

Tele-education in emergency care

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The use of telemedicine is becoming routine and accepted in certain limited areas such as electrocardiogram and radiograph/computed tomographic scan telemetry. Tele-education has thus far had limited applications although in emergency medicine it has been shown to be an effective medium for the education of senior house officers and emergency nurse practitioners in remote or peripheral units. Despite apparent clinical and cost benefits and government support, the full potential of two way video conferencing and tele-presence has yet to be realised by the clinician, educator and manager.

AIM

The purpose of this review is to describe the current use and future potential of tele-education, focusing on the emergency department and pre-hospital care.

Search strategy

Four literature searches were performed. The terms “(telemedicine or telecare) AND emergency” and “tele adj education” were used to search for information added since 2000 into the Medline and Embase databases.

Tele-education

Tele-education can be viewed within the context of the four domains of learning:

- Knowledge
- Skills
- Relationships
- Attitudes

Knowledge

Tele-education already has many successful applications that allow the acquisition of knowledge. Any educational programme that uses “distance correspondence” is an example. Such courses are often supported by web-based learning. This means of education empowers the student and facilitates convenient, flexible, self-directed learning. This allows access to courses that are otherwise impractical or impossible for part-time, geographically distant or disabled students.

In addition, some institutions have disseminated formal grand rounds and lectures using telemedicine.⁹ These may consist of a simple one way audiovisual feed, or be two way video conferences using multiple cameras with additional information supplied beforehand, or transmitted and displayed simultaneously on additional displays (including text, diagrams and radiographs). This allows full interaction between the lecturer and students. Such a system has been used in the Grampian region of Scotland for the induction lectures given to emergency medicine senior house officers (SHOs) at three remote peripheral hospitals.¹⁰ An evaluation of this arrangement confirmed the acquisition of knowledge by demonstrating improved performance in multiple choice questionnaire tests taken before and after the lectures, although “local SHOs” given the same lectures in person performed better in these. Encouragingly high ratings regarding the lectures’ content, relevance and presentation were awarded by both local and remote groups, demonstrating a general acceptance of this means of education. In England, the Central Middlesex

Telemedicine is defined as the practice of medicine when the patient and healthcare professional are separated by distance.¹ The European Commission more broadly described the term to include “the investigation, monitoring and management of patients and the education of patients and staff which allow easy access to expert advice and patient information no matter where the patient or relevant information is located”.²

Telemedicine has a surprisingly long history, paralleling the development of new communication technologies over more than a century. Records exist from 1897 of a telephone being used to diagnose a child with croup,³ and over 100 years later in 1999, Dr Jerri Nielsen, medical officer for an Antarctic expedition, dramatically performed and prepared a biopsy of her own breast tumour.

In modern emergency care there are many examples of telemedicine, including NHS Direct (NHS 24 in Scotland), basic life support advice given to 999 callers, electrocardiogram (ECG) telemetry to hospital in support of paramedic thrombolysis, and tele-radiological transfer of computed tomographic scans for neurosurgical opinion. The most successful applications are often viewed as routine clinical practice rather than telemedicine: a term that in many minds is reserved for video conferencing or unfamiliar applications of doubtful value. In fact, early experience of telemedicine has been successful in the visual specialties, such as pathology and radiology,^{4,5} and in certain telephone-based applications.⁶ However, the moving image has yet to find a convincing niche in emergency care, despite several initiatives that have used video conferencing to support minor injuries units and peripheral emergency facilities.^{7,8}

Telemedicine is generally taken to encompass the linked concepts of tele-medicine, tele-presence, tele-care and tele-education. This article concentrates on tele-education, as applied to emergency care.

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Hospital emergency department describes a similarly successful experience in case, scenario and topic teaching of medical students, emergency nurse practitioners (ENPs) and nurses based at a peripheral minor injuries unit. A "flattening" of the traditional "medical hierarchy" was noted and it was felt that the system was most effective when used in small groups.¹¹

Interestingly, when the Arizona Telemedicine Programme (a long-established continuing medical education programme that has broadcast more than 800 events) studied reasons for non-attendance, the most common response was a preference for attending conferences in person, followed by a preference for courses delivered using CD-ROM. This suggests that tele-education may never replace traditional means of education, and that students will pick and choose a medium that suits them.¹² It may also reflect a preference among older clinicians to acquire knowledge in a traditional manner that is familiar to them. However tele-education increases flexibility by allowing students with different learning styles to review information in a range of formats, and even view a lecture again. Teachers can perform self-evaluation by reviewing the videotape of a lecture they have given. Feedback can be instantaneous and anonymous allowing teachers to improve themselves, though this concept may be threatening to some.

