

Bengal Journal of Otolaryngology and Head Neck Surgery

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Correspondence

Dr Chiranjib Das

Editor

Bengal Journal of Otolaryngology and Head Neck Surgery

C/O The Association of Otolaryngologists of India, West Bengal

CMC House, 91B Chittaranjan Avenue, Kolkata - 700073

Email: editor@bjohns.in

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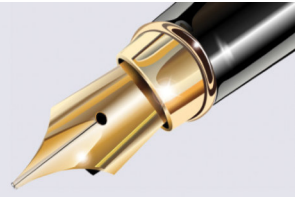
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From the Desk of the Editor



The medical landscape stands on the brink of a profound transformation powered by artificial intelligence (AI). What began as an academic aspiration in computational systems has matured into tangible clinical tools reshaping diagnostics, therapeutics, decision support, and medical education. As voices from across healthcare herald AI's potential to enhance precision, speed, and accessibility, the field of Otorhinolaryngology (ENT) emerges as both a beneficiary and a proving ground for these technologies.

AI's integration into medicine is not merely a technological trend but a structural shift in how clinicians interpret data and deliver care. Across specialties, AI's strength lies in ingesting vast and complex datasets — whether in imaging, physiological signals, or electronic health records — and distilling patterns that might elude even expert clinicians. This breadth of capability is reshaping diagnostics, prognostics, and patient management workflows globally.

In general medical practice, AI algorithms have been developed to interpret imaging modalities such as X-rays, CT, and MRI with performance that often meets or surpasses human experts. These systems can flag abnormalities, prioritize urgent findings, and assist clinicians in early disease detection. Beyond imaging, AI-powered tools are increasingly employed for remote patient monitoring, chronic disease tracking, and early detection of clinical deterioration by synthesizing physiological data streams in real time. Such capabilities are especially valuable in resource-limited settings and for augmenting clinical capacity without sacrificing quality of care.

In Otolaryngology, the story is equally compelling. A comprehensive bibliometric analysis of AI research in ORL reported 498 published articles (1982–2024), reflecting a rapid escalation in interest and exploration of AI applications in ENT practice. Diagnostics and imaging — particularly MRI and CT radiomics — are among the most advanced areas of implementation, where deep learning models assist in tumor detection, segmentation, and characterization. AI models have been successfully applied to complex tasks such as predicting lymph node involvement, assessing bone invasion, or differentiating benign from malignant lesions, significantly enhancing diagnostic accuracy and clinical decision support.

In image-based diagnosis across ENT subdomains, state-of-the-art reviews show impressive aggregated performance. Machine learning systems analyzing endoscopic or radiographic input have achieved accuracy ~88%, area under the ROC curve ~92%, sensitivity ~87%, and specificity ~89%, underscoring robust diagnostic potential.

Other applications include voice and sound analysis for laryngeal pathology, histopathological interpretation, and even AI-augmented cochlear implant tuning. As one narrative review in otolaryngology reports, subsets of AI — specifically deep learning — have demonstrated model performances comparable to specialists in detecting conditions such as nasopharyngeal carcinoma (~92% accuracy) and laryngeal malignancies (~86% accuracy), while also enabling segmentation and intraoperative landmark recognition.

AI's value extends beyond diagnosis to surgical skill evaluation and education. Traditional surgical training often relies on subjective assessment, which can vary widely among evaluators. AI tools using motion tracking, kinematic data, and video analysis can provide objective feedback on surgical technique, with classification accuracies ranging from approximately 60–100% depending on the task and modality. Such metrics hold promise for standardized benchmarking, accelerated learning curves, and enhanced trainee feedback loops.

Additionally, generative AI — including large language models — is being explored for crafting educational materials, supporting board exam preparation, and enhancing patient communication. Comparative analysis of advanced AI models (e.g., GPT-4) suggests superior performance over earlier tools in answering specialty-specific knowledge questions, highlighting their growing utility in medical education.

Despite compelling technological strides, clinician acceptance and integration remain active topics of research. A mixed-methods study among otolaryngologists found that while familiarity with general AI concepts is common (72% reported some familiarity), only a minority had practical clinical experience with AI tools. Still, a strong majority see clinical utility in AI assistance, with 82% willing to use AI for decision support and 78% comfortable with AI contributing treatment recommendations. Many expect AI integration into practice within the next five years, albeit with caution toward trusting AI for complex tasks like malignancy detection.

These perspectives highlight a critical transitional phase: clinicians recognize AI's promise but demand robust validation, transparency, and evidence of improved outcomes before widespread adoption.

AI's potential is shadowed by real challenges. Model accuracy, especially in diverse clinical populations, can vary widely depending on training data quality, representativeness, and size. Some analyses report AI accuracies in ORL research datasets ranging from 70% to 98%, contingent upon case volume and study design, often limited by small sample sizes and lack of standardized protocols.

Moreover, issues of algorithmic bias, data privacy, and legal liability loom large. Who bears responsibility when an AI's recommendation contributes to an adverse outcome? What safeguards ensure patient data confidentiality in AI training pipelines? And how should regulators balance innovation with clinical safety?

Importantly, AI systems may generate confident but erroneous outputs — sometimes termed “hallucinations” — if trained or deployed without rigorous validation. This necessitates a careful

human-in-the-loop approach where clinicians retain ultimate decision-making authority and critical reasoning.

Looking forward, the trajectory of AI in medicine and ENT suggests a layered evolution from research and proof-of-concept work to integrated clinical tools that augment — not replace — human expertise. Several domains are poised for particularly rapid growth:

Radiomics and Precision Diagnostics — AI-enhanced imaging that provides quantitative biomarkers, subgroup risk stratification, and personalized prognostic modeling.

Operative Assistance — real-time intraoperative guidance, instrument tracking, and augmented visualization to support surgical decision-making.

Patient Engagement and Education — AI chatbots and language models that tailor explanations, follow-up instructions, and self-care guidance to individual patient needs.

Outcomes Prediction and Workflow Optimization — predictive algorithms for postoperative complications, treatment success, and resource allocation.

To usher this future responsibly, multidisciplinary collaborations among clinicians, data scientists, ethicists, and regulators are essential. Data standards, prospective multicenter validation studies, explainable AI frameworks, and clinician education programs will be key pillars in achieving impactful, equitable, and safe AI integration.

AI's advent in medical science represents more than a technological novelty. It is a structural evolution in how we approach disease detection, clinical decision-making, education, and patient engagement. In Otolaryngology, AI's footprint — from imaging and diagnosis to surgical training and prognostics — is expanding rapidly, with research outputs nearly doubling in recent years and early evidence of high diagnostic performance in multiple subspecialties.

Yet, embracing this revolution demands thoughtful stewardship. AI must be developed and deployed with rigorous validation, clinician oversight, ethical safeguards, and a commitment to enhancing — not undermining — the human dimensions of care. In doing so, we can harness AI's transformative capabilities while ensuring that it serves as a trusted ally in improving patient outcomes and elevating the art and science of medicine.



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