International Journal of Otorhinolaryngology and Head and Neck Surgery
Kaipuzha RR et al. Int J Otorhinolaryngol Head Neck Surg. 2026 Aug;12(4):652-659
https://www.ijorl.com
pISSN 2454-5929 | eISSN 2454-5937

DOI: https://dx.doi.org/10.18203/issn.2454-5929.ijohns20262388

Systematic Review

Cognitive debiasing strategies in otorhinolaryngology: a framework for clinical excellence and patient safety

Ramiya Ramachandran Kaipuzha*, Davis Thomas Pulimoottil

Department of ENT, Al Azhar Medical College and Super Specialty Hospital, Thodupuzha, Kerala, India

Received: 04 April 2026
Revised: 06 July 2026
Accepted: 08 July 2026

***Correspondence:**
Dr. Ramiya Ramachandran Kaipuzha,
E-mail: davisthomasp@yahoo.in

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

To present a comprehensive debiasing framework to mitigate systematic cognitive errors in Otorhinolaryngology Head and Neck Surgery (OHNS), establishing it as a fundamental requirement for patient safety and clinical excellence. This study utilizes a systematic review that identified 71 OHNS-relevant cognitive biases. It evaluates the dual-process theory of cognition, differentiating rapid, intuitive System 1 processing from analytical System 2 deliberation and synthesizes current evidence regarding structural safety protocols, educational mnemonics, and artificial intelligence (AI) applications. Cognitive biases span the entire patient care lifecycle and contribute to approximately 20% of surgical "never events," with confirmation bias being the most prevalent factor. Effective mitigation strategies include cognitive forcing functions such as the WHO surgical checklist, "Stop, Pause, and Agree" protocols, and the SKAIR mnemonic for resident assessments. Furthermore, explainable AI (XAI) and large language models (LLMs) demonstrate significant promise as "second observers" to objectively challenge subjective clinical assessments. Achieving clinical excellence in OHNS requires a paradigm shift from individual awareness to systemic institutional change. By embedding simulation-based education and Bayesian decision-making into daily surgical practice, the specialty can ensure accurate and precise decision-making, though future research is necessitated to experimentally validate these interventions in real-world clinical environments.

Keywords: Cognitive bias, Otolaryngology, Clinical decision-making, Debiasing, Patient safety

INTRODUCTION

The field of otorhinolaryngology head and neck surgery (ORLHNS) represents a clinical discipline defined by high-stakes decision-making, intricate anatomical relationships, and a rapid transition between outpatient diagnostic workups and complex surgical interventions. In this environment, the cognitive architecture of the clinician is the most critical tool, yet it is often the most vulnerable to systematic errors in thinking known as cognitive biases.[1] These biases are not merely incidental lapses in judgment but are predictable deviations from rationality rooted in the very heuristics that allow experienced surgeons to operate efficiently. The implementation of cognitive debiasing strategies is therefore not an elective educational supplement but a fundamental requirement for the evolution of patient safety and surgical quality.[2,3]

METHODS

This systematic review was conducted in accordance with the PRISMA 2020 reporting standards to synthesize cognitive debiasing strategies within the specialty of OHNS. A narrative synthesis approach was adopted rather than a meta-analysis due to the significant conceptual heterogeneity of cognitive bias taxonomies and the diversity of identified interventions, which included educational curricula, surgical checklists, and AI adjuncts.

A comprehensive systematic search was executed in January 2026 across 6 electronic databases, including PubMed/MEDLINE, Scopus, Web of Science, Embase, Cochrane Library, and PsycINFO. The search strategy utilized high-sensitivity Boolean strings such as ("cognitive bias" OR "heuristics") AND ("otorhinolaryngology" OR "head and neck surgery") AND ("debiasing" OR "cognitive forcing function"). Eligibility was restricted to English-language original research published between 2000 and 2026 focusing on ENT clinicians and trainees (Population), cognitive biases and debiasing interventions (Concept), and diagnostic, operative, or postoperative settings (Context). This search was supplemented by manual reference screening and a grey literature review to ensure a comprehensive overview of existing debiasing frameworks. Study selection followed a dual-stage independent reviewer process, with discrepancies resolved through consensus. Standardized data extraction focused on the clinical phase of bias occurrence, intervention type, and outcome measures such as error rates, diagnostic accuracy, and cognitive load. The results were integrated through a thematic narrative synthesis mapping diagnostic, intraoperative, and AI-driven debiasing strategies, effectively grounding dual-process theory within a structural safety framework for surgical practice.

