stage II	1,2 3,4	1,2 3,4	<40 <40
Stage III	3 4	0,1,2 0,1,2	<40 <40
Stage IV	1,2,3,4	0,1,2,3,4	>40

Success Rate of UPPP in the treatment of sleep disordered breathing

Stage	Successful	**Failure**	Total
I	**80.6%** (n=25)	19.4% (n=6)	100% (n=31)
II	37.9% (n=18)	62.1% N=18	100% (n=29)
III	8.1% (n=68)	91.9% (n=68)	100% (n=74)

Success Rate of UPPP+TBRF in the treatment of sleep disordered breathing

Stage	UPPP/ tonsillectomy	UPPP/ RFBOT	Total
I	80.6% (n=25)		100% (n=31)
II	37.9% (n=18)	74%* P=.0001	100% (n=29)
III	8.1% (n=68)	43.8%* P=.0001	100% (n=74)

UPPP Conclusion

A clinical staging system for SDB based on palate position, tonsil size, and body mass index is presented. It appears to be a valuable predictor of the **success** of UPPP.

*Otolaryngol Head Neck Surg 2002;127:13-21

Tonsillectomy as a treatment of Obstructive Sleep Apnea in adults with hypertrophic tonsils*

- N-11
  - 5 severe OSA
  - 4 Mild OSA
  - 2 Simple snorers
- The surgical response rates (defined as decrease in the postoperative AHI >50% and a postoperative AHI of less than 20) were **80.0%** in severe apneics and **100%** in mild apneics
  - Laryngoscope, 110:1556–1559, 2000

The Role of Tonsillectomy in Adults with Tonsillar Hypertrophy and Obstructive Sleep Apnea*

- N-34
- Insomnia Severity Index
- Epworth Sleepiness Scale
- FOSQ 10
- Surgical success to treatment was defined by a >50% ↓ in AHI and ↓ AHI to <20

*Otolaryngology–Head and Neck Surgery,2017, Vol. 157(2) 331–335

Results

- Surgical success rate of **78.1**%
  - >50% ↓ in AHI and ↓ AHI to <20
  - Nothing in literature to indicate AHI<30 results in decreased survival
- Surgical cure rate 50%
  - 50%↓ in AHI and an AHI <5
- No significant difference in AHI based on BMI
  - BMI 24-29, 30-35, 35-40

AHI, ESS, ISI, FOSQ-10

Table 1. Outcomes After Tonsillectomy in Adults with Tonsillar Hypertrophy and Obstructive Sleep Apnea.

Outcome Variable: BMI Group	Subjects, n	Mean ± SD		*P* Value
		Pretreatment	Posttreatment	
AHI				
All	18	31.57 ± 25.88	8.12 ± 8.94	<.001
25-29.9	4	26.28 ± 15.54	9.38 ± 15.11	.125
30-34.9	5	30.2 ± 18.35	3.0 ± 2.35	.063
35-39.9	9	34.68 ± 33.74	10.41 ± 7.65	.074
ESS				
All	34	10.94 ± 4.43	5 ± 4.61	<.001
25-29.9	7	10.86 ± 2.54	4.14 ± 3.53	.016
30-34.9	8	7.88 ± 3.14	4 ± 4.24	.016
35-39.9	19	12.26 ± 4.90	5.73 ± 5.15	.001
ISI				
All	34	16.64 ± 5.54	6.15 ± 3.47	<.001
25-29.9	7	17.14 ± 5.24	5.43 ± 2.76	.016
30-34.9	8	15.38 ± 6.55	4.75 ± 2.12	.008
35-39.9	19	17 ± 5.44	7 ± 3.99	.001
FOSQ-10				
All	34	9.91 ± 3.1	14.26 ± 1.94	.001
25-29.9	7	9 ± 2.92	14.57 ± 1.24	.016
30-34.9	8	10.94 ± 2.24	14.69 ± 0.92	.008
35-39.9	19	9.82 ± 3.46	13.97 ± 2.42	.001

Questions To Ask Ourselves

- Should we only do tonsillectomy on adult OSA patients with enlarged tonsils?
  - Maybe UPPP does not add anything
- Is the **80% success** in Friedman Stage 1 due to removing enlarged tonsils?
  - Malampati, **Tonsil size**, BMI
- Is success the same if only tonsillectomy is performed?

