CONTINUING MEDICAL EDUCATION

Beyond CPAP

Surgical Management of Obstructive Sleep Apnea

A practical referral and counseling guide for primary care clinicians



45-minute lecture • 26 slides

Three learning objectives

01

Understand non-CPAP options

Compare oral appliances, weight treatment, and upper-airway procedures.

02

Know when to refer

Identify which patients merit consultation with a sleep surgeon or bariatric team. Don’t gatekeep care.

03

Explain benefits and drawbacks

Discuss clinical outcomes, recovery, risks, follow-up and residual OSA.

OSA is common—and often undiagnosed

83.7 million

U.S. adults estimated to have OSA

2024 modeled prevalence: 32.4% of adults ≥20

81.4%

Previously undiagnosed

Among 156 San Diego study participants with AHI ≥15

Modeling supports a large U.S. burden; many people remain outside formal diagnosis and treatment.

PRIMARY CARE TAKEAWAY **Ask about snoring, witnessed apneas, sleepiness and resistant hypertension; order testing when indicated.**

Untreated OSA is linked to major health risks

01

HYPERTENSION

Linked with incident and treatment-resistant hypertension.

HR: 1.96 (1.44-2.66)

02

HEART ATTACK / CAD

Associated with coronary disease and adverse cardiac events.

CAD or HF: HR 2.60 (1.10-2.58)

03

STROKE

Prospective cohorts associate OSA with increased stroke risk.

HR: 2.12 (1.56-2.87)

04

DEMENTIA

2024 meta-analysis: all-cause dementia

HR 1.34 (1.17–1.53).

PRIMARY CARE TAKEAWAY **Patients deserve symptom review, diagnostic evaluation and follow-up. Not all patients are obese.**

Craciun et al., 2025 · Li et al., 2024 · Yeghiazarians et al., 2021; Mazzotti et. al, 2025

How do we measure whether OSA treatment works?

AHI / RDI

Physiology

Events per hour of sleep / recording

Symptoms

Patient function

Sleepiness, fatigue, function, safety

Adherence

Real-world use

Treatment benefit requires sustained use

A lower AHI is not automatically “cure,” and symptom improvement does not prove OSA resolution.

PRIMARY CARE TAKEAWAY **A CPAP that isn’t used is not a treatment. A patient with decreased AHI who still feels poorly isn’t adequately treated.**

Chang et al., 2023

CPAP (or APAP or BiPAP) is the standard of care

START HERE



POSITIVE PRESSURE KEEPS THE AIRWAY OPEN

“CPAP intolerant” should trigger troubleshooting

Common barriers

Mask leak or discomfort
Claustrophobia, insomnia
Congestion or nasal obstruction
Dry mouth / aerophagia
High-pressure intolerance

What primary care can do

Ask specifically why PAP was stopped
Review download or adherence data
Request mask / pressure optimization
Treat relevant nasal symptoms
Document trials and preferences

PRIMARY CARE TAKEAWAY **Insurance does require a CPAP trial before they will cover other treatments.**

