Where Does Telemedicine Fit into Otolaryngology? An Assessment of Telemedicine Eligibility among Otolaryngology Diagnoses

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Sponsorships or competing interests that may be relevant to content are disclosed at the end of this article.

Abstract
Telemedicine applications are expanding to improve access to specialty care in rural areas. Telemedicine is not routinely used to evaluate new patients in otolaryngology, and it remains unclear which patients could benefit from this technology. This study estimates the rate of telemedicine eligibility among specific otolaryngology diagnoses. We conducted a retrospective cohort study of all ear, nose, and throat consults between August 1, 2013, and July 31, 2015. We paired diagnoses (International Classification of Disease, Ninth Revision) with office-based procedures (Current Procedural Terminology) and applied prespecified telemedicine eligibility criteria to encounters retroactively. If a specialized procedure was necessary to reach a diagnosis, the diagnosis was considered ineligible for telemedicine. We found that 62% of otolaryngology encounters would likely be eligible for telemedicine. Patients with inner and middle ear problems were more likely eligible for telemedicine, while patients with problems affecting the larynx and external ear were least likely eligible. Nearly 90% of veterans drove >1 hour round-trip for services. Understanding which otolaryngology problem types are more frequently eligible for telemedicine may assist those who are planning to implement a telemedicine program.

Keywords
telemedicine, telehealth, otolaryngology, eligibility, triage, Department of Veterans Affairs, veterans

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Telemedicine enables the provision of health care from afar with telecommunication technology. Although telemedicine is increasingly being used to provide specialty care to remote patient populations,1 few otolaryngology programs have reported successful, durable integration of telemedicine into routine work flow.2,3 Prior studies differed in both the telemedicine format (live interactive vs store and forward) and the level of experience of the patient examiner.

The current Veterans Affairs telehealth model employs video technology to connect an otolaryngologist at the main hospital with a patient at a community-based outpatient clinic. A health technician is present with the patient at the community-based outpatient clinic to operate the equipment and conduct the physical examination. The otolaryngologist interviews the patient in real time and interprets the examination findings obtained by the health technician. Compared with physician or midlevel patient examiners, health technicians are less expensive but have little or no specialized training. Health technician examiners are not able to perform any procedures (eg, biopsy, flexible laryngoscopy, rigid nasal endoscopy, cerumen removal), so patients who require specialized procedures are not considered eligible for telemedicine.

The purpose of this study is to estimate the rate of telemedicine eligibility among outpatient consultations performed in a general otolaryngology practice. Specifically, we sought to identify the proportion of encounters and types of diagnoses that would be expected to be serviceable in a telemedicine system that relies on health technicians to perform the patient physical examination in a live interactive encounter. A secondary objective was to understand the travel burden faced by veterans receiving specialty care in northern New England.

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Methods

Case Selection

All outpatient otolaryngology “new patient” or “consult” evaluation and management codes between August 1, 2013, and July 31, 2015, at the White River Junction Veterans Affairs Medical Center were identified with the Department of Veterans Affairs Ambulatory Care Reporting Project database. Current Procedural Terminology and International Classification of Disease, Ninth Revision codes, as well as patient demographics, were also collected with the database.

Case Classification

Encounters were deemed “eligible” or “ineligible” for telemedicine visit on the basis of whether a procedure was performed during the visit. This criterion for eligibility was determined per our experience with telemedicine in the Veterans Affairs system.

Analysis

We analyzed eligibility at both the encounter level and the diagnosis level. Diagnosis codes were individually categorized into “diagnostic groups” according to anatomic location of the diagnosis (external ear, larynx, etc) whenever possible. Eleven percent of the diagnoses involved multiple or nonspecific anatomic sites and were therefore categorized by problem type (sleep apnea, trauma, etc). The International Classification of Disease, Ninth Revision codes included in each diagnostic group are shown in the appendix (available in the online version of the article). Procedure codes were manually linked to the corresponding diagnosis codes within each encounter.

