Head and neck cancer assessment by flexible endoscopy and telemedicine

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Summary

We have conducted a feasibility study to establish whether ENT tele-endoscopy would be a suitable method of service delivery for patients who live in the Shetland Islands. Ten clinics were conducted over a period of 17 months using ISDN-based videoconferencing at a bandwidth of 384 kbit/s. A total of 42 patients were seen in Aberdeen via videoconferencing for a head and neck cancer assessment. Feasibility was confirmed after the first 20 patients, following positive feedback from all concerned and the absence of any significant clinical or technical problems. A total of 42 journeys was avoided, each journey saving 123 kg CO_2 per person. A preliminary cost analysis showed that the threshold at which tele-ENT became cheaper than travel was a workload of 35 patients/year. The actual workload during the pilot study was 29 patients/year. A national telemedicine service for the initial assessment of potential malignancy has the potential to reduce unnecessary transfers to specialist centres, with accompanying reductions in carbon emissions.

Introduction

The incidence of head and neck cancers is increasing in the UK[1] and the subsequent rise in the numbers of referrals to specialist centres for diagnosis has put these services under increasing pressure. Telemedicine might be a way of improving access to specialist centres (i.e. it might reduce the waiting time to a specialist consultation) and might also reduce the number of patients travelling unnecessarily.

Recent discussions regarding climate change have highlighted the impact of unnecessary travel, in particular air travel, on the environment. It has been estimated that 5% of UK road travel is concerned with NHS work.[2] It has therefore been suggested that the NHS and its staff should make efforts to reduce this carbon footprint and that telehealth can lead to significant reductions in CO_2 emissions.[2]

Previous studies of the use of telemedicine for ENT endoscopic examination have demonstrated improved access, appropriate diagnostic accuracy and high levels of patient satisfaction.[3–9] They have also demonstrated cost savings to health-care systems and a reduction in patient travel for paediatric outpatient ENT appointments.[4,9] We have conducted a feasibility study to establish whether ENT tele-endoscopy would be a suitable method of service delivery for patients who live in the Shetland Islands.

Shetland is the most northerly health board in NHS Scotland. It is nearer to Bergen than to Aberdeen, and is further north than Moscow or southern Greenland. Until the telemedicine work began, patients in the Shetland Islands who needed to be seen by an ENT specialist had to travel to Aberdeen or wait for a visit from the visiting consultant ENT service. The visiting consultant travelled to Shetland approximately every ten weeks. Between these visits, the details of patients with symptoms of possible head and neck cancer had to be sent by fax to the consultant in Aberdeen for a decision to be made whether to offer an appointment at the next visiting clinic or transfer the patient to Aberdeen for an urgent assessment. If patients had to travel to Aberdeen, their travel costs were reimbursed.

Methods

Two local doctors on Shetland were trained in nasendoscopy. Patients referred from primary care were

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selected for the pilot study by the consultant otolaryngologist in Aberdeen and the two local doctors on Shetland. The laryngoscope (ENF GP Rhino-laryngoscope, Olympus) was connected to the videoconferencing unit (880MXP, Tandberg) via an S-video cable. Video conferencing with Aberdeen was conducted at 384 kbit/s via the ISDN network. Although previous studies have confirmed the diagnostic accuracy of telemedicine using both rigid and flexible endoscopes, we followed up the first 20 patients after two and six months in order to confirm patient safety.

Initially the tele-endoscopy images were recorded in Aberdeen. They were also captured on the DVD recorder on the theatre stack used for the endoscopic examination. This allowed the ENT consultant to compare the images for diagnostic accuracy. After the first two clinics, the ENT consultant decided that the live videoconferencing images were of sufficient quality for accurate diagnosis. None of the tele-endoscopy diagnoses were altered after review of the captured DVD images, suggesting that the diagnostic quality of the tele-endoscopy images was satisfactory.

Feasibility

Feasibility was evaluated by patients and staff at the initial clinics. All patients were questioned about their experience at the clinic immediately after the visit. Any technical problems were assessed by the clinical and technical staff.

Avoided travel

The CO_2 saving from avoided travel was calculated according to the methodology of the Department for Environment, Food and Rural Affairs.[10] The journey from hospital in the Shetland Islands to the specialist centre in Aberdeen required a road journey from hospital to the nearest airport, a flight, and then a journey from the airport in Aberdeen to the hospital (Figure 1).