Nasal surgery can help PAP tolerance

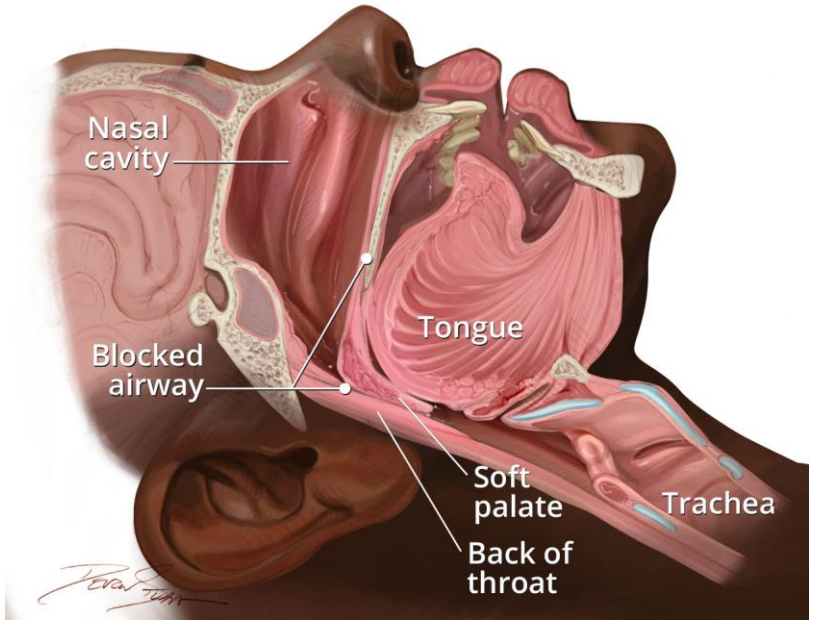
Nasal Surgery does not reduce AHI

OSA is a “throat problem,” not a nose problem

Nasal Surgery can improve quality of life

Nasal Surgery can improve RDI

Nasal Surgery can improve PAP tolerance



OSA is a throat problem

When is a surgical referral appropriate?

BMI < 40

Discuss sleep-surgeon referral

OSA with PAP intolerance or nonacceptance · STRONG

BMI ≥ 35

Discuss bariatric-surgery referral

OSA with obesity and PAP intolerance · STRONG

BMI < 40

Consider adjunct surgery

Pressure-related side effects limiting adherence · CONDITIONAL

An AASM recommendation to DISCUSS referral is not a mandate for surgery.

BMI is a limiting factor, but not the sole factor. It is ok to be realistic with patients.

PRIMARY CARE TAKEAWAY **Document PAP history, patient goals and BMI; Document reasons for PAP failure.**

Kent et al., 2021

A five-item checklist that improves a referral

1	**Sleep-test report**	AHI / REI, obstructive vs central events
2	**PAP experience**	Interface trials, intolerance reason, usage
3	**Medical context**	BMI, comorbidities, medications, anatomy
4	**Patient preference**	Goals, willingness for procedure / device
5	**Safety & follow-up**	Driving risk, postoperative sleep-study plan

Kent et al., 2021 · Chang et al., 2023

OSA care beyond CPAP can be effective

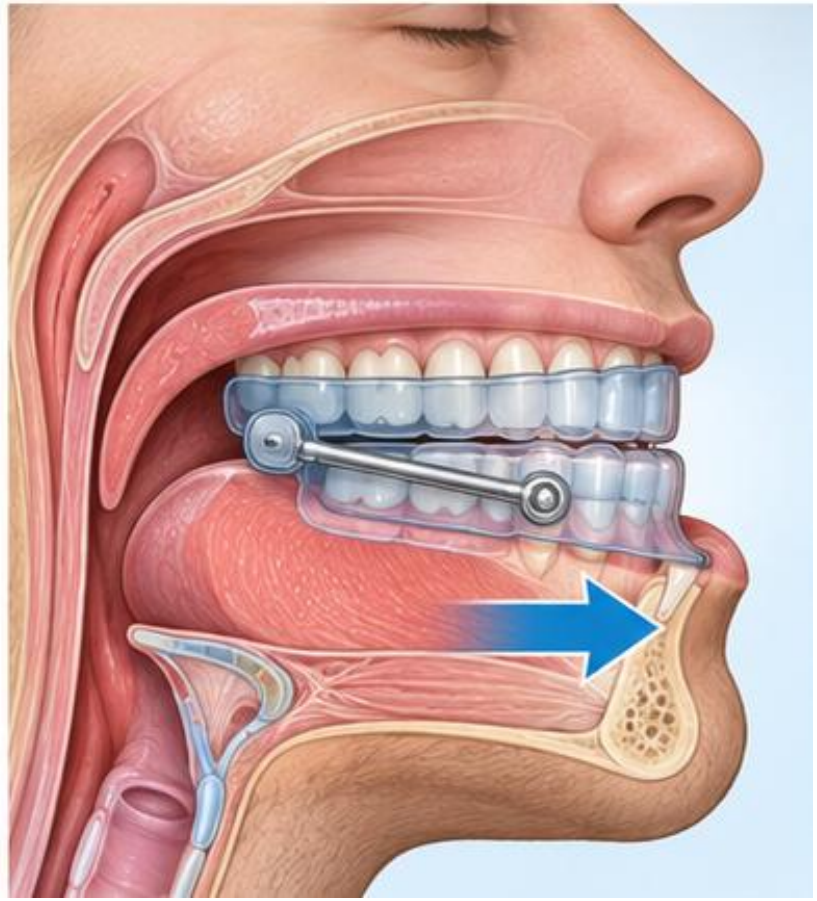
ORAL APPLIANCE	**Mandibular advancement**	Custom titratable device
WEIGHT TREATMENT	**Lifestyle / tirzepatide**	Treat obesity-driven OSA
AIRWAY SURGERY	**Palate / tongue / hyoid**	Correct selected anatomic sites
NEUROSTIMULATION	**Hypoglossal nerve stimulation**	Synchronize tongue protrusion
AIRWAY BYPASS	**Tracheostomy**	Rare, high-burden definitive bypass