Back to UPPP, UPPP/tonsillectomy and CPAP

- What is our primary endpoint?
  - Decreasing AHI
    - Are we treating a number?
  - Daytime somnolence (ESS)
  - Cardiovascular disease
  - Cerebrovascular disease
  - Diabetes
  - Obesity
  - Quality of life (FOSQ-10)
  - **Survival**

Survival of veterans with sleep apnea: Continuous positive airway pressure versus surgery*

- This retrospective cohort database study included all sleep apnea patients treated with CPAP or UPPP in Veteran Affairs facilities from October 1997 through September 2001
- Treatment groups were compared with Cox regression, adjusting for age, gender, race, year treatment was initiated, and comorbidity.
- Sleep apnea severity and CPAP use data were not available
  - Weaver et al, Otolaryngol Head Neck Surg 2004;130:659-65

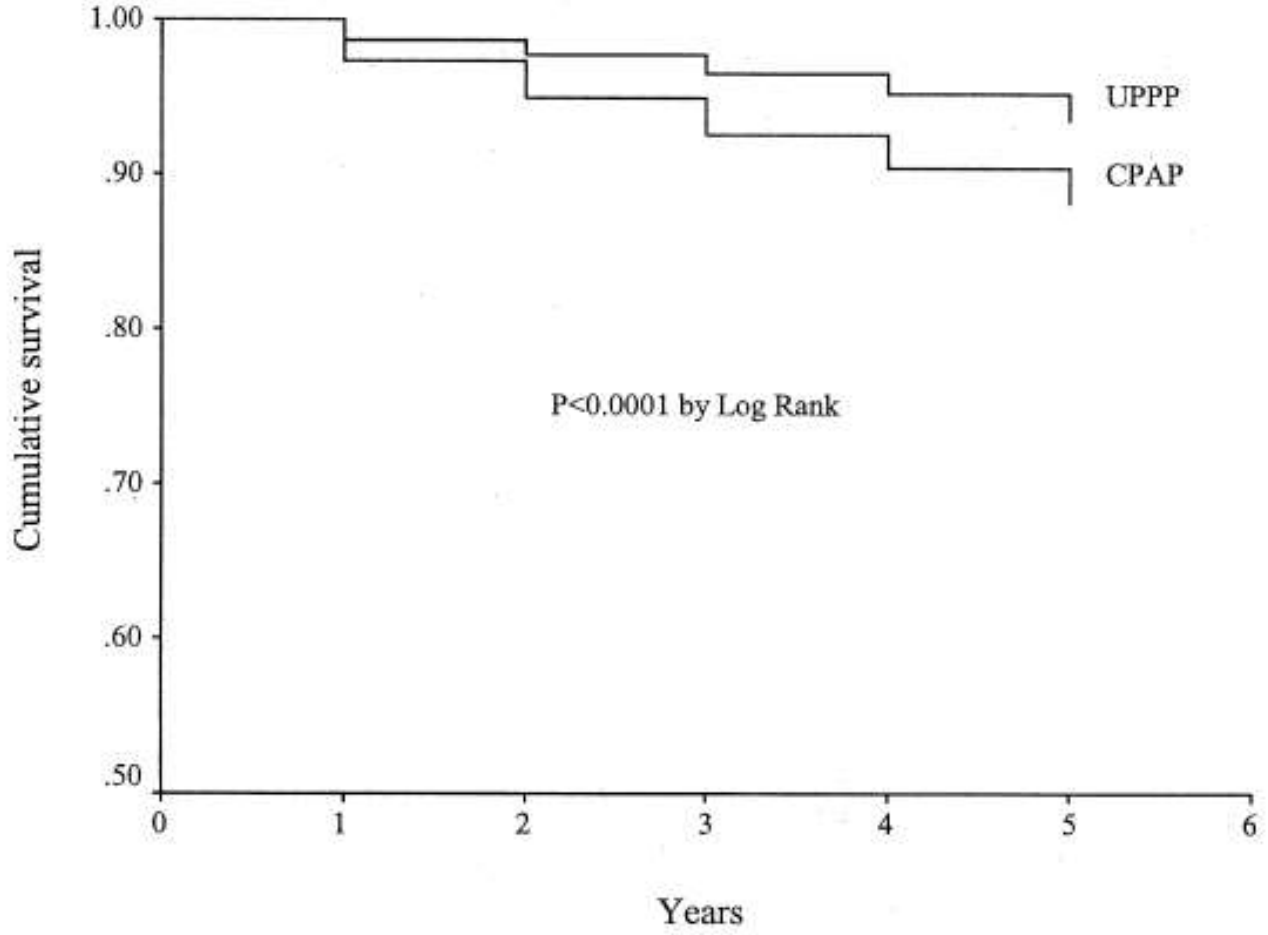


Fig 1. Survival curves for uvulopalatopharyngoplasty (UPPP) and continuous positive airway pressure (CPAP). Proportion of UPPP and CPAP patients alive in the time (years) after treatment (UPPP operation or provision of CPAP device). UPPP patients had significantly better survival than CPAP patients.

CPAP & UPPP

- In 1,339 (7.1%) of 18,754 CPAP patients and 71 (3.4%) of 2,072 UPPP patients were dead ($P < 0.001$).
- After adjustment, CPAP patients had 31% (95% confidence interval, 3% to 67%, P 0.03) higher probability of being **dead at any time**, relative to UPPP patients

