

Telemedicine – the way ahead for medicine in the developing world

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SUMMARY An e-mail link with the facility to send high-resolution digital images is a cheap and uncomplicated telemedicine method. The Swinfen Charitable Trust helped establish such a link in Patan Hospital Kathmandu, Nepal in March 2000. Over 12 months using this link 42 telemedicine referrals were sent to specialists throughout the world. Referrals were: 36% respiratory medicine; 21% neurology, 21% dermatology; 14% cardiology; 5% nephrology; and 3% radiology – 28 had digital pictures attached, of which 96% were of high enough quality on which specialists were able to comment.

Thirty-nine replies were received. The average time for a specialist reply was 2 days, and 45% were answered within 24 hours. All replies were judged by independent assessors to be helpful or very helpful for diagnosis, management and education. The assessors decided that in 50% of cases the advice if acted upon would have shortened hospital stay.

This pilot study has shown that a low-cost telemedicine link is technically feasible and can be of significant benefit for diagnosis, management and education in a developing world setting.

Introduction

Nepal is one of the world's poorest countries and most people live in the mountains without access to basic medical treatment. Patients have to travel long distances to hospitals in the capital, Kathmandu, for treatment. Patan Hospital is a partly mission run hospital in Kathmandu offering general medical, surgical and obstetric care. Specialists in other fields are not available, so patients requiring specialist advice on diagnosis and management have to be referred to other hospitals in Kathmandu, with attendant costs and delays.

It was felt that in selected cases this problem could be overcome through the use of telemedicine to provide expert medical advice from afar. The usefulness and cost effectiveness of telemedicine in developing countries where finances are restricted cannot be assumed, but requires evaluation in pilot projects in each country^{1,2}.

Store and forward telemedicine using e-mail and a digital camera is much less expensive than real-time telemedicine using video-conferencing equipment and ISDN lines. A simple store and forward telemedicine link was therefore established in Patan Hospital in March 2000. This pilot project aimed to explore the technical feasibility and benefit of low cost telemedicine in terms of making a diagnosis and management plan for patients in this developing country.

Materials

A digital camera (Olympus C-1400XL) and Manfrotto tripod. E-mail messages were sent via an Internet service provider World Link Nepal using a COMPAQ presario 1688 laptop computer, 56kbps modem.

The digital camera and tripod were donated by the Swinfen Charitable Trust. The laptop was partly funded by an award for previous telemedicine research and the remainder privately paid for. The e-mail subscription was privately paid for.

Methods

Any patient aged 16 or older attending Patan Hospital who needed specialist medical advice during a 1 year period from March 2000 until February 2001 was included in the study. Permission was requested from each patient before using the telemedicine link.

Each referral was coded according to established protocols³⁻⁴. Patient details, i.e. name, hospital number and address, were not recorded on any e-mail. An e-mail referral detailing the history, examination and questions to be answered was sent to the specialist and copied to coordinators at the Swinfen Charitable Trust. Where needed a digital image was sent along with the e-mail. The main Trust coordinator checked e-mail referrals three times daily. Specialists offering their advice, free of charge, were available in neurology, renal and respiratory medicine, dermatology, radiology and cardiology. Specialists were from the UK, Australia, Bangladesh and the USA. Specialists sent their replies to Patan and copied them to the coordinators.

Speed of specialist reply was recorded. Appropriateness, benefit of the reply for diagnosis, management and education were scored by two independent assessors using a five point scale – very unhelpful, unhelpful, neutral, helpful, very helpful. Whether the advice was acted upon or not was also recorded.

Results

Forty-two telemedicine referrals were sent during the 12 month period. Eight requested advice on general management of certain conditions and 34 were patient specific asking for diagnostic or management advice. On two occasions there was a 10 hour delay in sending referrals due to difficulty connecting to the Internet.