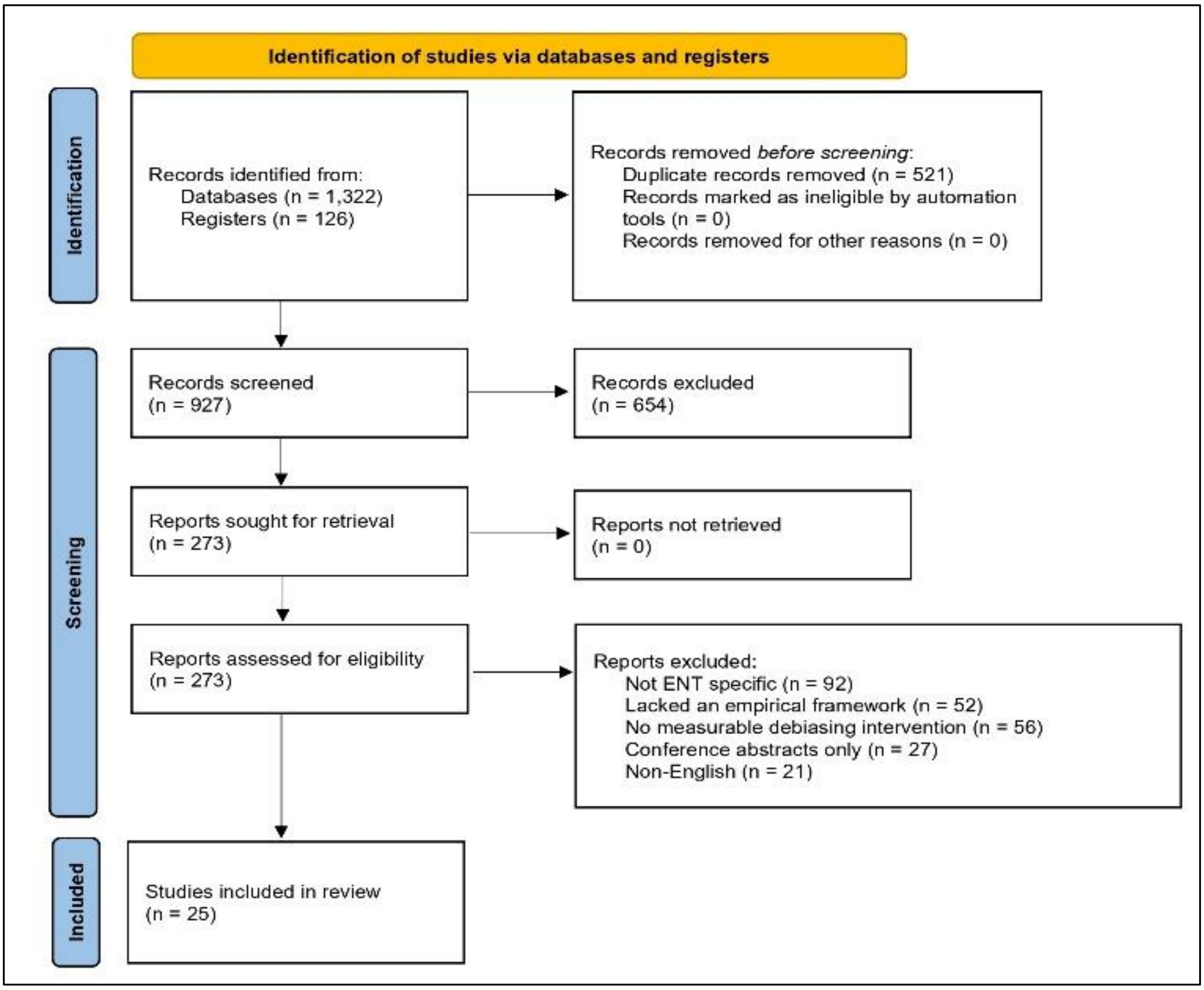

Figure 1: PRISMA flow diagram.