- If only 50% of patients use CPAP and UPPP is 50% effective, why do UPPP patients live longer?

Uvulopalatopharyngoplasty reduces the incidence of cardiovascular complications caused by obstructive sleep apnea: results from the national insurance service survey 2007-2014.

Lee HM[1], Kim HY[2], Suh JD[3], Han KD[4], Kim JK[5], Lim YC[5], Hong SC[5], Cho JH[6].

- **Objective**: The objective of this study was to investigate whether uvulopalatopharyngoplasty (UPPP) reduced the risk of cardiovascular complications for patients with OSA.
- **Methods:** Data from Korea National Health Insurance Corporation, a national health care database in South Korea, were analyzed. All patients with a new diagnosis of OSA from 2007 to 2014 were identified. Propensity score matching by age and sex was used to identify a control group **five times larger** than the **OSA group** for comparison. Patient **demographics** and **comorbidities** were collected. The OSA group was further divided into patients who had an **UPPP** and patients **who did not undergo surgery**. The **primary endpoints** were **newly diagnosed MI, CHF, and AF**.
- **Conclusion**: **OSA** increases the risk of CHF and AF. **UPPP in this population can significantly reduce the risk of cardiac complications in patients with OSA.**
  - H.M. Lee et al. / Sleep Medicine 45 (2018) 11e16

"Small sample size, limited follow up and patient selection" Sher, Sleep 1996:19(2):156-177

