Disparities in Hypoglossal Nerve Stimulation: a Cross-Sectional Survey Study of Awareness and Perceptions

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Introduction

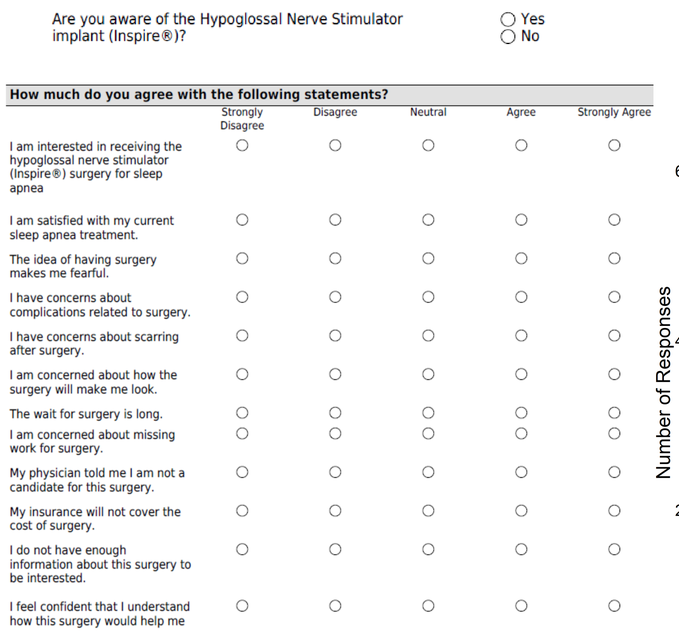
- Hypoglossal nerve stimulation (HNS) is becoming an increasingly used alternative therapy for obstructive sleep apnea (OSA) in patients who are intolerant to positive airway pressure (PAP).
- Significantly more White-identifying patients receive HNS compared to non-White patients.[1]
- Studies to date investigating patients' knowledge, awareness, and perceptions of HNS therapy have focused on online material rather than direct patient perspectives.[2]

Specific Aims

- Evaluate awareness and perceptions of HNS amongst a racially diverse patient population with OSA presenting for evaluation in sleep surgery and sleep medicine clinics.

Methods

- Following IRB approval, adult patients with OSA presenting to tertiary sleep medicine or sleep surgery clinics were consented and surveyed from April 2024 to August 2025.
- Surveys were designed to assess prior awareness of and perceptions towards HNS using Likert scales.
- Surveys were administered via REDCap (**Figure 1**).
- If participants reported no previous awareness of HNS, educational statements regarding about the HNS implant and surgery were provided before assessing perceptions of HNS.
- Only completed surveys were analyzed.
- Likert scales were consolidated with "Agree" and "Strongly Agree" responses categorized as "Agree."
- "Neutral" responses were grouped with "Disagree" and "Strongly Disagree" responses as these were considered to be an overall lack of agreement with a particular perception.



Are you aware of the Hypoglossal Nerve Stimulator implant (Inspire®)? ○ Yes ○ No

How much do you agree with the following statements?

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I am interested in receiving the hypoglossal nerve stimulator (Inspire®) surgery for sleep apnea	○	○	○	○	○
I am satisfied with my current sleep apnea treatment.	○	○	○	○	○
The idea of having surgery makes me fearful.	○	○	○	○	○
I have concerns about complications related to surgery.	○	○	○	○	○
I have concerns about scarring after surgery.	○	○	○	○	○
I am concerned about how the surgery will make me look.	○	○	○	○	○
The wait for surgery is long.	○	○	○	○	○
I am concerned about missing work for surgery.	○	○	○	○	○
My physician told me I am not a candidate for this surgery.	○	○	○	○	○
My insurance will not cover the cost of surgery.	○	○	○	○	○
I do not have enough information about this surgery to be interested.	○	○	○	○	○
I feel confident that I understand how this surgery would help me	○	○	○	○	○

Figure 1. Administered patient survey with Likert scales assessing awareness and perceptions of HNS.