Referral types were 36% respiratory, 21% neurological, 21% dermatological, 14% cardiology, 5% nephrology and 3% radiology. Twenty-eight referrals had digital pictures attached – in 82% of cases only one digital picture was required. Of the pictures sent 45% were chest X-rays, 31% were skin lesions, 10% were electrocardiograms, 10% were computerized tomography scans and 4% were magnetic resonance imaging scans. One digital picture of a chest X-ray was of such poor quality that the specialist was unable to offer any comment.

In three cases the specialist did not reply. In the 39 referrals where replies were received, the average speed of specialist reply was 2 days. The average reply time for each specialty was: radiology and nephrology – 1 day; neurology and cardiology – 2 days; respiratory medicine and dermatology – 3 days.

One specialist reply for dermatology came after 11 days because the specialist was on holiday and due to a problem with his computer the coordinator had not received a copy of the referral. This led to a breakdown in the re-referral process. This re-referral process is used when a telemedicine specialist for any reason does not reply within 3 days. The coordinator would then ask another specialist to offer advice. Interestingly, this patient was also referred to a specialist in Kathmandu at the same time as telemedicine referral, and was seen by him on day 9. Despite a change in treatment advised by the Kathmandu specialist the patient died on day 11 (from immunosuppression and haemorrhagic herpes zoster). The telemedicine specialist made the same diagnosis from the digital photograph as the Kathmandu specialist.

Specialists receiving referrals at their private e-mail addresses replied more quickly on average than specialists with a hospital e-mail address. The assessors judged that all specialist replies were appropriate for a developing world hospital and the restricted tests available there. Seventy-three per cent of replies were helpful, and 27% very helpful, for establishing a diagnosis – 57% were helpful, and 43% very helpful, for making a management plan – 77% were helpful, and 23% very helpful, for education.

From the 34 patient specific referrals, the specialist advised a definite change in diagnosis or management in 23 cases. Where different management was suggested, this was in 58% of patients half as expensive as the management being undertaken in Patan Hospital. For 42% of those for whom more expensive management had been suggested, the cost was approximately a quarter more expensive.

In the referrals where different management was suggested by the specialist the management was not changed in 33% – two were improving on current treatment, for two the antibiotics suggested were not available in Nepal, and one patient had died. The assessors decided that in 50% of cases the advice if acted upon would have shortened hospital stay.

Discussion

There have been significant advances in information and communication technology in the last 10 years. E-mail has enabled high-speed communication between towns and continents. Digital cameras are continuing to reduce in price making a visual dimension to e-mails increasingly accessible to more people. Doctors working in developing countries where medical specialists are most needed but least available could benefit from advice from specialists in other countries via telemedicine. The potential for telemedicine to play a useful role in the developing world has been the focus of attention for several years⁵⁻⁸. A recent evaluation by the Swinfen Charitable Trust has confirmed the benefit of identical low cost telemedicine in a busy spinal injuries centre in Bangladesh⁹. This Trust has now helped establish several such links in the developing world¹⁰.

The benefit of the Patan Hospital link subjectively and as evaluated by the assessors for making a

diagnosis and advising on management is significant. Outpatient and inpatient medical problems can be referred for diagnosis and management. The average speed of telemedicine replies (2 days) compares very favourably with standard (non-telemedicine) outpatient UK referrals.

A breakdown in communication between referring doctor and the specialist is always a possibility if e-mails are not copied to all concerned, if computers malfunction or if replies are lost in the Internet system. Such communication problems occurred in three of the 42 referrals, a rate that was probably acceptable in the context of a busy hospital.

Personally knowing the specialist is an advantage and reassuring to the referring clinician, but is not always feasible.

Telemedicine is a unique means of consultation and in addition it is a powerful educational medium. The educational value goes beyond the information transmitted by the specialist – the doctors involved retain many details of the case and its outcome. Introduction of new therapy like a blood patch for the management of bronchopleural fistula has gone beyond use in a single case – it has been of value for subsequent patients.

Conclusion

This pilot study has shown that a low-cost telemedicine link is technically feasible, it is of great educational value, and it can be of significant benefit for diagnosis and management of medical conditions in Nepal. It can readily be emulated elsewhere in the developing world.

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