Study design

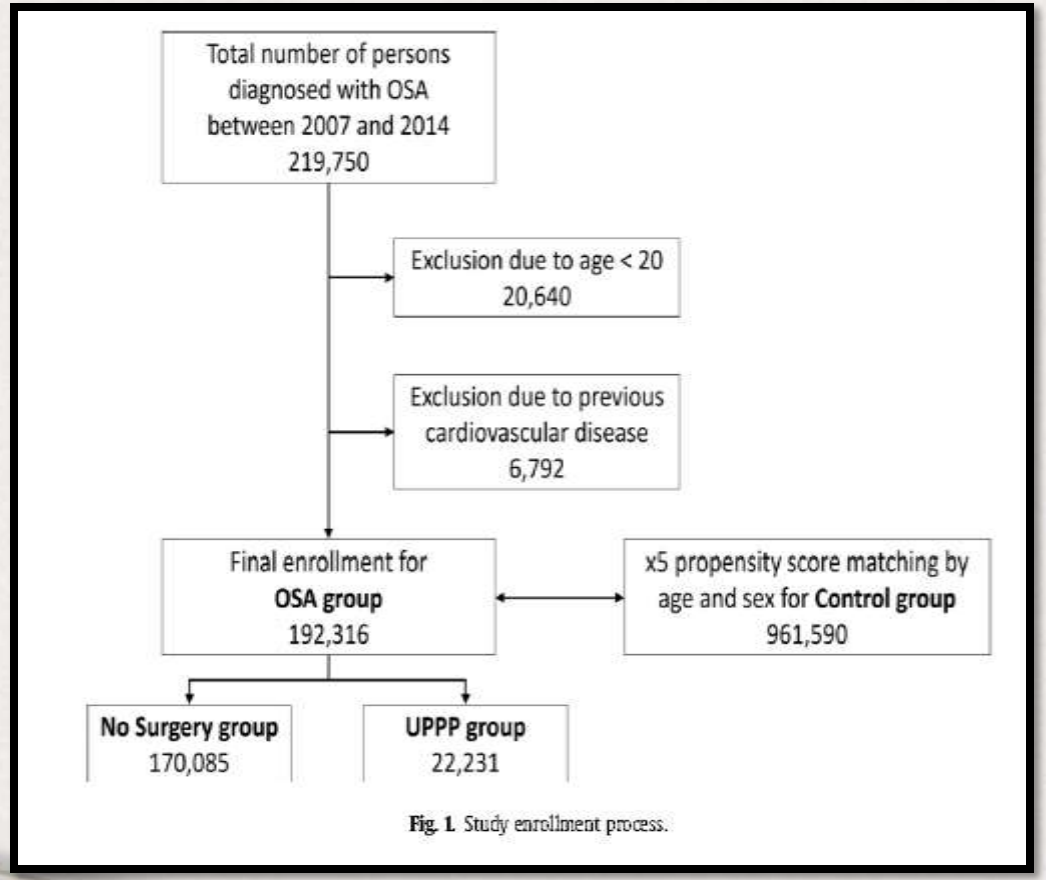


Fig. 1. Study enrollment process.

Big data

Table 2
Demographics of obstructive sleep apnea (OSA) patients and control group.

	Control		OSA			
			No Surgery		UPPP	
	n	%	n	%	n	%
Total number	961,590	100.00	170,085	100.00	22,231	100.00
Men	735,775	76.52	127,744	75.11	19,410	87.31
Mean age, y	44.8 ± 13.2		45.2 ± 13.3		41.6 ± 11.4	
Age ≥40 y	603,725	62.78	108,461	63.77	12,282	55.25
Income lowest quintile	214,236	22.28	29,371	17.27	3422	15.39
Urban residency	446,751	46.55	79,557	46.87	11,417	51.43
Diabetes	54,793	5.7	11,937	7.02	1246	5.6
Hypertension	134,334	13.97	39,219	23.06	4937	22.21
Dyslipidemia	79,558	8.27	27,762	16.32	2925	13.16

UPPP, uvulopalatopharyngoplasty.

"Small sample size, limited follow up and patient selection"