PRIMARY CARE TAKEAWAY **Many patients benefit from combination therapy and ongoing weight management.**

Chang et al., 2023 · Kent et al., 2021

Mandibular advancement device: how it works

NOT SURGERY



JAW ADVANCES TO ENLARGE THE RETROLINGUAL AIRWAY

Mandibular advancement: benefits vs limitations

When it fits / advantages

- Usually mild OSA; can be considered when CPAP is unacceptable in other severities
- Non-invasive, portable and often well tolerated
- Can improve symptoms and ambulatory BP

Drawbacks / follow-up

- May leave residual moderate or severe OSA
- Jaw discomfort, TMJ symptoms, dental movement or bite changes
- Adequate dentition and repeat sleep testing are needed

Ou et al., 2024 · Chang et al., 2023

GLP-1 pathway: tirzepatide for OSA and obesity

−20.0

AHI vs placebo

SURMOUNT-OSA trial 1 at 52 weeks

−23.8

AHI vs placebo

SURMOUNT-OSA trial 2 at 52 weeks

FDA APPROVAL

Dec 2024

For moderate–severe OSA in adults with obesity

Weight reduction can reduce OSA burden; GI effects, cost, ongoing treatment, and residual OSA matter.

PRIMARY CARE TAKEAWAY **Weight loss doesn't always cure OSA, but can improve OSA and can make other treatments more effective.**

Malhotra et al., 2024 · US FDA, 2024 (regulatory approval)

Weight loss

Intervention	Effect on OSA	Study
Weight loss (general)	AHI decreases approximately 0.45 events/hour for each 1% reduction in body weight	Locke et al., 2024
Intensive lifestyle modification	51% reduction in AHI after 8 weeks	Carneiro-Barrera et al., 2022
Tirzepatide	Approximately 50–59% reduction in AHI after 52 weeks	Malhotra et al., 2024
Bariatric surgery	Average AHI reduction of 19.3 events/hour; pooled remission rate of 65%	Al Oweidat et al., 2023

Adenotonsillectomy: first-line for many children

CHILDREN WITH OSA + ADENOTONSILLAR HYPERTROPHY

When to refer

- Snoring, witnessed apneas, restless sleep or daytime behavioral concerns
- Enlarged tonsils / adenoids and suspected or confirmed OSA
- Consider polysomnography, especially in higher-risk or unclear cases

Benefits and limitations

- Can improve sleep symptoms, quality of life and some cases of hyperactivity
- Low overall failure rate
- Postoperative pain, dehydration, bleeding and respiratory risk

