Otologic Skills Training

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KEYWORDS

- Surgical simulation • Otology training • Otology skills • Simulation training
- Surgical education

KEY POINTS

- Otology skills training ranges from simple procedures such as otoscopy to complex lateral skull base surgery, and simulation-based training of most otologic procedures is possible.
- Keys to effective learning of otologic skills in a simulation-based curriculum include distributed practice; deliberate practice; mastery learning; and directed, self-regulated learning with feedback.
- Future directions are likely to include further improvement of simulator fidelity and realism. However, the development of simulation-based curricula centered on adult learning theory, national efficacy studies, and validation of assessment strategies is required for learners to fully benefit from simulation technologies.

INTRODUCTION

Otologic skills training encompasses a range of procedures, including those that need to be mastered by all medical doctors, such as otoscopy; basic procedures needed by general otologists, such as myringotomy; and more advanced procedures, such as mastoidectomy and lateral skull base procedures. At present, in the United States, training in otologic skills in otolaryngology is accomplished throughout the 5-year course of clinical study. This training has traditionally consisted of a gradual increase in exposure and practice beginning with the most basic procedures, such as cerumen

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removal, and progressing to the more complex lateral skull base procedures. However, this time-honored training approach has come under pressure for change as a result of several factors, including less time available for individual teaching and an emphasis placed on patient safety whereby attending physicians are more sensitized to trainee involvement in patient care. Given these challenges that face all medical/surgical training programs, educators have increasingly looked toward simulation as a potential tool to mitigate these issues. In otolaryngology, several recent reviews of simulation activity noted that otology is one of the most developed with respect to simulation applications.[1,2] This article presents a summary of all otologic procedures in which simulation-based training is currently available and described in the literature, ranging from diagnostic procedures to mastoidectomy and more advanced procedures, including both physical and computer-based virtual-reality (VR) models. The article is divided based on procedure type, and, where applicable, it addresses the need for training, target trainees, available training systems, evidence for efficacy in training, and means for assessment of technical skill. Key features of effective simulation-based training in otology and future directions are presented.

OTOSCOPY

Otoscopy is the visual examination of the ear canal and the tympanic membrane and is used to diagnose a wide range of common ear canal and middle ear diseases, such as external otitis, acute and serous otitis media, and tympanic membrane perforation, in addition to identifying infrequent but important disorders such as cholesteatoma that need referral for surgery. Otoscopy is a common procedure and a key skill for all clinicians, including general practitioners and pediatricians. Otologists most often prefer otomicroscopy to allow magnification and simultaneous procedures such as removal of cerumen but much of the following discussion applies to otomicroscopy training as well.

Otoscopy skills can be taught on peers or patients because they cause little discomfort. However, otoscopy relies on the coordination of the instrument and the examiner's visual field, making it difficult to supervise in the training situation and to ensure that a systematic approach is learned unless a video otoscope is routinely used for training with feedback. In addition, adequate exposure to the full range of disorders can be difficult to achieve: often, training consists of practical training on the patients supplemented by textbook/atlas images of disorders. Optimally, training in otoscopy consists of repeated hands-on practice with feedback of otoscope and patient handling while also directing a systematic approach to the examination. There is a need for improvement in otoscopy skills training because general practitioners and medical students have shown comparable but mediocre otoscopy skills.[3]

A range of simulation-based training models for otoscopy have been reported: mannequin models for otoscopy and pneumatic otoscopy (Spectrum Nasco, Newmarket, Ontario, Canada; and Limbs and Things, Bristol, United Kingdom),[4] a Web-based platform with three-dimensional (3D) models of the ear displayed on a computer screen,[5,6] and more advanced models with a variety of situations that can also track the otoscope for annotation[7] and provide automated feedback.[8] An otoscopy simulator (OtoSim Inc, Toronto, Ontario, Canada) has been widely marketed and consists of the physical interface of an adult auricle and external canal with a small light-emitting diode (LED) screen that displays scaled images of normal and pathologic tympanic membranes. The instructor can control which image is displayed and point out disorders from a laptop computer connected to the interface. Recently, the system was upgraded to include pneumatic otoscopy capabilities. There is some