Sher, Sleep 1996:19(2):156-177

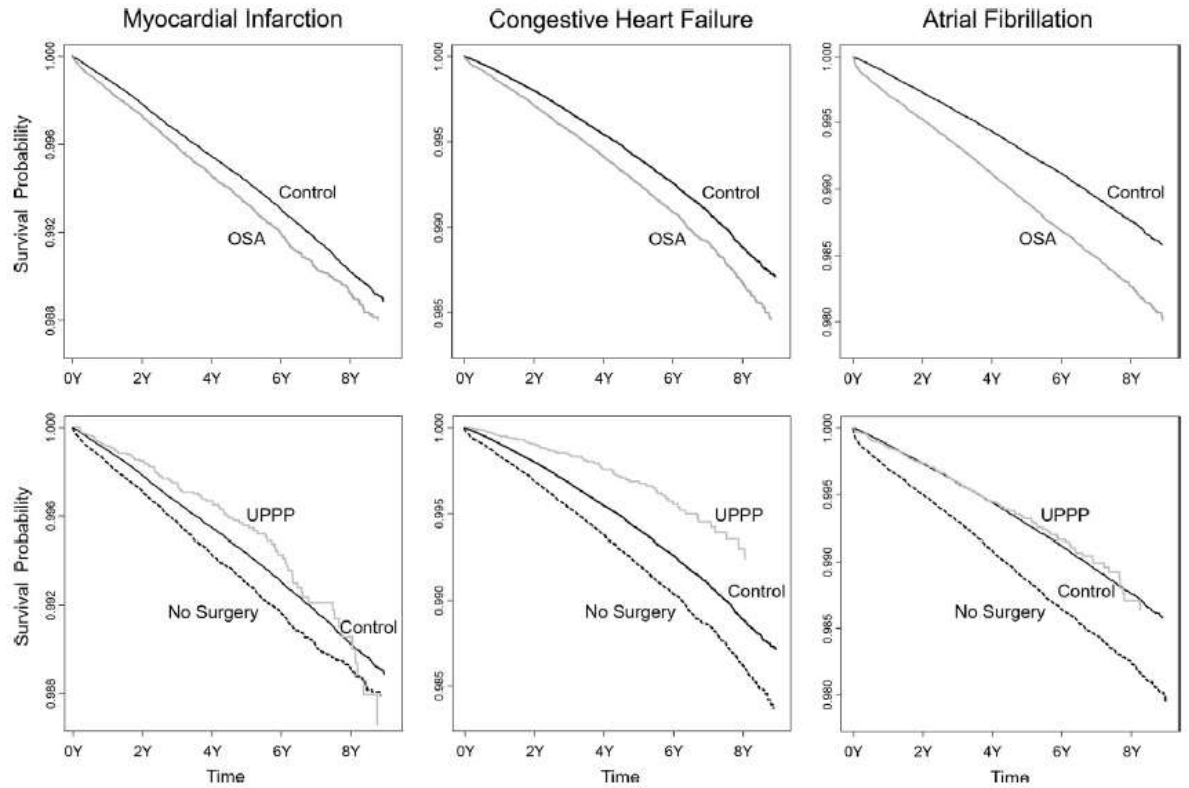


Fig. 2. Kaplan–Meier plot of the incidence of cardiovascular disease in obstructive sleep apnea (OSA) patients. The upper row compares the control and OSA groups, and the lower row compares the control, uvulopalatopharyngoplasty (UPPP), and No Surgery groups. Myocardial infarction (MI) and congestive heart failure (CHF) occur more frequently in the OSA group than in the control group, but less in the UPPP group. Atrial fibrillation (AF) is more common in the OSA group than in the control group, but in the UPPP group the occurrence is similar to that in the control group.

Opportunities for Research

- **CPAP** is now in the same space **UPPP** was 15 years ago
  - Poor compliance
  - **Short length of follow-up and underpowered studies**
- What is it about UPPP confers increased survival on patients with OSA?
  - Is it **AHI** or another biomarker that impacts survival in OSA?
  - **Arousals**, **ODI**, **tachy-brady**
- **Huge** opportunity for Otolaryngology to do meaningful research in OSA