PRIMARY CARE TAKEAWAY **T&A is the treatment of choice. Reassess symptoms; high-risk children may need repeat sleep testing after surgery.**

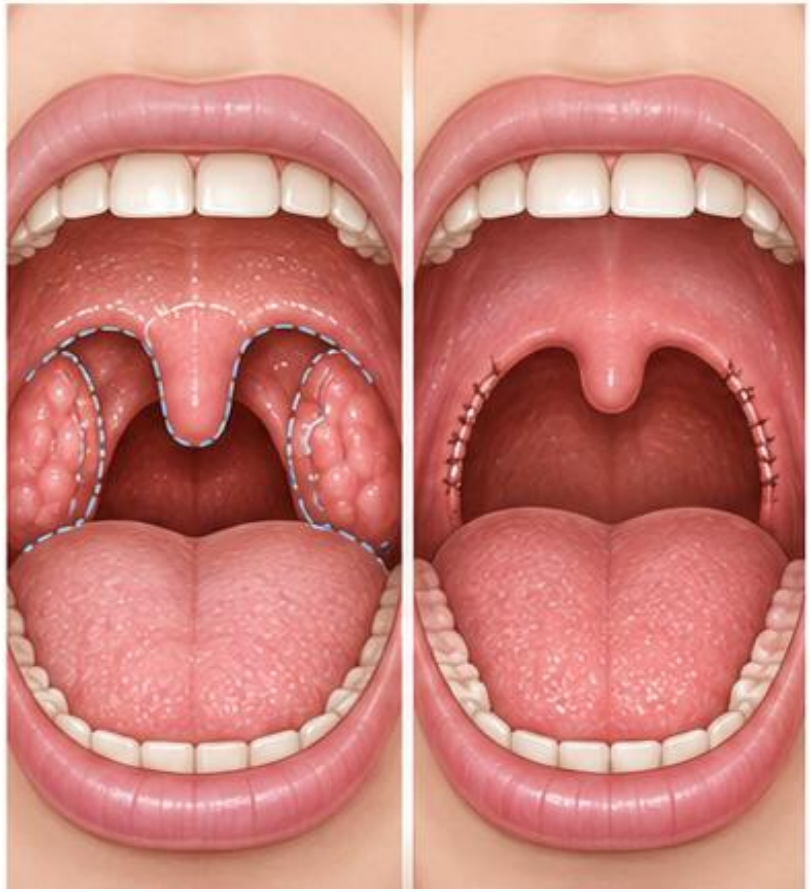
What is collapsing? That determines the operation.

SOFT PALATE / TONSILS	**Expansion Pharyngoplasty or a modified palatal procedure**	Palatal / retropalatal crowding
LATERAL PHARYNGEAL WALLS	**Expansion sphincter pharyngoplasty**	Side-to-side collapse
TONGUE BASE	**Tongue-base reduction / HNS**	Retroglossal obstruction
LOW PHARYNX / HYOID	**Hyoid suspension, usually combined**	Hypopharyngeal contribution

Many patients have multilevel collapse; no single operation guarantees complete resolution.

