



Artificial Intelligence in Otorhinolaryngology: Towards More Effective, Equitable, and Sustainable Healthcare

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Editorial

Artificial Intelligence (AI) is progressively transforming medical practice, and otorhinolaryngology (ENT) is no exception. Based on the analysis of multimodal data, including imaging, endoscopy, audiometry, video, and clinical data - this specialty represents a particularly favorable field for the development of deep learning. Current applications include diagnosis, image classification, prediction, and selected therapeutic applications [1]. Large Language Models (LLMs) are also opening new perspectives in clinical, educational, administrative, and scientific domains [2]. In head and neck oncology, AI is being investigated for lesion detection and classification, radiological and histopathological analysis, tumor segmentation, and prognostic assessment [3, 4]. In otology, automated analysis of otoscopic images represents another promising application. A systematic review and meta-analysis demonstrated encouraging diagnostic performance for the classification of various ear diseases [5]. AI and machine learning are also being explored in audiology for the analysis of auditory data and hearing screening [6].

However, the performance of an algorithm on an experimental dataset does not guarantee its performance in clinical practice. Differences in patient populations, data quality, equipment, and clinical practices may lead to a decline in performance during external validation. Dataset shift therefore represents a major challenge for the deployment of AI in healthcare [7, 8]. Sensitivity, specificity, calibration, robustness, and performance across different patient subgroups should be assessed beyond overall accuracy alone. External, multicenter, and prospective validation should become an essential step before widespread clinical implementation. This issue takes on particular significance in the context of Global Health. Hearing loss represents a major public health concern, with the number of affected individuals expected to increase over the coming decades and a substantial shortage of specialized services in low- and middle-income countries [7, 8]. AI-enabled digital tools could potentially facilitate certain stages of screening and referral; however, their actual effectiveness and transferability must be demonstrated in the settings where they are intended to be used. The issue of equity is inseparable from that of performance. A model developed in a highly specialized environment cannot be considered universally applicable without validation in other populations and healthcare systems. Selection, representation, and measurement biases may result in different levels of performance across patient groups. Model generalizability should therefore become an objective as important as initial model performance.

However, AI in otorhinolaryngology is not solely concerned with patients. It could also contribute to a better understanding and prevention of Work-Related Musculoskeletal Disorders (WMSDs) among healthcare professionals. These disorders represent a major occupational health issue, particularly affecting the cervical spine, shoulders, and back [9, 10]. Surgeons are particularly exposed to sustained awkward postures and repetitive movements, with a high prevalence of work-related musculoskeletal disorders reported in the literature [10, 11]. This issue is particularly relevant in otorhinolaryngology, where endoscopy, microscopy, surgery, and the maintenance of static or asymmetrical postures may impose repeated biomechanical strain. Advances in computer vision and motion analysis now make it possible to envision AI-enhanced ergonomics. Systems capable of automatically analyzing occupational postures could identify high-risk situations and contribute to the prevention of WMSDs [12]. The goal would not be to control or monitor the practitioner, but rather to better understand their working environment to make it safer. However, AI cannot replace conventional preventive measures, including appropriate adjustment of furniture and equipment, work organization, scheduled breaks, ergonomic training, and modification of professional techniques and movements.

This approach aligns closely with the priorities of Global Health. Truly sustainable healthcare

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should not only improve access to care for populations; it must also protect the health and well-being of those who deliver that care. Simple, accessible, and affordable AI solutions could be particularly valuable in resource-limited healthcare systems, if they are locally validated and developed in collaboration with the professionals who will use them. Thus, the future of AI in otorhinolaryngology should not be defined solely by the sophistication of algorithms. It should encompass four key requirements: clinical performance, equity, patient safety, and professional healthcare well-being.

The goal, therefore, is not simply to build an AI-augmented field of otorhinolaryngology, but to develop an augmented, validated, equitable, and sustainable ORL practice, benefiting both patients and the professionals who care for them.

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