RESULTS

The literature identification process yielded 1,322 records from databases and 126 via manual screening (n=1,448). After removing 521 duplicates, 927 records were screened at the title and abstract stage, leading to the exclusion of 654 reports. Of the 273 full-text articles assessed for eligibility, 248 were excluded: 92 were not ENT-specific, 52 lacked an empirical framework, 56 featured no measurable debiasing intervention, 27 were conference abstracts only, and 21 were non-English. Consequently, 25 studies met all inclusion criteria and were incorporated into the final synthesis, providing a robust evidentiary basis for the proposed patient safety framework.

DISCUSSION

The neurocognitive architecture of otorhinolaryngology

To understand the necessity of debiasing, one must first examine the dual-process theory of cognition, which provides the theoretical framework for medical decision-making. Clinicians operate across two primary cognitive tracks: System 1 (intuitive) and System 2 (analytical). System 1 is characterized by rapid, unconscious, and pattern-recognition-driven processing, which accounts for approximately 95% of clinical activity.[4] This mode utilizes "illness scripts" and heuristics mental shortcuts developed through years of training and experience-to manage the high volume of cases in a typical ENT clinic. For example, identifying a classic barking cough of croup or recognizing the characteristic "hot potato voice" of epiglottitis occurs largely through System 1 processing.[5]

System 2, conversely, is slow, effortful, and rule-based. It requires conscious deliberation and is activated when a clinician encounters a case that does not fit a standard pattern or when conflicting data emerges.[6] Ideally, a surgeon toggles fluidly between these two systems. However, environmental stressors ubiquitous in

otorhinolaryngology, such as the high decision density of the emergency department, the cognitive load of multitasking in the operating room or even in the outpatient department in between consults and procedures, and the physiological toll of sleep deprivation, often trap the clinician in System 1. Errors occur when heuristics are applied inappropriately to atypical presentations, or when System 2 fails to provide the necessary executive oversight to override a biased System 1 response.[7]

The lifecycle of cognitive bias in OHNS

The impact of cognitive bias extends across the entire continuum of patient care, from the initial preoperative assessment through intraoperative execution to postoperative follow-up. A comprehensive systematic review identified 71 distinct cognitive biases as being specifically relevant to otorhinolaryngology, illustrating the pervasive nature of these distortions (Table 1).[1]

Table 1: The lifecycle of cognitive bias in ENT.

Phase of care	Key biases identified	Impact on performance
Diagnostic workup	Anchoring, premature closure, confirmation bias	Misdiagnosis, delayed treatment, failure to consider alternative pathologies.
Treatment/surgical phase	Overconfidence, fixation bias, sunk cost fallacy	Inaccurate risk-benefit estimation, intraoperative "tunnel vision," technical errors.
Post-treatment follow-up	Outcome bias, hindsight bias, availability bias	Failure to learn from complications, inaccurate assessment of surgical success.
Administrative/general	Left-digit bias, self-serving bias, bandwagon effect	Inequitable resource allocation, arbitrary delays in surgical candidacy.

The transition from a state of unawareness to the active initiation of debiasing strategies involves several critical stages: developing an awareness of bias, gaining the ability to detect its presence in real-time, deciding that a change in thinking is necessary, and finally employing specific tools to accomplish that change.[8] This process is rarely a single event but rather a developmental skill that must be cultivated throughout a professional career.[7,8]

Taxonomy and mechanisms of dominant biases in ENT

While dozens of biases have been described, a subset of cognitive distortions appears with higher frequency and greater impact in the surgical literature. These biases act as "invisible puppeteers," subtly manipulating decisions even among the most well-intentioned and experienced practitioners.[2]

Anchoring bias occurs when a clinician relies too heavily on the first piece of information encountered, the "anchor" and fails to adjust their diagnostic impressions as new, contradictory evidence emerges. In otorhinolaryngology, this often manifests as a reliance on the initial triage note or a preliminary radiology report. A vivid example is found in the "possible to probable to sure to wrong" trajectory, where an initial examination finding of impacted cerumen in a patient presenting with new-onset unilateral ear blocked sensation distracts the surgeon from the underlying diagnosis of a sudden sensorineural hearing loss or when the surgeon “anchors” to the FNAC histopathology report of a ‘reactive lymph node’ in a 50 year old smoker who presents with a painless, firm neck mass and is treated repeatedly with antibiotics, delaying the final diagnosis of a metastatic squamous cell carcinoma.[9]