Results

Table 1. Survey Respondent Characteristics by Previous HNS Awareness.

	Aware (n=30)	Unaware (n=40)	All (n=70)	P value
Age (years) – median (IQR)	58 (47-66)	46 (34-57)	52 (36-60)	**0.005**
Sex – no. female (%)	9 (30)	23 (58)	32 (46)	**0.041**
Survey location – no. (%)				
Sleep surgery clinic	15 (50)	21 (53)	36 (51)	0.73
Sleep medicine clinic	7 (23)	8 (20)	15 (21)	
Portable sleep study	3 (10)	6 (15)	9 (13)	
In-lab sleep study	1 (3)	4 (10)	5 (7)	
Education level – no. (%)				
<4 years of college	5 (17)	15 (38)	20 (29)	0.09
Bachelor degree or higher	24 (80)	23 (58)	47 (67)	
Income level – no. (%)				
<$100,000	11 (37)	19 (48)	30 (43)	0.35
$100,000 or higher	18 (60)	17 (43)	35 (50)	
Insurance status – no. (%)				
Government insurance	6 (20)	9 (23)	15 (21)	0.99
Private insurance	24 (80)	30 (75)	54 (77)	
AHI (events/hour) – median (IQR)	29 (15-44)	20 (9-26)	21 (14-36)	0.08
Epworth Sleepiness Score – median (IQR)	7 (5-9)	13 (7-19)	9 (6-16)	**0.007**
Self-reported race – no. (%)				
White	16 (53)	21 (53)	37 (53)	1.00
Not White	14 (47)	19 (48)	33 (47)	

- Survey was completed by 70 patients (46% female, median age 52 yrs), of which 33 patients (47%) self-identified as Not White.
- Most patients reported being unaware of HNS at the time of being surveyed (40, 57%).
- Younger age (p=0.005), female sex (p=0.041), and higher Epworth Sleepiness Score (p=0.007) were associated with a lack of prior HNS awareness (**Table 1**).
- There was no difference in prior HNS awareness between White and Not White patients.
- The most frequently agreed-to HNS perceptions were concerns about complications (39, 56%), cosmetic outcomes (27, 39%), and lack of enough information about HNS to be interested (36, 52%, **Figure 2**).
- The least frequently agreed-to HNS perceptions were concerns about insurance coverage of costs of surgery (5, 7.4%) and wait time (15, 22%, **Figure 2**).