Skills

Can a psychomotor skill be acquired using telemedicine? A particularly imaginative attempt to achieve this is exemplified by "transcatheter cardiovascular therapeutics". These global meetings host up to 10 000 interventional cardiologists with live case demonstrations of new procedures. Multiple screens show the physician in real time, the catheter laboratory, medical images, physiological data, and the instrumentation details, all supported with subtitles. Audience response screens allow a reactive flow of questions to the demonstrator. Hence, the clinician student receives a lesson about a new technique that includes a demonstration, a lecture, countering views of experts and unfiltered assessment of peers and colleagues.¹³

In the context of emergency care, telemedicine can be a valuable educational tool allowing ENPs to develop skills such as radiograph interpretation. Equally important is the observation that the availability of a remote expert opinion is educational, rather than de-skilling.¹⁴ Telemedicine supported nurse-led units have shown a decreased need for tele-consultation over time, suggesting the effective acquisition of skills and knowledge, and more autonomous practice.¹⁵

"Tele-presence" is an expansion of the video conference. It can be defined as the use of communication technology to provide a user with the feeling that they are actually physically present at the other site. It has some anecdotal success stories, particularly in the USA where tertiary centre trauma care is not immediately available in rural areas. As an example, a child involved in a serious car accident was resuscitated by a junior doctor who was able to place a femoral central venous line under the supervision of a trauma surgeon over 100 miles away.¹⁶ Pioneers of this technology hope to reduce the mortality of patients involved in motor vehicle accidents in rural areas, which is currently twice that of urban victims.¹⁷ By comparison, experience in a UK emergency department of similar technology found the necessary equipment (camera headset and microphone, uplink and connections) cumbersome. It was therefore hardly utilised (3% of all telemedicine consultations) in preference to standard video conferencing equipment,¹⁸ and remains very much the province of the enthusiast.

Relationships

In emergency care, telemedicine has the potential to enhance relationships within and between healthcare providers, particularly in relation to ENPs and specialist teams. A video

conference referral has the potential benefit of better communication between correspondents (including recognition of the staff involved), providing additional information and therefore appropriate treatment advice and a greater opportunity for education. In a review of staff attitudes regarding telemedicine at four UK sites, nurse practitioners felt empowered by their medical colleagues and managers to take on extended roles.¹⁴

Attitudes

With the creation of autonomous ENPs working in nurse centred units there is a risk of isolation. The additional visual element of telemedicine may be daunting for some, but also fosters relationships and reduces the feeling of separation. The recent proliferation of pictures transmitted via the mobile phone network may make video conferencing more familiar and acceptable, particularly among students and younger healthcare professionals, who also tend to be more familiar with modern technology. Telemedicine may help to maintain inclusion and the preservation of beneficial attitudes such as motivation and a feeling of team membership.

Practicalities

Centralisation and specialisation of healthcare encourages the development of telemedicine and tele-education. The clinical effectiveness of telemedicine in supporting nursing staff in a peripheral unit has been demonstrated,¹⁹ but the widespread application of this technology has been impeded by process issues such as complex or unreliable equipment and a failure to engage staff.²⁰ Prehospital care, initial consultation and diagnosis, and subsequent referral and transfer can all benefit from specialist advice or supervision, particularly where expensive and/or inappropriate referrals are avoided. However, while tele-radiology and pre-hospital ECG transmission have become standard practice, other projects involving video communication have failed to develop beyond the pilot stage.²¹

Tele-education has been shown to be cheaper than traditional educational programmes, once initial resources and investment are made available. The Arizona Telemedicine Programme calculated a saving of \$1544 (£765, €1130) per year for each health professional involved.²²

Any tele-education network is dependent on the technology involved, and healthcare staff require formal training in the technical aspects of a system, followed by an opportunity to practise. Technical support and maintenance of systems will be vital if confidence is to be acquired and maintained.²³ Training to a standard qualification in telemedicine has been suggested,¹⁴ and the successful adoption of tele-education into routine practice is substantially more likely where there are clear incentives for staff to engage. Initially at least, video conferencing is likely to take more time than a face to face equivalent.¹⁹

Possibilities

A group based at the University of Portsmouth has been compiling records of telemedicine activities in the UK since 1998. Originally known as the UK National Database of Telemedicine (NDTM), it now uses the acronym TEIS-UK (Telemedicine and E-health Information Service). Their objectives are to bring together those working in the field of telemedicine, tele-care and e-health; to encourage them to share information and experience, and to provide an information resource on telemedicine activity in the UK. The information they collect is published on their website (www.teis.nhs.uk), and as of June 2005 they list 257 separate telemedicine activities, compared to 108 in 2001. Twenty-three of these relate specifically to tele-education, spanning fields as diverse as tele-therapy for bulimic disorders and video conferencing to teach laparoscopic and endoscopic techniques to trainee surgeons.