Premature closure is the functional endpoint of anchoring. It is the tendency to stop the diagnostic search once a "satisficing" diagnosis is found. In a busy clinic, once a clinician identifies a common cause for hoarseness, such as vocal fold nodules, they may stop looking for secondary or more sinister pathologies, such as laryngeal cancer, particularly in non-traditional patient demographics.[7,10] This "satisfaction of search" is a major contributor to diagnostic failure, accounting for 10-15% of all diagnostic errors in clinical practice.[1]

In the surgical realm, overconfidence bias is particularly dangerous. It leads surgeons to overestimate their technical proficiency or the likelihood of a complication-free outcome. This bias can distort the risk-benefit analysis presented to patients, potentially pressuring them into procedures where the actual benefit is marginal. Overconfidence is often self-reinforcing; the more experienced a surgeon becomes, the more they may trust their intuition, even when that intuition is flawed.[1,7]

Confirmation bias works in tandem with overconfidence by leading the clinician to prioritize information that supports their preconceived diagnosis while dismissing or "explaining away" data that contradicts it.[1] This is frequently seen in the interpretation of radiographs; a surgeon who is convinced of a patient's need for sinus surgery may focus on minimal mucosal thickening on a CT scan while ignoring the patient's lack of cardinal symptoms or endoscopic signs of inflammation. Nearly 20% of surgical "never events" are attributed to such cognitive errors, with confirmation bias being the single most common culprit.[11]

Implicit biases-the unconscious associations we hold about groups of people-serve as profound barriers to equitable patient management.[7] These biases affect not only the physician-patient relationship but also peer interactions and resident evaluations. For instance, the "left-digit bias" (LDB) has been documented to cause arbitrary delays in surgical treatment for chronic rhinosinusitis (CRS). A regression discontinuity analysis revealed that 20-year-olds were 35% more likely to receive surgery than 19-year-olds, despite having identical clinical indications, simply because they transitioned into a new "decade" of age in the eyes of the clinician.[12] Furthermore, surgical ageism remains a significant factor in resource allocation and procedural decisions. Clinicians may unconsciously favour younger patients for scarce resources, such as ventilators or ICU beds during a crisis, a preference that "veil of ignorance" reasoning a moral reasoning device that promotes impartial decision-making can help to reverse.[2]

Structural and procedural debiasing strategies

To counter the inherent fallibility of human cognition, the field of ORLHNS has adopted several structural strategies designed to "force" the clinician out of System 1 and into a more analytical System 2 mode.[5,6,9]

The World Health Organization (WHO) surgical checklist is perhaps the most well-known debiasing tool. It serves as a cognitive forcing function that ensures critical safety steps-such as confirming patient identity, surgical site, and allergies-are not omitted due to memory lapses or distractions.[13,14] In otorhinolaryngology, these checklists are tailored to specific procedures, such as airway management for laryngoscopy or laser safety protocols for office-based surgery.[15] Recent research has explored the synergy between checklist management and standard operating procedures (SOPs). In a study of ENT nursing care, the combined application of these tools significantly improved nursing quality and physician satisfaction (Table 2).[16,17]

Table 2: The impact of structured SOPs on surgical efficiency and nursing quality.

Metric of improvement	Control group (Standard care)	Intervention group (Checklist+SOP)
Physician satisfaction (Preparation)	3.1/5.0	4.8/5.0
Instrument nurse collaboration	3.2/5.0	4.9/5.0
Problem-solving ability	2.8/5.0	4.6/5.0
Adverse event incidence	4.2%	0.8%

*Data synthesized from ENT nursing coordination studies evaluating the impact of structured SOPs on surgical efficiency.[17]

For minor procedures performed in the outpatient setting, a full WHO checklist may be impractical, yet the risk of error remains. The "Stop, Pause, and Agree" protocol is a specialty-specific requirement for single-operator procedures in ENT. This involves a final verbal confirmation of the procedure and site with the patient just before the intervention. For any procedure where laterality is a factor, such as a biopsy of an external ear lesion or a trans-tympanic injection, marking the site with a semi-permanent arrow is mandatory.[16]

Educational interventions and faculty development

Cognitive debiasing must be taught as a core clinical competency, starting at the medical student level and continuing through faculty development.

Faculty often fall into cognitive traps when evaluating trainees, anchoring on negative first impression/allowing a "bandwagon effect" to influence group consensus during clinical competency committee meetings.

The SKAIR mnemonic provides a structured approach to minimizing this bias:

Slow down

Avoid the pressure to "just get it done" during brief evaluation windows.

Know your bias

Maintain awareness of personal predispositions toward certain personality types or learning styles.

