

ORIGINAL ARTICLE

Safety and Effectiveness of Telemedicine for Neurology Outpatients

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Declaration of authors' financial and commercial interest.

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Abstract**Background and Aims**

Patients often wait many months to see a neurologist for the first time. With the introduction of targets for maximum waiting times there is a need for novel approaches. Real time telemedicine by videolink (VL) is one such method and we aimed to replicate this in Aberdeen.

Methods

Patients were seen by VL by two Irish-based neurologists, one experienced in telemedicine, the other not. A senior trainee neurologist present with some of the patients validated the telemedicine diagnosis and management with his own face-to-face (FF) assessment. Satisfaction was assessed by questionnaires. Numbers requiring investigations and review were recorded as were representations to neurology over six months.

Results

Forty-four patients were seen. Satisfaction was higher and review rates were similar to previous cohorts seen by FF and VL. There was no difference between the two neurologists. There was complete diagnostic agreement between the VL and FF neurologists. There was a diagnostic change in a single patient after six months follow-up.

Conclusion

Neurology consultation using VL is safe and effective as well as acceptable, and the necessary skills were acquired rapidly by a telemedicine-naïve neurologist. Telemedicine using VL can contribute to waiting list reduction, and is likely to be most useful in rural areas.

Key Words

Telemedicine, service improvement, neurology services.

Introduction

Patients with neurological symptoms referred by their General Practitioners (GPs) to neurologists in the UK traditionally have to wait very many months until they are seen, numbers of consultant neurologists being much less per unit of population than most other industrialised countries.¹ Many such patients are referred to physicians whose waiting times are generally shorter, but whose care is probably less good.²

The UK Government has deemed long waiting times unacceptable and has introduced targets of maximum times above which patients are not permitted to wait.³ A number of suggestions have been made to reduce these waiting times, one of which is using real time telemedicine by videolink to see patients. There is evidence that this is effective,^{4,5} and it is in routine clinical use in Northern Ireland. Videolink enables neurologists from a different region or country to see patients without having to travel. This solution was implemented in the North East of Scotland which has a population of 775,000 in an area of 3,685,163 hectares. Neurological care is provided by 3.5 whole-time-equivalent Consultant Neurologists based at Aberdeen Royal Infirmary, and one full-time Locum Consultant Neurologist based at Raigmore Hospital in Inverness. This equates to one whole-time neurologist for a population of 172,000, so it is hardly surprising that waiting times to see a neurologist are greater than six months (the government target at the time of this study). The implementation of teleneurology in the North East of Scotland provided an opportunity to evaluate the various aspects of the quality associated with this system, specifically its safety, effectiveness and acceptability.

Methods**Patients:**

New referrals from GPs who had been referred to the neurologists in Aberdeen, whose letters were graded by the neurologist as non-urgent and whose waiting times were about to exceed the current government target of 26 weeks were approached by telephone to see whether they would be willing to be seen by videolink.

Consultant Neurologists:

The patients were seen by two consultant neurologists; V Patterson, who was experienced in the technique and based in

Belfast, Northern Ireland; and P Crowley, who was inexperienced and based in Waterford in Ireland.

Videolink Examination:

Connection was made using digital telephone lines (ISDN) with a band width of 384 kbs. Videoconferencing equipment at Aberdeen was a Sony 1600, in Belfast it was a Tandberg 880 MXP, and in Waterford it was a Polycom Viewstation FX. When the patient arrived they were met by the Project Manager (C Dorrian) who explained what the videolink involved. Before the patient came into the videolink room, the clinic nurse had gone through the Aberdeen notes and presented details of past medical history to the neurologist. Patients were accompanied in the videolink room by the clinic nurse and were then interviewed by the neurologist over the videolink. After the neurologist had obtained the history, patients were examined by the nurse under the neurologist’s direction. The neurologist then spoke to the patient and discussed the diagnosis and suggested management. After any questions the patient had were answered the video call was terminated.

Staff training:

P Crowley sat in with V Patterson at one of his videoclinics. C Duncan, who had witnessed videoconsultations by V Patterson, showed the neurology nurses in Aberdeen how to do a neurological examination suitable for a videolink. V Patterson did a videolink clinic to Northern Ireland from Aberdeen to enable the Aberdeen authors to witness the technique in action. At the first videoclinic from Aberdeen, an experienced teleneurology assistant from Northern Ireland was present.

Measures of safety:

For the Belfast patients, a specialist registrar in neurology (C Duncan) was in the room with the patient and nurse and was able to hear the neurologist’s history and witness the examination. After the neurologist’s examination, and before the neurologist spoke to the patient, the specialist registrar took any extra history, examined the patient face-to-face (FF) and then conferred with the neurologist by telephone. Any differences between the consultant’s videolink diagnosis and the registrar’s face-to-face diagnosis were recorded. In addition, information was obtained on all patients six months after the outpatient consultation as to whether they had re-presented with any neurological problem.

Measures of acceptability:

A satisfaction questionnaire which had been used in previous studies of outpatient teleneurology was used.⁴ It was administered to the patient by the Project Manager at the end of the consultation.

Measures of effectiveness:

We recorded the number of patients who required review appointments and those who were investigated.

Results

Of the 49 patients contacted, 44 agreed to participate. Only one did not participate because of concern about a videoconsultation, the rest declining because either they had prior arrangements or their symptoms had resolved. Twenty-five were seen by V Patterson and 19 by P Crowley.

