

# Otolaryngology consultations by real-time telemedicine

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## SUMMARY

**We aimed to assess the value of real-time telemedicine using low cost videoconferencing equipment for otorhinolaryngology consultations. A general practitioner, using low cost videoconferencing equipment, presented patients to an otorhinolaryngologist. After history taking and clinical examination, investigations were requested if required and a diagnosis and management plan formulated. The patients were then seen, by the same otorhinolaryngologist, for a conventional face-to-face consultation. Differences in the history, clinical examination and investigation requests were reported. The accuracy of diagnosis and correlation of management plans between the two consultations were analysed. Forty-three patients were admitted to the study but one, a young child, refused examination either by tele-link or the conventional approach and had to be excluded. There were thus 42 patients with 55 diagnoses included in the trial, 26 (62%) females and 16 (38%) males. Age range was 5 months to 70 years. There was no difficulty with any of the patients in obtaining an accurate history and ordering investigations, if required, via the tele-link. Clinical examination during the tele-link consultation was inadequate for eight out of the first 20 patients, resulting in a wrong diagnosis in three patients and a missed diagnosis in five patients. All of the next 22 patients had a correct diagnosis and management plan. Comparison of data from the two types of consultation showed that a correct diagnosis and management plan was made in 34 patients. Low cost real-time telemedicine is a useful technique, providing reliable otorhinolaryngology consultations in a general practice setting. However initial difficulties due to inexperience in using the equipment need to be overcome.**

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## INTRODUCTION

Real-time telemedicine as a means of gaining expert advice is fast gaining recognition as a viable alternative to the traditional referral system. Clinical areas such as cardiology and dermatology have demonstrated its value and effectiveness as a diagnostic and management tool.<sup>1-2</sup>

Previous studies have used medium to high bandwidth transmission and have shown that the quality of tele-otorhinolaryngological images are highly acceptable for remote diagnosis.<sup>3-6</sup>

There are no reported formal studies of tele-otorhinolaryngology consultation effectiveness at low bandwidth.

This study aimed to evaluate the diagnostic, investigative and clinical management decisions of otorhinolaryngological conditions using real-time low-cost equipment at low bandwidth transmission.

## METHOD

Basic rate ISDN lines at 128kb/s were connected between two adjacent rooms in a teaching hospital in Belfast. Low cost videoconferencing units (VC7000, BT) were installed in both rooms; one for the general practitioner and patient, the other for the otorhinolaryngologist.

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A video camera with a Storz rigid endoscope (Endovision Dx-cam 20230001) and light source (CLS 150-2, Rimmer Brothers) were connected to the videoconferencing unit in the general practitioner's room to enable transmission of close-up images to the otorhinolaryngologist. The endoscopic camera had a resolution of 752x582 pixels.

Patients with a range of otorhinolaryngological conditions requiring a specialist referral were invited to participate in the study by their general practitioner. All such patients consented to take part in the study and were referred to a pre-arranged tele-otorhinolaryngology clinic.

Conditions such as dysphonia, dysphagia and others requiring indirect laryngoscopy or fibre-optic laryngoscopy were excluded as the general practitioner did not feel proficient in examining these areas and did not have the necessary equipment. Uncooperative patients, who refused examination via tele-link or by conventional approach, were also excluded.

The general practitioner obtained a full, medical history and conducted an examination, which was observed via tele-link by an otorhinolaryngologist situated in an adjacent room. A three-way interactive consultation ensued and the otorhinolaryngologist recorded a history, clinical examination, diagnosis, and management plan. Any investigation required, such as audiometry, was requested during the tele-link consultation.

Following the tele-consultation the patient was seen for a conventional consultation by the otorhinolaryngologist to confirm the history, examination, diagnosis and management plan.

## RESULTS

A total of nine tele-otorhinolaryngology clinics was arranged. Forty-three patients attended the above clinics, 27 females and 16 males, with an age range from 5 months to 70 years. One child refused examination during both the tele-link consultation and the conventional consultation and had to be excluded from the study.

Table I lists the range of otorhinolaryngological conditions presenting to the clinic.

Eleven patients presented with two or more symptoms.