UPPP: Uvulopharyngoplasty – not performed all that often anymore

TARGET: RETROPALATAL CROWDING



LEFT: PREOPERATIVE · RIGHT: AFTER TISSUE REMOVAL

Kaffenberger et al., 2025 · Chang et al., 2023

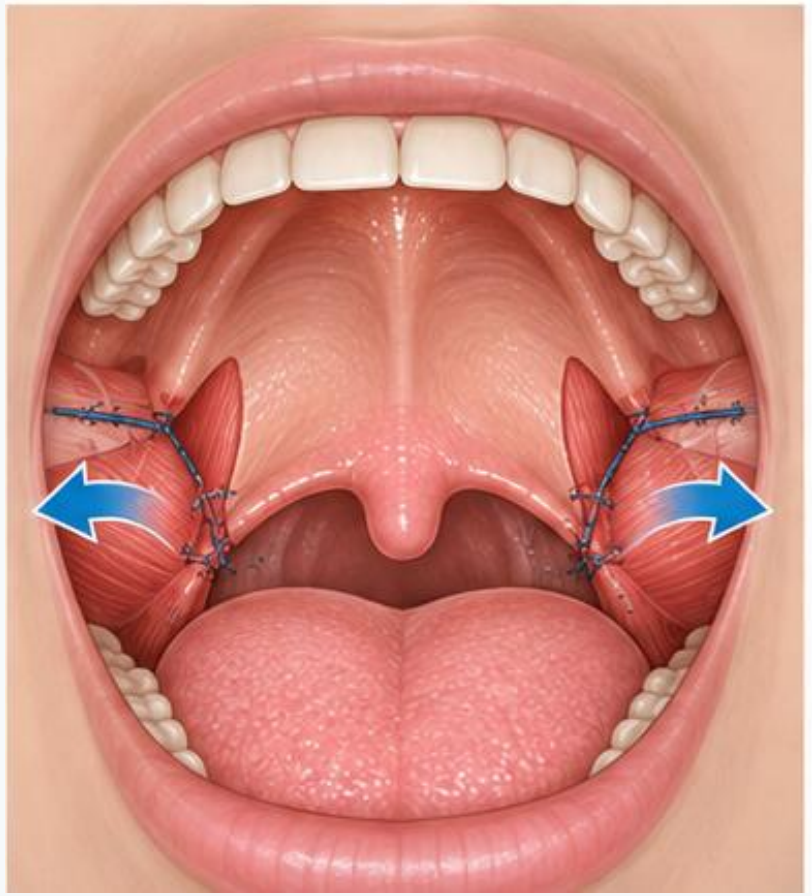
Expansion pharyngoplasty

Highly variable outcomes
- Patient weight
- OSA severity
- Tonsil size
- Base of tongue size (MMP score)

Often a part of “multi-level” surgery

Can be curative.
- 33.3% “cure”, 82.6% no longer need CPAP

Can fail later.



PRIMARY CARE TAKEAWAY **Let the ENT surgeon decide whether a reconstructive palatal operation fits the phenotype.**