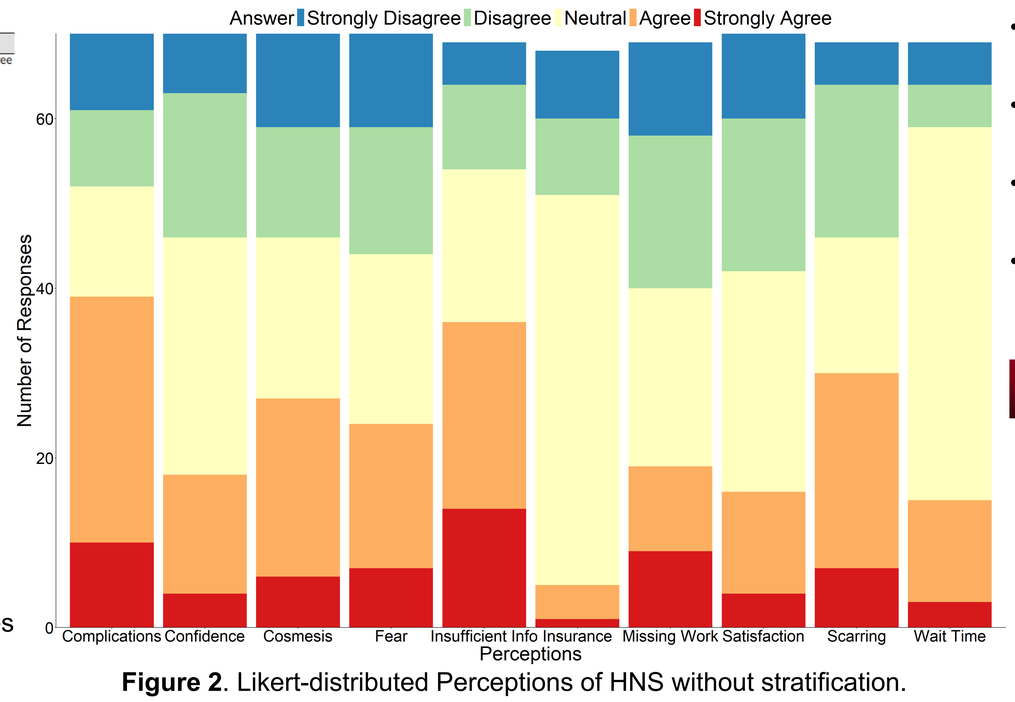


Figure 2. Likert-distributed Perceptions of HNS without stratification.

- There were no differences in HNS perceptions between White and Not White patients.
- Awareness of HNS was associated with increased satisfaction with current OSA treatment (p=0.008), decreased fear of surgery (p=0.015), and increased confidence in understanding how surgery can be helpful (p=0.04, **Table 2**).
- A sub-group analysis comparing HNS perceptions between White and Not White patients when stratified by awareness of HNS demonstrated no disparities in perceptions of HNS.

Table 2. Perceptions of HNS stratified by prior awareness of HNS.

	Aware (n=30)	Unaware (n=40)	All (n=70)	P value
Satisfied with current OSA treatment – no. Agree (%)	12 (40)	4 (10)	16 (23)	**0.008**
Fear – no. Agree (%)	5 (17)	19 (48)	24 (34)	**0.015**
Complications – no. Agree (%)	15 (50)	24 (60)	39 (56)	0.56
Concerns about scarring – no. Agree (%)	12 (40)	18 (46)	30 (44)	0.79
Cosmetic outcomes – no. Agree (%)	8 (27)	19 (48)	27 (39)	0.13
Wait for surgery – no. Agree (%)	5 (17)	10 (26)	15 (22)	0.55
Work – no. (%)	6 (20)	13 (33)	19 (28)	0.39
Insurance – no. Agree (%)	3 (10)	2 (5)	5 (7)	0.73
Not enough information – no. Agree (%)	13 (45)	23 (58)	36 (52)	0.43
Confident in understanding of surgery– no. Agree (%)	12 (40)	6 (15)	18 (26)	**0.04**

Conclusions

- Most patients presenting to a tertiary sleep center did not have previous awareness of HNS, regardless of race.
- HNS awareness is associated with increased rates of satisfaction with OSA treatment, decreased fear about surgery, and increased confidence in understanding surgery as an option for OSA management.
- The most common perceptions of HNS are related to concerns about complications, cosmetic outcomes, and insufficient information to guide decision-making.
- Efforts to improve awareness of HNS could improve the equitable delivery of the full spectrum of OSA care.

Limitations and Future Directions

- This was a cross-sectional study with a limited study period, so causal inferences cannot be made.
- Single-center study with modest sample size limits generalizability and power, respectively.
- Using a survey as our main instrument, our work is inherently threatened by sampling, nonresponse, and recall biases.
- Future work will expand study sample size to increase statistical power and explore avenues such as social media[2] to improve knowledge of and access to HNS as a surgical option for eligible patients with OSA.

References

1. Khan M, Stone A, Soose RJ, et al. Does race-ethnicity affect upper airway stimulation adherence and treatment outcome of obstructive sleep apnea? J Clin Sleep Med. 2022;18(9):2167-2172. doi:10.5664/jcsm.10068
2. Baird AM, Owen GS, Ravasio A, Fleischer L, Hutz MJ. Patient Perceptions of Hypoglossal Nerve Stimulation on Social Media. Laryngoscope Investig Otolaryngol. 2025;10(4):e70236. doi:10.1002/lio2.70236