The UK government is seeking to support such new technologies, but many of the applications of telemedicine envisaged in the NHS Plan of 2000 have not yet come to pass.²⁴ While ECG telemetry is now widespread, the suggestion that “ambulances will be equipped with video and monitoring equipment so that victims of accidents can get the most appropriate care while they are being taken to hospital” has not yet been realised. Similarly, a statement that the “consulting room will become the place where appointments are booked, test results received and more diagnosis carried out using video and tele-links to hospital specialists” now seems a little ambitious. Telemedicine has been advanced as a solution to many perceived problems within the health service, including the effective delivery of education, but except for areas where there is genuine geographical isolation, or where the concept has been championed by a local enthusiast, conventional approaches continue to prevail. Nevertheless, the National Programme for IT, established in 2003 with a budget of £2.3 billion (€3.4 billion, US\$4.6 billion), included within its four key developments a National NHS Network: this infrastructure programme aims to provide sufficient connectivity and capacity to support the national applications and local systems that will serve as a very effective conduit for tele-education. Whether this results in a wholesale change in behaviour, however, remains to be seen.

CONCLUSION

Telemedicine and tele-education are already here. The most successful applications have become invisibly embedded in routine practice, but tele-education is not widely utilised in emergency care, except where geographical factors preclude any reasonable alternative. However, the use of modern communication systems to deliver effective education will increase and improve as technologies develop, investment increases and teachers, students and patients alike become more accepting of these new approaches.

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REFERENCES

- 1 Wootton R. Telemedicine: a cautious welcome. *BMJ* 1996;**313**:1375–7.
- 2 European Commission AIM Programme. Framework for European Studies in Telemedicine: a report on health care assessments. AIM Project A-2011. Brussels; European Commission, 1994.
- 3 Maclean JR. Telemedicine and the nurse: the benefit or burden of new technology? *J Telemed Telecare* 1996;**2**(suppl 2):54–6.
- 4 Kayser K, Kayser G. Basic aspects of and recent developments in telepathology in Europe, with specific emphasis on quality assurance. *Analytical & Quantitative Cytology & Histology* 1999;**21**:319–28.
- 5 Hailey D, Roine R, Ohinmaa A. Systematic review of evidence for the benefits of telemedicine. *J Telemed Telecare* 2002;**8**(suppl 1):1–30.
- 6 Car J, Sheikh S. Telephone consultations. *BMJ* 2003;**326**:966–9.
- 7 Bengner JR, Wootton R. Minor injuries telemedicine. *J Telemed Telecare* 1999;**5**(suppl 3):50.
- 8 Brebner EM, Brebner JA, et al. Evaluation of an accident and emergency teleconsultation service for north-east Scotland. *J Telemed Telecare* 2004;**10**:16–20.
- 9 Graham AR. Tele-education in medicine: why and how. *Riv Med Lab – JLM* 2002;**3**(suppl 1):24–6.
- 10 Pedley D, Brebner E, et al. A role for tele-education in the centralization of accident and emergency services. *J Telemed Telecare* 2003;**9**(suppl 1):33–4.
- 11 Tachakra S, Creagh-Brown B. Using telemedicine for distance education. *J Telemed Telecare* 2001;**7**(suppl 1):43–4.
- 12 Krupinski EA, Lopez AM, et al. Continuing education via telemedicine: analysis of reasons for attending or not attending. *J Telemed Telecare* 2004;**10**(N 3):403–8.
- 13 Abele JE. The pros and cons of tele-education. *Semin Int Radiol* 2002;**19**(N 2):147–9.
- 14 Gerrard I, Grant AM, et al. Factors that may influence the implementation of nurse-centred telemedicine services. *J Telemed Telecare* 1999;**5**:231–6.
- 15 Tachakra S, Hollingdale J. Evaluation of telemedical orthopaedic specialty support to a minor accident and treatment service. *J Telemed Telecare* 2001;**7**:27–31.
- 16 Anon. Saving lives is more than ‘virtual’ with teletrauma. *ED Management* February 2005;**18**.
- 17 Latifi R, Peck K, et al. Telepresence and telemedicine in emergency care management. *Establishing telemedicine in developing countries: from inception to implementation*. IOS Press, 2004.
- 18 Armstrong IJ, Haston WS. Medical decision support for remote general practitioners using telemedicine. *J Telemed Telecare* 1997;**3**:27–34.
- 19 Bengner JR, Noble SM, et al. The safety and effectiveness of minor injuries telemedicine. *Emerg Med J* 2004;**21**:438–45.
- 20 Bengner JR. A development and evaluation template for minor injuries telemedicine. *J Telemed Telecare* 2001;**7**:58–60.
- 21 Curry GR, Harrop N. The Lancashire telemedicine ambulance. *J Telemed Telecare* 1998;**4**:231–8.
- 22 Barker G, McNeil KM, et al. Cost effectiveness of delivering continuing medical education via telemedicine. *Telemed J* 2000;**6**:124.
- 23 Nelson Norman J, Alsajir MB. Tele-education – postgraduate education. *Med Principles Pract* 2001;**10**:115–22.
- 24 Department of Health. *The NHS Plan: a plan for investment, a plan for reform*. July 2000; www.dh.gov.uk.