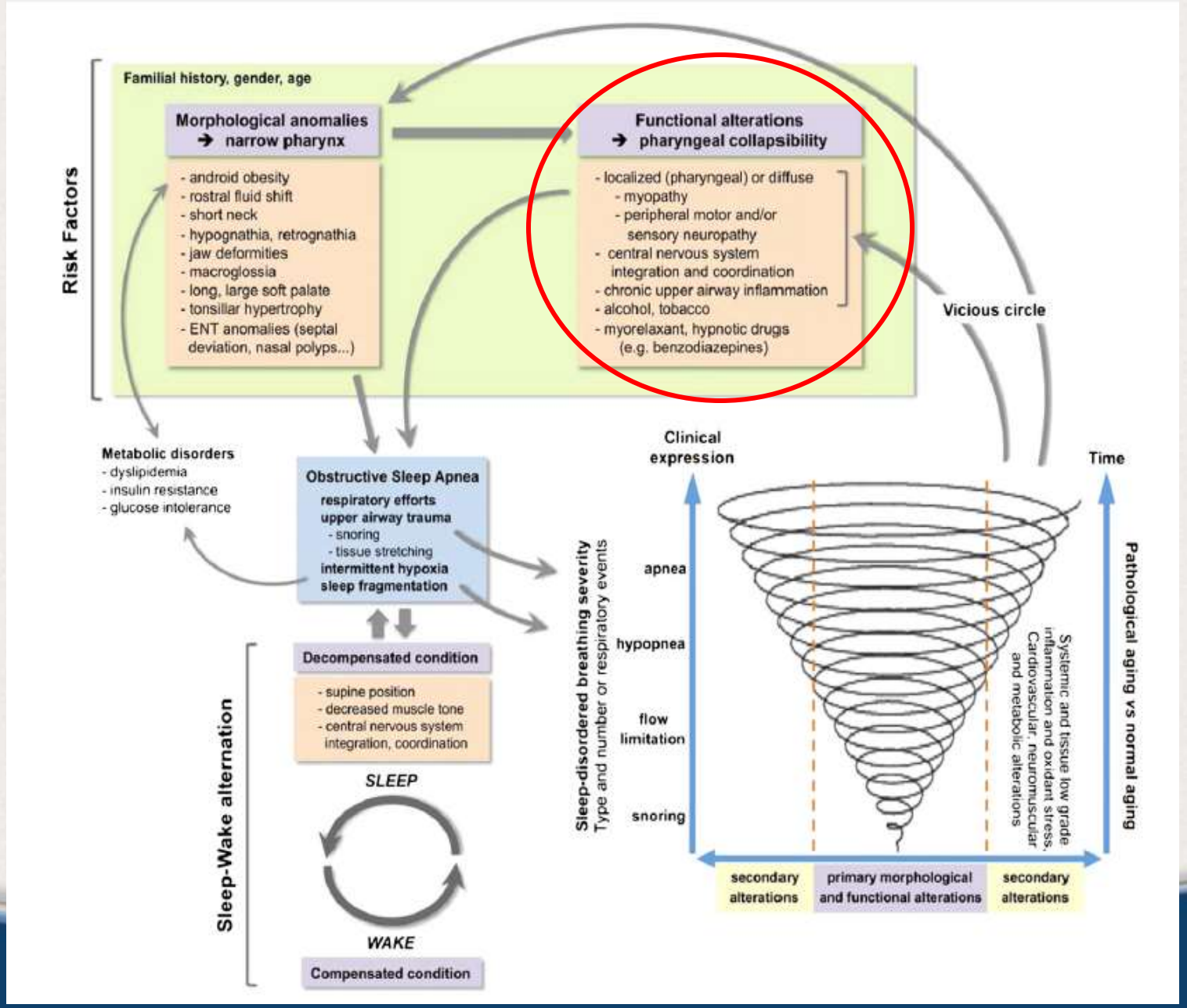
OSA is multifactorial

Anatomy vs Physiology

- OSA does not necessarily mean anatomical obstruction, much like achalasia is not due to an esophageal obstruction
  - Neurologic abnormalities
  - Genetic
  - Pulmonary
  - Loop gain
  - Obesity

Surgery will never get us to 100% success

- Not all OSA is a surgical disease
- The challenge is to identify individuals with OSA due to
  - Anatomical
  - Neurological
  - Pulmonary
  - Genetic cause



Otolaryngology and OSA

- CPAP and UPPP/tonsillectomy are on equal footing in terms of efficacy
  - CPAP in large populations has not shown improvement in health outcomes
- UPPP wins on **survival**
  - In **large** series studies over a long period of time
- HGN stim for UPPP and CPAP failures
  - 74% success with HGN stimulator
- AHI **may not** be the "be all, end all"
- ODI is coming on strong as a biometric

Henry Ford Health System

HENRY FORD HOSPITAL

HENRY FORD 2019 Sinus & Nasal Symposium

A Multidisciplinary Approach to the Nose, Inside & Out

You're invited to attend the 2019 Sinus & Nasal Symposium

August 9th, 2019

8:00am - 4:30pm

Henry Ford Hospital
Education & Resource Building 2055

2799 W Grand Blvd,
Detroit, MI 48202

Course Directors

John Craig, M.D.
Division Chief, Sinus and Skull Base Surgery
Otolaryngology- Head and Neck Surgery
Henry Ford Health System

Robert Deeb, M.D.
Division Chief, Facial Plastic and Reconstructive Surgery
Otolaryngology-Head and Neck Surgery
Henry Ford Health System

Rodney Schlosser, M.D.

Stephen Park, M.D.