Consider the alternative

Contemplate the possibility that an initial negative impression of a resident's performance might be wrong.

Get more information

Review objective data, such as written rotation feedback or direct observations, before finalizing an assessment.

Reflect

Utilize metacognition to analyse the factors influencing the assessment.[18]

Simulation provides a unique environment for clinicians to experience the "bias blind spot"-the false sense of invulnerability to bias that is paradoxically more common in highly intelligent providers. Simulation-based education (SBE) scenarios can be specifically designed to trigger cognitive biases, such as an "esophageal intubation" scenario where thoracic movement and fogging in the tube provide false confirmation of correct placement, leading to catastrophic outcomes if not corrected by analytical System 2 checks.[3]

Emerging frameworks for simulation design include "cognitive recreation" (CR), which focuses on activating mirror neurons to understand the patient's perspective, and "emotional distance reflection" (EDR), aimed at minimizing egocentricity bias.[19] While simulation has been shown to equal classical teaching in terms of student motivation, its primary value lies in its ability to model team-based situational awareness and interdisciplinary communication.[20,21]

Technological and AI-driven debiasing

The integration of AI and LLMs represents the next frontier in cognitive debiasing. These tools can act as "second observers," providing objective data to challenge subjective human assessments (Table 3).[22,23]

Table 3: The role of AI tools in debiasing.

AI technique	ENT clinical application	Debiasing objective
Natural language processing	Interpreting clinical notes and history.	Offloading cognitive load to prevent fatigue-driven errors.
Computer vision (CNNs)	Removing smoke/blood from surgical feeds.	Maintaining visualization to prevent fixation bias.
Explainable AI (XAI)	Providing a rationale for diagnosis.	Increasing cognitive engagement and reducing over-reliance on automation.
Predictive modeling	Forecasting disease trajectory (e.g., chronic sinusitis).	Challenging overly optimistic or pessimistic prognostications.

Generative AI programs like Med-PaLM 2 and ChatGPT-4 can process vast amounts of patient data-including history, physical findings, and imaging reports, to generate a comprehensive differential diagnosis.[22] This can mitigate the "satisfaction of search" error by providing alternatives that the clinician may have overlooked. However, LLMs themselves are prone to biases, particularly regarding gender and ethnicity.[24,25] To improve the debiasing capabilities of AI, researchers have developed "few-shot prompting" and "debiasing prompts," which instruct the model to actively mitigate bias. In comparative tests, few-shot strategies demonstrated a statistically significant reduction in biased responses (OR 0.1 for Llama-3.3-70B) compared to base prompts.[25]

In the operating room, AI modelling of surgical videos and instrument kinematics allows for the generation of automated skills assessments. Advanced preprocessing frameworks can de-noise and de-blur intraoperative imaging, enhancing visualization in procedures like endoscopic sinus surgery.[26] AI can also segment safe dissection planes and identify positive surgical margins in real-time during oropharyngeal cancer surgery, providing a critical check against "fixation bias" (tunnel vision).[27]

The "reflection machine" concept takes this a step further by using AI to ask Socratic questions that stimulate the clinician's critical thinking, rather than simply providing a recommendation.[28] This ensures that the human remains at the centre of the decision-making process while still benefiting from the machine's lack of biological cognitive fatigue.

The impact of environmental and systemic factors

Cognitive performance in otorhinolaryngology is significantly modulated by the clinician's internal state and the external environment. Otorhinolaryngologists often work in chaotic environments characterized by frequent interruptions and "surges" in patient flow.[7] Every task switch-moving from a phone call to a patient examination to an insurance authorization-carries a "cognitive cost." After prolonged periods of intense cognitive activity, clinicians suffer from "decision fatigue," a state where they are more likely to make impulsive, risky, or "status quo" decisions.[29,30]

Research into multidisciplinary oncology team meetings (MDMs) has highlighted the "Patient 70" phenomenon: the quality of decision-making significantly deteriorates for cases discussed at the end of a long meeting compared to those discussed at the start. Pragmatic interventions include "fatigue-proofing" through scheduled breaks, providing food, and rotating the order of patient discussions.[30]

A growing body of evidence suggests that individual clinician factors, such as attachment styles, can influence diagnostic accuracy. Clinicians with "insecure" attachment styles may exhibit lower cognitive flexibility and a lower threshold for cognitive load, making them more susceptible to heuristic errors during complex cases. Recognizing these personal traits is a critical step in achieving the metacognitive awareness required for effective debiasing.[5,9]

The evidence base that guides clinical practice is itself subject to "positive outcome bias." A retrospective analysis of trials published in four major ENT journals found that 84% reported positive findings. The fact that trials with positive results are cited significantly more frequently and are less likely to be randomized than those with negative results suggests a systematic bias in the specialty's literature.[31] This can lead to the "availability bias" in clinicians, where they are more likely to remember and employ treatments they have read about as being successful, even if the underlying evidence is of lower quality.