The total road distance from Gilbert Bain Hospital (Shetland) to Sumbrugh airport (Shetland) and from Dyce airport (Aberdeen) to Aberdeen Royal Infirmary was calculated using a standard route planner (Automobile Association Limited) and the great circle distance between the airports was calculated using Vincenty's formula.[10]

Service costs

A preliminary cost-minimisation analysis was conducted. The costs included the cost of the equipment and telecommunications for telemedicine, the staff time involved and the travel costs.

Results

Ten clinics were conducted over a period of 17 months and 42 patients were seen via videoconferencing for a head and neck cancer assessment.

Feasibility

Feasibility was confirmed after the first 20 patients, following positive feedback from all concerned and the absence of any significant clinical or technical problems. The doctors on Shetland performed the endoscopy whilst the consultant otolaryngologist in Aberdeen viewed the examination live. Twenty-seven patients (64%) were given

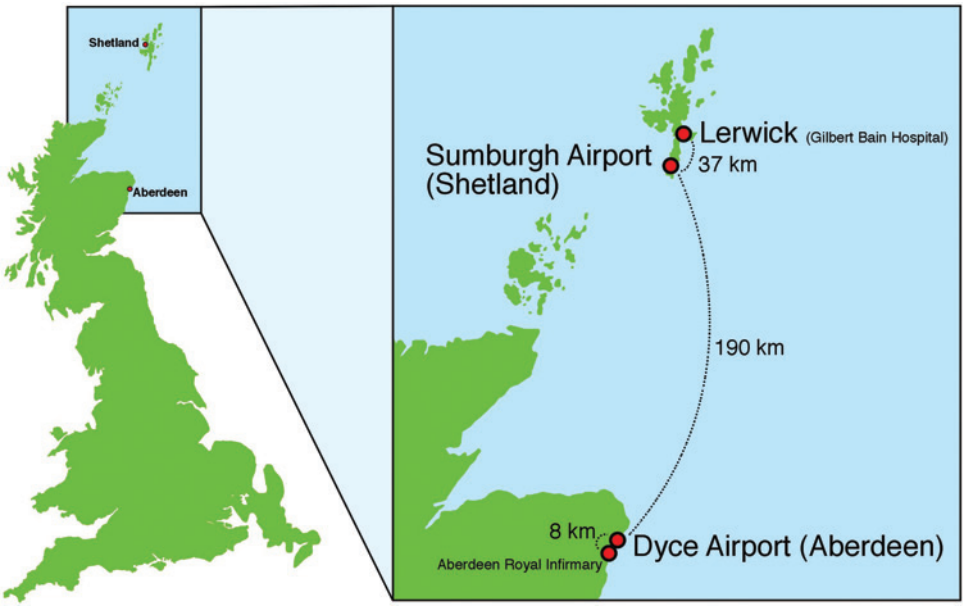

Figure 1 The journey from hospital in Shetland to hospital in Aberdeen involved two road trips and a flight

reassurance or advice and discharged, 2 patients (5%) were put onto the surgical waiting list, 9 patients (21%) were followed up and 4 (10%) were referred to the speech and language therapist (one of whom was later discharged).

Avoided travel

The ENT consultant who saw the patients via telemedicine would otherwise have had to see all 42 patients face-to-face, i.e. a total of 42 journeys was avoided. The total road distance was 46 km. The emission from a car with an average-sized diesel engine is 0.199 kg CO_2/km. Thus, the avoided road travel saved the emission of 9.15 kg CO_2.

The distance between the two airports was 303 km. Allowing for an additional 9% of flying to take account of taxiing etc (the so-called uplift factor) means that the emission from a short (domestic) flight is 0.158 kg CO_2/km. Thus, the avoided air travel saved the emission of 52.2 kg CO_2.

Thus, the total saved emissions for the journey were 61.3 kg CO_2 per person (one-way). This gives a total of 123 kg CO_2 per person for a return journey.