Plaza, 2019

Base of Tongue Reduction

Extremely Morbid

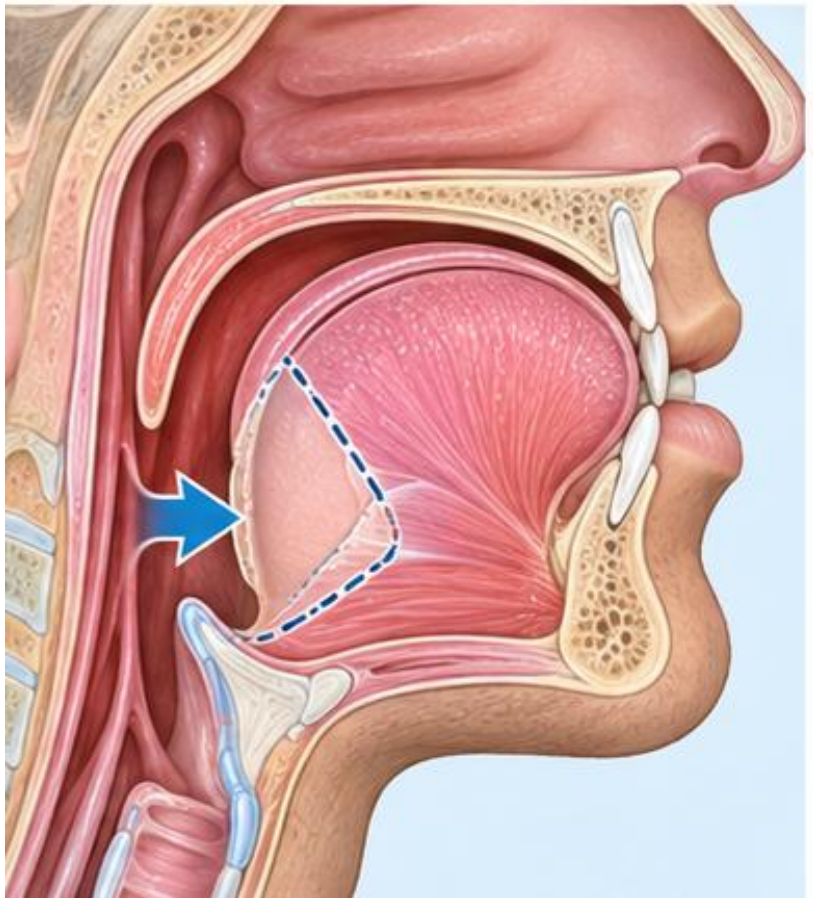
Often a part of “multi-level” surgery

Works reasonably well on obese patients

Often significant dysphagia and speech issues post op.

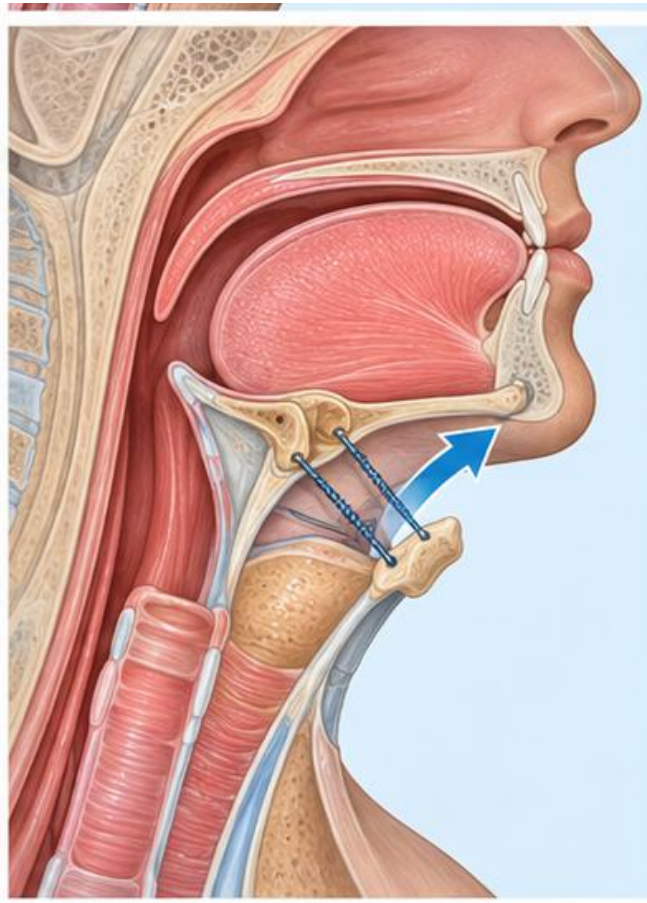
Can be curative.
66.4% “success,”
26.6% cured

Can fail later.



