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TELEMEDICINE AS A TOOL TO IMPROVE ACCESS TO SPECIALIST HEALTHCARE FOR ENT PATIENTS IN RURAL RWANDA: PILOT PROJECT

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**TELEMEDICINE AS A TOOL TO IMPROVE ACCESS TO SPECIALIST HEALTHCARE FOR ENT PATIENTS IN RURAL RWANDA: PILOT PROJECT**

B. K. MUKAARA, L. J. NGENZI and R. J. DANIELS

**SUMMARY**

**Patients in rural and remote areas frequently suffer poor access to specialist ear, nose and throat services despite comparatively high prevalence of ear disease in many populations. Telemedicine has been proposed as one solution to this issue, and the advent of high quality affordable digital otoscopes with improved access to mobile internet has brought this concept within the reach of many populations. We sought to test this technology in a group of patients presenting for the first time with undiagnosed ear complaints. Using the VSee telemedicine platform with a Welch Allyn Otoscope over a mobile 3G internet service 90% of patients were diagnosed accurately and furthermore competence in using the equipment was acquired within 30 minutes. This suggests that there is potential for this existing technology to be rolled out as a potential cost effective solution to widen access to specialist otology advice.**

**INTRODUCTION**

In 2006 the World Health Organization identified Rwanda as a country with a shortage of medical staff (1) and in response the government has made significant efforts to build the medical workforce. As a result, the doctor to patient ratio has progressively improved from 1:70,000 in 2000 to 1:13,748 in 2014, with projections to 1: 11,903 in 2018 (2). There are however only 11 ENT surgeons in Rwanda today serving an estimated population of 12 million inhabitants, all of who are stationed in two urban national referral facilities.

Doctors and nurses working in rural Rwanda have limited postgraduate training in general and in particular none have post graduate experience in ear, nose and throat problems, despite there being a high burden of middle ear disease in rural communities. Patients presenting to primary care are frequently referred to specialists in the capital Kigali, which entails long journeys for patients and long waiting periods with overwhelming pressure on specialist medical staff at referral facilities. Rwanda though is uniquely positioned to benefit from Telemedicine due to its universal 3G and widespread 4G/fibre internet system, with specialist healthcare located primarily in the teaching and referral hospitals of the capital Kigali.

The ideal system will be cheap, easy to use in the hands of someone with limited medical and computer skills and provide a high level of diagnostic accuracy using existing telecommunications infrastructure.

Telemedicine has the potential to improve health care in this area by allowing specialists to consult at a distance, allowing triage of patients in rural areas and also to facilitate postgraduate education and training. Telemedicine has been used in otology for both acute diagnosis (3,4) and post treatment follow up of patients (5). Previous studies have demonstrated a high level of diagnostic concordance between on site and remote consultations (3), and we wished to determine if this was a feasible option for improving access to specialist otology advice. We set out to test the feasibility of remote consultations in this field using the Vsee telemedicine platform (VSee Lab, Inc, Sunnyvale, California) during an ear camp in Nyagatare in North-East Rwanda.

The Starkey foundation run ear camps in rural Africa, offering a one stop hearing aid service to patients who would otherwise not have access to these devices. Hearing aids are offered to anyone in the local area, simply by presenting to the ear camp on a designated day. Patients are initially screened by an otologist prior to hearing assessment and hearing aid fitting, where appropriate. We decided to use the

opportunity this provided to test the feasibility of a tele-otology advice service using the local 3G mobile broadband service, for remote diagnosis.

### MATERIALS AND METHODS

To test the feasibility of generic healthcare workers using the equipment a group of five clinical medical students from the University of Rwanda with no previous experience of ear, nose and throat medicine received a 30 minute group teaching session on the use of the digital otoscope. At the end of the session all 5 were able to obtain an adequate image of a tympanic membrane. Ethical approval was obtained from the University of Rwanda.

Ten consecutive patients with ear disease presenting to the ear camp were assessed and diagnosed on scene by an experienced otologist and had a brief history taken by a medical student, with a digital image of their tympanic membrane being recorded using a laptop and Welch Allyn Digital Macroview Otoscope (Welch Allyn Inc., Skaneateles Falls, NY, USA.)

The brief summary of the patients history and a digital image of the affected eardrum, were then used in a live online consultation with a junior ENT consultant stationed in Kigali. Using this information, the consultant made a clinical diagnosis and this was compared with the diagnosis made at the patient's consultation. The time taken for the digital image to be visible online in Kigali was recorded with a digital stopwatch.

### RESULTS

Of the ten patients seen, it was possible to record an adequate image in nine cases. Of these nine cases, the remote diagnosis concurred with the on-site diagnosis

in all nine cases. The patient in whom it was not possible to obtain an adequate image, was diagnosed correctly on the basis of the history and description of the signs. Although the 3G mobile internet connection was too slow to support live video examination, it was adequate for both a live teleconsultation and transmission of otoscope images and audio quality. The mean time for the digital image to be visible was 28.2 seconds (range 29.9 to 48.6 seconds) and the mean file size was 156 KB.

In conclusion, this pilot study demonstrates that the VSee platform and a 3G mobile internet service has the potential to facilitate live remote telemedicine consultations for patients with ear disease in rural and remote areas. Furthermore it is possible for healthcare workers with no prior experience of this system to acquire sufficient proficiency in the use of the equipment within 30 minutes.

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