Application of debiasing in vulnerable populations and rare pathologies

The application of debiasing is particularly crucial in vulnerable populations and rare disease states. A prospective study of patients aged 65 and older seeking laryngology care found that 25% had undiagnosed cognitive impairment (CI).[32] This undiagnosed CI can profoundly impact the decision-making process for elective medical or surgical treatments and negatively affect the outcomes of voice or swallowing therapy. For clinicians, failing to screen for CI is a form of premature closure; they may anchor on the physical laryngeal findings while ignoring the cognitive barriers to treatment compliance.

Rare conditions like Grisel's syndrome, a rotatory atlantoaxial subluxation that can present after ENT procedures, are frequently missed because they do not fit common pattern-recognition illness scripts. A 7-year-old presenting with torticollis after a URI might be diagnosed with a simple neck strain (satisficing) unless the clinician actively engages System 2 to look for the "red flags" of pediatric torticollis.[1]

Similarly, the diagnosis of benign vocal fold lesions (BVFLs) presents a challenge for ENT residents. While senior residents can diagnose nodules and polyps with >90% accuracy, their accuracy in identifying vocal fold cysts is significantly lower (60.7%).[10] This "mindware gap" represents a deficiency in the internal database of patterns, which debiasing strategies like guided reflection and increased exposure to laryngoscopic images can remediate.[8]

Integrated recommendations for institutional debiasing

Achieving quality in clinical decision-making requires a multifaceted approach that moves beyond individual awareness to systemic change.[9,11,33] National organizations like the American Academy of Otolaryngology-Head and Neck Surgery (AAO-HNS) have established patient safety and quality improvement (PSQI) committees to lead these efforts.[34] Key initiatives include:

The choosing wisely campaign

Identifying and reducing the performance of low-value, high-risk tests and procedures.

Patient safety event reporting tools

Shifting from a culture of blame to a culture of process improvement where "never events" are reviewed through the lens of cognitive bias.[33,34]

Digital learning platforms

Utilizing OTO Logic and FLEX products to provide residents with "simulation warm-ups" and "virtual escapes" to improve clinical reasoning.[35,36]

On a day-to-day basis, clinicians should employ "diagnostic time-outs" and maintain a "not yet diagnosed" status for uncertain cases.[7,37] In surgery, the use of "speak-up" campaigns can empower junior members of the surgical team to challenge a senior surgeon's "fixation bias" during critical intraoperative moments.[2,27]

Furthermore, the implementation of Bayesian thought. using likelihood ratios and evidence-based decision rules, can provide a mathematical check against the subjective "gut feelings" that often drive System 1.[7] Offloading tasks through computerized documentation and using "patient lists" to manage cognitive load are simple yet effective methods to maintain peak performance throughout a surgical shift.[11]

Future directions and research needs

Despite the growing recognition of cognitive bias, the empirical evidence for the effectiveness of specific debiasing strategies remains limited.[1] Future research must focus on:

Experimental validation

Determining which CFSs or reflection techniques actually lead to a measurable reduction in diagnostic error rates in real-world surgical environments.[6,11]

AI ethics and transparency

Developing frameworks to ensure that AI-driven decision support does not simply replace human bias with algorithmic bias.[22-24]

Longitudinal training impacts

Assessing whether teaching debiasing in residency leads to sustained improvements in patient safety over a multi-decade career.[4,18]

CONCLUSION

Otorhinolaryngology stands at a crossroads where the increasing complexity of medical technology must be matched by a sophisticated understanding of the human mind. By embedding cognitive debiasing into the fabric of surgical education and practice, the specialty can ensure that every scalpel stroke and every diagnostic decision is guided by clarity, precision, and an unwavering commitment to patient safety. The path forward requires a synthesis of ancient Socratic wisdom and modern algorithmic precision, creating a culture where "thinking about thinking" is as valued as the most delicate microsurgical technique.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