Service costs

The variable cost of the patient being seen in Aberdeen was approximately £383. The annual fixed cost of the tele-endoscopy clinics was £10,502 and the variable cost was £77 per patient. The increase in total cost with workload is shown in Figure 2 for the two modalities. The threshold at which tele-ENT became cheaper than travel was a workload of 35 patients/year. The actual workload during the pilot study was 29 patients/year.

Other benefits

The mean time for a patient to be seen following receipt of the referral letter at the video clinic was 6.6 weeks. Prior to telemedicine there were only six visiting clinics per year.

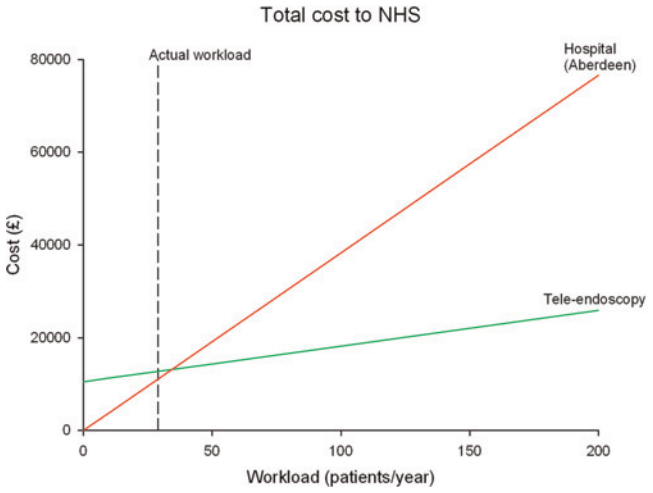

Figure 2 Preliminary cost analysis

With telemedicine in use, 12 clinics were held per year, i.e. 6 visiting and 6 virtual clinics. No patient waited longer than four weeks for an appointment, which conforms with current health service guidelines.[1]

Also there were approximately 85 patients per year travelling to Aberdeen from Shetland, who thus occupied 85 slots in the Grampian outpatient clinics. Following the introduction of telemedicine, these slots were given to Aberdeen patients.

Discussion

The present study demonstrates that tele-otolaryngology, utilising nasoendoscopy, for the initial assessment of potential malignancy is feasible and acceptable to both patients and staff. Such a service has the potential to reduce unnecessary transfers to specialist centres, with accompanying reductions in carbon emissions. A preliminary cost-minimisation analysis of this service suggested that telemedicine becomes cheaper than treating patients in Aberdeen when the workload is greater than 35 patients per year. This is just above the current annual workload. Other economic studies of telemedicine in ENT have found it to be less costly than conventional alternatives.[6,11] One reason why this was not observed in the current study is our assumption that the videoconferencing equipment was not used by any other services, i.e. the full costs were attributed to the endoscopy clinic. However, other services are likely to use the equipment in the near future, which would therefore reduce the fixed costs of the tele-endoscopy clinics.

The new telemedicine service is already alleviating pressure on the ENT waiting list, which should allow the Scottish waiting time target for cancer to be met for Shetland patients. The service is to be extended to routine otolaryngology referrals to further reduce waiting times. In addition, some refinements are planned to maximise the efficiency of the service.

Currently, each patient is seen by two senior doctors at each consultation via a live video link. However, the examination and nasendoscopy at the remote site could in principle be performed by a non-medically-qualified health-care professional, following appropriate training; this would reduce the costs of running the service. It would also be possible to offer the service via store-and-forward mode, i.e. by recording the nasoendoscopy examination and transmitting it for later viewing by the consultant. Such a screening system would allow more efficient use of the specialist's time, and only those patients with equivocal findings would need to proceed to real-time teleconsultation. The net result of a hybrid system would be rapid assessment for initial triage of potential malignant conditions with benefits for both the patient and the NHS.

Future studies to evaluate these alternative service delivery models in different settings (e.g. district general hospitals, community hospitals, health centres) are in progress. The possibility of developing a national network of otolaryngologists for rapid reporting of nasendoscopy images in potential cancer cases deserves investigation.

Conclusion

The present study demonstrates that providing a head and neck cancer appointment by videoconferencing allows patients improved access to a key diagnostic appointment. Telemedicine appears to be safe, reliable, accurate, quick and patient friendly. It helps to meet government targets and reduces the carbon footprint of the NHS.

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