Safety:

The results of the FF examination by the registrar agreed with the videoconsultation in 100% of patients. In one patient the registrar felt that the signs (of a fifth lumbar root palsy) were better seen FF. In other words, in none of the patients did the results of the FF examination alter what was told to the patient in terms of diagnosis or management.

At six months follow-up, a single patient was admitted to hospital with what turned out to be multiple sclerosis. He had presented with sensory symptoms on the background of many other general symptoms. At the time of the consultation there were no signs on examination either by videolink or FF and it was felt by both examiners that these were medically-unexplained symptoms. The symptoms progressed in the weeks following the videoconsultation and he was re-referred at which point he had signs suggestive of spinal cord disease. The diagnosis of multiple sclerosis was confirmed by magnetic resonance imaging and cerebrospinal fluid examination. None of the other patients were re-referred.

Acceptability:

The results of the acceptability questionnaire are shown in Table I. There was no significant difference between the experienced teleneurologist and the less experienced one.

Table I. Acceptability Results in 44 Patients.

| Question | Disagree | No opinion either way | Agree |
|---|----------|-----------------------|-------|
| 1. I was able to say all that I wanted | 0 | 1 | 43 |
| 2. I feel shy and nervous about speaking | 32 | 6 | 6 |
| 3. I could hear everything that the neurologist said | 1 | 0 | 43 |
| 4. I was worried that others might be listening or watching during the outpatient appointment | 39 | 3 | 2 |
| 5. I felt that the neurologist understood my problems | 0 | 2 | 42 |
| 6. I felt that the neurologist's explanation of my symptoms was satisfactory | 0 | 2 | 42 |
| 7. I felt that the outpatient appointment with the neurologist was useful | 0 | 1 | 43 |
| 8. I had confidence in the way the neurologist addressed my problems | 0 | 1 | 43 |

Effectiveness:

Seven of the 44 patients seen were given review appointments (16%) and 15 (34%) were investigated by computed tomography or magnetic resonance imaging of brain or spine, or clinical neurophysiology.

Discussion

This study confirms the feasibility of seeing new neurological referrals by videolink and shows that the level of patient acceptability was extremely high. Satisfaction levels were far superior to both the FF and videolink cohorts in the previous study of outpatient teleneurology⁴ which used the same satisfaction questionnaire; for example, in the current study, 42 of 44 patients (95%) felt the neurologist understood their problems compared with 34 of 49 (69%) in the cohort seen by videolink in the previous study. Likewise for the statement "I felt shy and nervous about speaking", 73% of patients in the current study disagreed compared with 43% in the previous cohort seen by videolink. This improvement is probably due to better patient preparation and the greater involvement of nurses at the patients' end.

Importantly we have shown that the necessary skill to see patients by videolink can be acquired by a clinically experienced neurologist without extensive training in the technology, and that there was no difference between patient satisfaction obtained by the experienced and inexperienced teleneurologist. In most studies of telemedicine, patients are generally more enthusiastic than doctors, the latter often being worried about difficulty in using the technology. This study suggests that those concerns may be unfounded.

The safety of this procedure was demonstrated in a novel way by having a trainee neurologist in the room with the patient to perform a FF examination at the end of the videolink consultation. That this did not alter the diagnosis answers another reservation which many neurologists have about videolink neurology, namely, that important physical signs will be missed. The one patient who did have a change in diagnosis at six months was also examined FF with no signs being apparent on either examination at that time.

The percentages of patients seen who required either investigations or clinic review are taken as surrogate markers of the confidence of the neurologists seeing the patients over a videolink and, therefore, the effectiveness of the technique. Both were well within the bounds of our previous studies of FF consultation by other neurologists and are well below that of the cohort in which neurological patients were seen by general physicians.^{2,5} This is shown in full in Table II.

Table II. Investigations and Reviews Compared with Previous Published Cohorts.

| How seen | Videolink | | Face-to-face | | | | |
|------------------|----------------------|----|--------------|----|----|------------|-----|
| | Neurologists | | Neurologists | | | Physicians | |
| Cohort reference | Current study | 4 | 4 | 5 | 5 | 5 | 2 |
| Numbers | 44 | 76 | 65 | 50 | 50 | 50 | 102 |
| % Investigated | 34 | 45 | 15 | 42 | 32 | 34 | 69 |
| % Reviewed | 16 | 29 | 21 | 30 | 46 | 30 | 49 |

Although we have shown that this service can be outsourced, in that it was delivered by neurologists in another part of Europe, it is clearly preferable for it to be delivered from the local neurology unit so that those patients who require investigations or clinic review can be more appropriately followed-up. However, outsourcing can deliver a service if there are issues which prevent local delivery.

For practical reason the patients seen in this initiative lived near to Aberdeen, however, videolink neurology has the potential to improve equity for those patients who live many miles away from their local neurology centre and for whom travelling can be both expensive and inconvenient. Travelling by the neurologist to a remote clinic is also a waste of a scarce resource. Videolink neurology reduces the need for such travelling and can provide a service which is both more equitable and less costly to patients living in rural areas.

Therefore, videolink neurology can meet the quality measures suggested by the United States Institute of Medicine – safety, patient-centredness, timeliness, effectiveness, efficiency and equity.⁶ In Scotland, expert FF neurology consultation is never going to be easily available for patients living many miles from neurology centres. Videolink neurology, where neither the patient nor the neurologist travels, is the next best thing and is likely to be superior to FF care from a physician.

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