REFERENCES

1. Pulimoottil DT, Philip AC, Kaipuzha RR, Thomas IA, Joseph NA, Moideen SP, et al. Cognitive biases in otolaryngology: a systematic narrative review. Int J Otorhinolaryngol Head Neck Surg. 2025;11(5):625-37.
2. Armstrong BA, Dutescu IA, Tung A, Carter DN, Trbovich PL, Wong S, et al. Cognitive biases in surgery: systematic review. Br J Surg. 2023;110(6):645-54.
3. Tewfik G, Rivoli S, Harbell MW. Recognizing and combating cognitive bias in anesthesiology: implications for patient safety. APSF Newsletter. 2023;38:28-31.
4. Daniel M, Carney M, Khandelwal S, Merritt C, Cole M, Malone M, et al. Cognitive Debiasing Strategies: A Faculty Development Workshop for Clinical Teachers in Emergency Medicine. MedEdPORTAL. 2017;13:10646.
5. Doherty TS, Carroll AE. Believing in Overcoming Cognitive Biases. AMA J Ethics. 2020;22(9):E773-8.
6. Thammasitboon S, Cutrer WB. Diagnostic decision-making and strategies to improve diagnosis. Curr Probl Pediatr Adolesc Health Care. 2013;43(9):232-41.
7. Croskerry P, Singhal G, Mamede S. Cognitive debiasing 1: origins of bias and theory of debiasing. BMJ Qual Saf. 2013;22(2):ii58-64.
8. Croskerry P, Singhal G, Mamede S. Cognitive debiasing 2: impediments to and strategies for change. BMJ Qual Saf. 2013;22(2):ii65-72.
9. Croskerry P. Achieving Quality in Clinical Decision Making: Cognitive Strategies and Detection of Bias. Acad Emerg Med. 2002;9(11):1184-204.
10. Alessa MM, Obaid SB, Aldayel F, Almetary R, Alhussinan K, Assiri H, Farahat M. Accuracy of Diagnosis of Benign Vocal Fold Lesions among Ear, Nose, and Throat Residents. Int Arch Otorhinolaryngol. 2024;28(4):e619-25.
11. McKinney M. Reducing Diagnostic Errors: Using Cognitive Science. EMOttawa Blog. 2021. Available at: https://emottawablog.com/2021/05/diagnostic-errors-what-cognitive-science-has-to-say/. Accessed on 2 February 2026.
12. Wang AZ, Leung RK, Roxbury CR. Left-Digit Bias in Surgical Management of Chronic Rhinosinusitis in Young Adults. Int Forum Allergy Rhinol. 2025;15(6):648-50.
13. Raghoebar-Krieger HMJ, Barnhoorn PC, Verhoeven AAH. Reflection on medical errors: a thematic analysis. Med Teacher. 2023;45(12):1404-10.
14. ENT Surgical Checklists. Exr.education. ExR; 2026. Available at: https://app.exr.education/lessons/dffe7746-7b41-45ad-be7d-0098d3d23f8d/. Accessed on 2 February 2026.
15. Dabholkar Y, Velankar H, Suryanarayan S. Evaluation and Customization of WHO Safety Checklist for Patient Safety in Otorhinolaryngology. Indian J Otolaryngol Head Neck Surg. 2018;70:149-55.
16. Local Safety Standards LocSSIPs for ENT Outpatients Clinic V2.0. 2025. Available at: https://doclibrary-rcht.cornwall.nhs.uk/DocumentsLibrary/RoyalCornwallHospitalsTrust/Clinical/EarNoseAndThroat/LocalSafetyStandardsLocSSIPSForENTOutpatientsClinic.pdf. Accessed on 2 February 2026.
17. Ren L, Han L, Ping F, Yin Y, Liang T, Wang F. Impact of Implementing Checklist Management Combined with SOP on Nursing Quality Among ENT Surgery Nurses. Risk Manag Healthc Policy. 2025;18:1735-46.
18. Meunier MR, Theofiles MG, Gonzalez CA. A Structured Approach to Mitigating Cognitive Bias in Educational Assessment. J Grad Med Educ. 2025;17(2):136-9.
19. Gilbert M, Keyser V. Implicit Bias Scenario Design: What Can We Learn from Cognitive Science? Clin Simulation Nursing. 2022;71:9-18.
20. Moll-Khosrawi P, Zöllner C, Cronje JS, Schulte-Uentrop L. The effects of simulation-based education on medical students' motivation. Int J Med Educ. 2021;12:130-5.
21. Ayoub NF, Rameau A, Brenner MJ, Bur AM, Ator GA, Briggs SE, et al. American Academy of Otolaryngology-Head and Neck Surgery (AAO-