PRIMARY CARE TAKEAWAY **Still performed, but largely supplanted by HNS**

Hyoid suspension



SUPPORTS FORWARD / UPWARD POSITION OF THE HYOID

Hypoglossal nerve stimulation

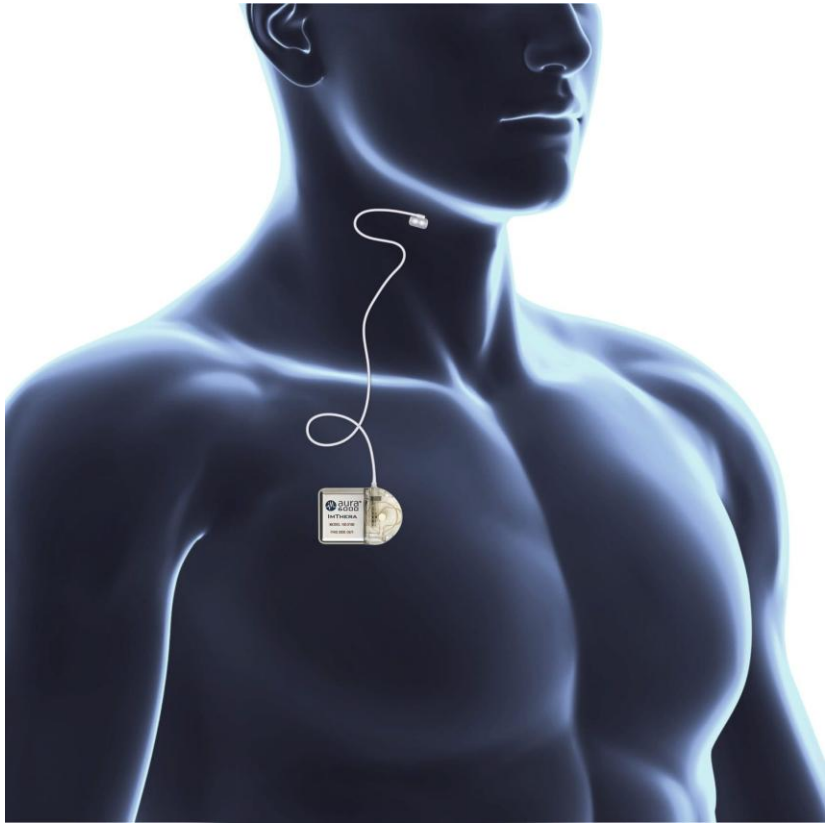
Implanted Device

Inactive during the day, turned on before bed

No bulky equipment

No changes in anatomy

8,670 patients (meta-analysis 2024)
80% “success”, 47% cure
3,220 patients (meta-analysis 2026)
74% “success”, 80% satisfaction



IMPLANT ACTIVATES TONGUE PROTRUSION DURING SLEEP

Strollo et al., 2014 · STAR · Patel et al., 2024 Kim et al., 2023 Heiser, 2026

Who should be assessed for HNS?

OSA severity	Predominantly obstructive moderate–severe OSA
PAP history	Intolerance / failure documented
Sleep endoscopy	No complete concentric soft-palate collapse
Anatomy / BMI	Evaluate BMI, tonsils, central-event burden
Practical factors	Willing to use remote and attend titration

Criteria

Moderate – Severe OSA (AHI 15+)
< 25% Central Apnea
Adults (18+)
Documented CPAP failure
BMI <35/40
DISE demonstrating no circumferential collapse

PRIMARY CARE TAKEAWAY Ensure patients have had a sleep study within 2 years and a CPAP trial within 2 years of referral.

Patel et al., 2024 · US FDA, 2023 (device labeling) · Strollo et al., 2014 · STAR

HNS counseling: promising, but not effortless

Benefits

- No daily mask, no change in anatomy
- Can substantially improve AHI, sleepiness and quality of life (up to 80%)
- A reversible, adjustable treatment for eligible patients
- No bulky equipment to haul around