There was no difficulty in obtaining an accurate history or ordering investigations, if required,

TABLE I

<i>Presenting conditions</i>	<i>Number of patients</i>
Nasal obstruction	14
Hearing loss	13
Recurrent sore throats	7
Tinnitus	4
Otalgia	4
Dizziness	2
Otorrhoea	2
Prominent ear	2
Snoring	2
Aural fullness	1
Facial palsy	1
Nasal trauma	1
Nasal bone deformity	1
Epistaxis	1
Total number of diagnoses	55

during the tele-link consultation. Twelve patients were referred for audiometry or tympanometry, and two patients were referred for allergy testing. Clinical examination via the tele-link was inadequate in eight patients resulting in a wrong diagnosis in three and a missed diagnosis in five patients.

TABLE II

### *Diagnostic accuracy of tele-link consultation compared to conventional consultation*

<i>Diagnosis</i>	<i>Number of patients</i>
Correct	34
Missed	5
Wrong	3

Thus a correct diagnosis was made in 34 patients (Table II). All eight patients with an incorrect diagnosis were within the first 20 patients assessed. In three patients there was an inadequate view of the tympanic membrane resulting in glue ear being missed and a wrong diagnosis. In five patients it was difficult to obtain adequate nasal views via the tele-link resulting in a deviated nasal septum (two patients), hypertrophy of inferior turbinates (two patients) and a nasal septal bleeding point (one patient) being missed.

TABLE III

*Level of agreement between tele-link consultation and conventional management plans*

<i>Correlation</i>	<i>Number</i>
Correct	34
Sub-optimal	1
Incorrect	7

All of the next 22 patients assessed had a correct diagnosis.

Table III shows the level of agreement between the tele-link consultation and conventional consultation management plans. There was no agreement in the management plans for seven patients because of an inadequate view using an endoscope during the tele-link consultation. In five of these patients there was difficulty in obtaining an adequate view of their nasal cavities as described above, resulting in a missed diagnosis and subsequent inappropriate management plans. Two patients had glue ear misdiagnosed, again due to inadequate visualisation of the tympanic membranes resulting in inappropriate management plans. Another patient with a history of recurrent otalgia and hearing loss was documented as having normal tympanic membranes by the tele-link consultation but had glue ear confirmed at the conventional consultation and by tympanometry. The management plan for this patient was broadly similar at both consultations, though the level of agreement was recorded as sub-optimal.

All eight patients with less than optimal level of agreement between the two consultations were from the first 20 patients assessed.

TABLE IV

*Outcome of conventional face-to-face consultations*

<i>Clinical outcome for patients</i>	<i>Number of patients</i>
No action needed	19
Review with General Practitioner	5
Surgical waiting list	6
Review at otolaryngology clinic	12

Table IV outlines the outcomes of the conventional face-to-face consultations. Nineteen patients needed no further action to be taken and were discharged. Five patients were referred back to their general practitioner. Six patients required surgery and were placed on the otorhinolaryngology waiting list. Twelve patients were requested to re-attend an otorhinolaryngology clinic for further review.

#### DISCUSSION

Telemedicine allows consultations between primary care centres and specialised hospital clinics by use of low cost videoconferencing equipment and in real-time. It not only gives access to expert advice, but also has an educational role for the general practitioner<sup>7</sup> and otolaryngologist.

As a health care system develops to meet the needs of patients, expert advice can be easily sought by the use of telemedicine. Patients and general practitioners can receive faster and more efficient advice resulting in a higher quality of health care.

Telemedicine also enables distant case discussion between specialist and sub-specialist, and inter-hospital case discussion between different specialities.<sup>8</sup>

Once a telemedicine link has been established between two centres it allows more efficient use of specialist time and will hopefully reduce the number of unnecessary referrals.

The results of this study demonstrate that the diagnostic, investigative and clinical management decisions of a range of otorhinolaryngology conditions are possible via real-time tele-link consultations using relatively cheap low bandwidth transmission lines.

There is a learning curve in mastering the technique of endoscopic examination with the main difficulty occurring in the correct focusing of the endoscope. However this difficulty can be quickly overcome, as shown in the results of this study. Out of the first 20 patients, examination was inadequate in eight resulting in an incorrect diagnosis and management plan with the tele-link consultation, whereas examination was adequate in the remaining 22 patients.

We feel that using low-cost videoconferencing equipment at a low bandwidth transmission provides satisfactory images. Once the

practitioner acquires the necessary skills and expertise to operate the equipment, accurate diagnosis and clinical management decisions can be made.

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