Travel distance and time were measured by entering the patient’s home ZIP Code into the recommended driving directions from Microsoft Bing Maps. The furthest ZIP Codes were plotted to determine a plausible catchment radius of 150 miles. Twenty-four ZIP Codes that fell outside the plausible catchment radius were excluded from the distance calculation analysis. Descriptive statistics were calculated in Microsoft Excel.

Institutional Review Board approval for this study was granted by the Dartmouth Committee for Protection of Human Subjects and by the White River Junction Department of Veterans Affairs Hospital Research and Development Committee.

Results

The study cohort consisted of 1385 encounters with 2008 individual diagnoses. Sixty-two percent of encounters did not require a specialized procedure to reach a diagnosis and were therefore considered eligible for a telemedicine format. After exclusion of patients living closer to the main hospital than the nearest telemedicine site (<1 hour round-trip), the overall estimated rate of telemedicine eligibility in this cohort was 54%.

Figure 1 shows the likelihood of telemedicine eligibility for the 12 most prevalent diagnostic groups. Eligibility varied by anatomic subsite. Ninety-two percent of inner ear diagnoses were considered eligible for telemedicine. In contrast, only 39% of patients with laryngeal complaints were eligible. Figure 2 summarizes the total number of diagnoses in each group and the proportion requiring office procedures. Endoscopic examinations of the larynx and nose constituted 60% of the office procedures performed. Binocular microscopic procedures of the external ear accounted for 30% of the procedures.
Travel data were available for 1360 patients (98.2%), who had a median round-trip travel time of 146 minutes (see Figure 3).

**Discussion**

Independent of travel distance, 62% of the encounters in this cohort were considered eligible for telemedicine visits with health technician examiners. This is remarkable, given that health technicians in the Veterans Affairs system are not trained to do specialized procedures. The diagnoses most likely to be eligible for telemedicine were those affecting the inner ear and middle ear because they less commonly require a procedure to reach a diagnosis. Conversely, problems affecting the larynx and outer ear are less frequently eligible for telemedicine evaluation because they typically require laryngoscopy or interventional otomicroscopy, respectively.

Our findings are consistent with a large navy study of 883 live interactive telemedicine otolaryngology encounters in which 64% of patients received a diagnosis and treatment plan. Among otolaryngology subspecialties, otology appears to be particularly well suited for telemedicine. Intraprovider concordance rates for telemedicine examination of the ear range from 79% to 85%, and audiologists have been successfully used as telemedicine examiners for otolaryngology.

One barrier to the use of telemedicine for a surgical subspecialty is the procedural component of the physical examination. Health technician patient examiners in the Veterans Affairs system are not able to perform specialized procedures, such as cerumen removal. Encounters that are considered ineligible in this study may be eligible in systems with patient examiners with greater technical expertise. This study likely overestimates telemedicine eligibility for laryngeal diagnoses because mirror examination of the larynx was not captured as a specialized procedure. Another limitation of this study is that it does not account for ancillary services used in medical decision making, which may not be available at the patient location in a telemedicine setting.

Appropriate use of telemedicine may alleviate the significant travel burden facing rural patients seeking specialty health care services. As applications of telemedicine increase, it is important to define which problem types within our specialty may be more or less suitable for evaluation by telemedicine. The findings in this study may assist others as they work to determine the feasibility of telemedicine in their particular practice setting. The study also reveals opportunities for expanding telemedicine eligibility as health technicians are trained and enabled to offer more procedures on the patient side of the telemedicine encounter.

**Author Contributions**

Ryan R. McCool, concept; design; literature review; institutional review board submission; data acquisition and analysis; drafting and revision of manuscript, tables and figures; final approval of version to be published; accountability for all work; submission; Louise Davies, study concept; design; critical revision of manuscript, figures, and tables; final approval of version to be published; accountability for all work.

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**Supplemental Material**

Additional supporting information is available in the online version of the article.

**References**