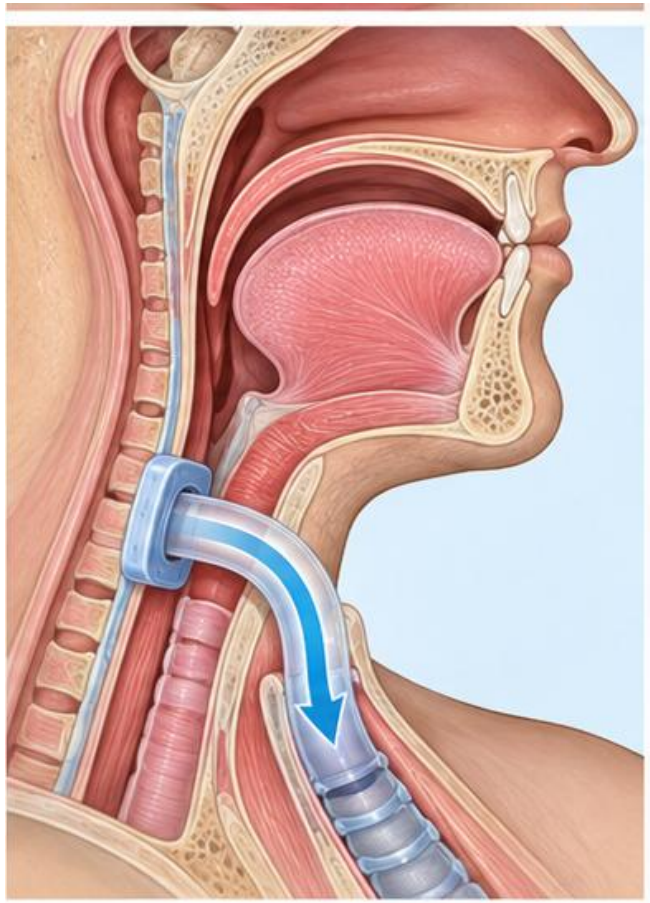
Limitations / risks

- Surgical risks
- Device programming, remote use and eventual battery procedures
- Residual OSA; some nonresponders, especially at higher BMI
- Can become less effective with weight gain
- MRI conditionally safe

Patel et al., 2024 · Strollo et al., 2014 · STAR

Tracheostomy: powerful, but rarely preferred

RESCUE / LAST RESORT



BREATHING PATHWAY BYPASSES UPPER AIRWAY BLOCKAGE

Chang et al., 2023

The goal is to treat the patient

Surgery is not right for everyone

Untreated OSA is a major health issue

Unused CPAP is not helpful

Improving quality of life, sleep quality, or AHI reduction are worthwhile goals.

We will never talk a patient in to surgery who is not likely to benefit



Patient want to hear their options

What benefits and drawbacks should patients hear?

OPTION	POTENTIAL BENEFIT	MAJOR TRADEOFF
Mandibular advancement	No surgery; often easier to use	Residual OSA; dental / jaw effects
UPPP	May improve crowded palate / tonsils	Not widely used any longer
Expansion pharyngoplasty	Targets lateral wall collapse, tonsils	Pain / swallowing issues; residual OSA
Tongue-base reduction	Targets retroglossal tissue excess	Pain, bleeding, dysphagia, prolonged recovery
Hyoid suspension	Hypopharyngeal adjunct	Less robust efficacy evidence; neck symptoms
Hypoglossal stimulation	Adjustable nonablative nighttime therapy	Implant surgery, titration, cost
Tracheostomy	Anatomic bypass of obstruction	Major long-term airway-care burden

Chang et al., 2023 · Kent et al., 2021 · Kaffenberger et al., 2025 · Mouratidou & Chaidas, 2024 · Schaaff et al., 2025 · Patel et al., 2024

Three takeaways & key peer-reviewed sources

CPAP first. Refer when PAP is unacceptable. Don’t gatekeep patient’s options.

Kent et al., 2021 · 10.5664/jcsm.9592

Chang et al., 2023 · 10.1002/alr.23079

Ou et al., 2024 · 10.1016/j.jacc.2024.03.359

Malhotra et al., 2024 · 10.1056/NEJMoa2404881

Kaffenberger et al., 2025 · 10.5664/jcsm.11810

Steinbichler et al., 2025 · 10.3390/clockssleep7030038

Mouratidou & Chaidas, 2024 · 10.3390/life14121700

Schaaff et al., 2025 · 10.1007/s11325-025-03370-8

Strollo et al., 2014 · 10.1056/NEJMoa1308659

Patel et al., 2024 · 10.1001/jamaoto.2024.0261

Full bibliographic details and per-slide talking points are embedded in speaker notes. STAR (2014) is intentionally included as a landmark exception.