HNS) Report on Artificial Intelligence. Otolaryngol Head Neck Surg. 2025;172(2):734-43.
22. Advancing Patient Safety and Quality Initiatives through Artificial Intelligence. AAO-HNS Bulletin. 2024. Available at: https://bulletin.entnet.org/home/article/22926504/advancing-patient-safety-and-quality-initiatives-through-artificial-intelligence. Accessed on 2 February 2026.
23. Benkirane K, Kay J, Perez-Ortiz M. How Can We Diagnose and Treat Bias in Large Language Models for Clinical Decision-Making? Proceedings of the 2025 Conference of the Nations of the Americas Chapter of the Association for Computational Linguistics: Human Language Technologies. 2025;1:2263-88.
24. Kim SH, Ziegelmayer S, Busch F, Mertens CJ, Keicher M, Adams LC, et al. LLM Reasoning Does Not Protect Against Clinical Cognitive Biases-An Evaluation Using BiasMedQA. medRxiv. 2025.
25. Knudsen JE, Ghaffar U, Ma R, Hung AJ. Clinical applications of artificial intelligence in robotic surgery. J Robot Surg. 2024;18(1):102.
26. Fixation bias in healthcare Recommending Best Practices. 2023. Available at: https://www.has-sante.fr/upload/docs/application/pdf/2023-08/ssp_fixation.pdf. Accessed on 2 February 2026.
27. Simon, Schraffenberger H, Thill S, Haselager P. Questions: A Taxonomy for Critical Reflection in Machine-Supported Decision-Making. arXiv.org. 2025.
28. Maier M, Powell D, Murchie P, Allan JL. Systematic review of the effects of decision fatigue in healthcare professionals on medical decision-making. Health Psychol Rev. 2025;19(4):717-62.
29. Soukup T, Lamb BW, Weigl M, Green JSA, Sevdalis N. An Integrated Literature Review of Time-on-Task Effects with a Pragmatic Framework for Understanding and Improving Decision-Making in Multidisciplinary Oncology Team Meetings. Front Psychol. 2019;10:1245.
30. Yang HH, Tsai M, Mukdad L, St John M. Positive Outcome Bias in the Influential Otolaryngology Clinical Trial Literature. Otolaryngol Head Neck Surg. 2024;170(3):812-20.
31. Leclerc AA, Gillespie AI, Tadic SD, Smith LJ, Rosen CA. The prevalence of cognitive impairment in laryngology treatment-seeking patients. Laryngoscope. 2020;130(8):2003-7.
32. Medical Mishaps Can Have Negative Effects on Otolaryngologists and Patients-ENTtoday. ENTtoday. 2023. Available at: https://www.enttoday.org/article/medical-mishaps-can-have-negative-effects-on-otolaryngologists-and-patients/2/?singlepage=1. Accessed on 28 February 2026.
33. Gettelfinger JD, Paulk PB, Schmalbach CE. Patient Safety and Quality Improvement. Otolaryngol Head Neck Surg. 2021;165:P46-54.
34. The Movement to Address Quality in Healthcare. AAO-HNS Bulletin. 2013. Available at: https://bulletin.entnet.org/home/article/21245653/the-movement-to-address-quality-in-healthcare. Accessed on 28 February 2026.
35. 2019-2020 AAO-HNS/F Committee Highlights. AAO-HNS Bulletin. 2020. Available from: https://bulletin.entnet.org/home/article/21248078/20192020-aaohnsf-committee-highlights
36. Track Cognitive Bias to Improve Patient Safety. Childrenshospitals.org. 2020. Available at: https://www.childrenshospitals.org/news/childrens-hospitals-today/2020/07/track-cognitive-bias-to-improve-patient-safety. Accessed on 28 February 2026.

Cite this article as: Kaipuzha RR, Pulimoottil DT. Cognitive debiasing strategies in otorhinolaryngology: a framework for clinical excellence and patient safety. Int J Otorhinolaryngol Head Neck Surg 2026;12:652-9.