Defence Medical Services telemedicine now: a successful pilot of video consultations and instant messaging support to firm base training

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ABSTRACT

Introduction: Telemedicine was pioneered in the Defence Medical Services (DMS) in 1998, since then the capabilities within the DMS have not advanced in step with advances in technology. We present our findings of a pilot of remote video consultation via Skype for MODNET during an arduous course held in the UK. Method: Combat medical technician sick parades were live streamed via Skype to a Defence Primary Healthcare Medical Centre and medical officer (MO) support was delivered remotely. This process was augmented by the use of Pando for still images of wounds and infection sites in order to enhance decision making and situational awareness. Results: Over a 3-week period, 34 consultations carried out during sick parade required the input from a remote MO, of those 34% required a prescription from an MO. None of the presentations required a face-to-face consultation, and all patients received MO-led care remotely. Conclusion: We have successfully demonstrated that video telemedicine consultations are safe, while simultaneously improving patient care, augmenting the distribution of medical assets and reducing costs.

INTRODUCTION

The first report of telemedicine by the British Military was in 1998 by Ritchie in the *Lancet*.[1] This was followed by a more detailed account by Vassallo *et al*.[2 3] A Role 2 facility in Bosnia transmitted digital images of radiographs, electrocardiograms, wounds and rashes by email to remote medical advisors in the UK via satellite link. At that moment in time, it was simultaneously revolutionary and pioneering within the British Military, and successfully demonstrated that telemedicine improved clinical care and reduced the need for MEDEVAC. From there, Colonel Vassallo went on to provide telemedicine support to a British military expedition advising the team who had a patient with appendicitis during the expedition.[4]

The Defence Medical Services (DMS) provide global healthcare, at reach and often in challenging environments. Given this requirement, coupled with reduced societal tolerance for medical error and increasing attention to supervision of colleagues, it may be found surprising that we have not progressed our telemedicine capability in line with advances in technology since the pioneering trial in 1998.

We present our findings of a pilot of video telemedicine consultation via Skype for MODNET during an arduous selection course held in Sennybridge, UK in January 2020. This pilot was augmented by the use of Pando, an instant messaging application currently under trial by the Army Medical Services. We hope that this trial serves as an early step in a rapid and iterative process of augmenting the telemedicine capability within UK Defence Medical Services.

TRIAL STRUCTURE

The trial used Skype for MODNET to conduct telemedicine video clinics with patients in Sennybridge attending morning and afternoon sick parades. MOs conducted consultations remotely from clinic rooms within the medical centre at Hereford DPHC. Combat medical technicians (CMTs) were observed conducting consultations by MOs remotely via Skype, who provided advice and assistance wherever appropriate. MOs documented their management, including prescription of drugs, on the MOD electronic healthcare record in real-time. CMTs also wrote up their consultation on DMICP using MODNET laptops.

If image quality over Skype was low patients had digital images taken of skin lesions via Pando. These images were assigned to a unique 'Patient Card,' which would then be available to specified users within a 'Selection' Pando team. This enabled all MOs responsible for the patient to have shared situational awareness of clinical problems should they be called on to make management decisions at a later date.

MOs called the duty medic via Skype prior to the start of clinic to test the connection. CMTs obtained consent from patients prior to them entering the consultation room. For those who did not want to take part, CMTs would terminate the call.

MOs used headsets to communicate with patients and CMTs via Skype for MODNET on a MODNET desktop or laptop end user device. CMTs set up a Polycam EagleEye IV USB webcam in the consultation room in order for MOs to view consultations. They also set up a Plantronics Castilo P610M speakerphone. This enabled MOs to listen to the consultations and also communicate simultaneously with CMT and patient. Pando was used via personal smartphone. WiFi was set up in Sennybridge using a D-Link 4G router.

Headsets and speakers plugged straight into laptops and computer terminals and did not require a separate power source. The Polycom EagleEye IV USB camera plugged into MODNET laptops via USB but required a separate mains power supply.

Tempus Pro monitors used during the trial were enabled for Corsium Suite access—this allowed live streaming of observations to a secure web browser that can be accessed remotely.

A breakdown of the equipment used during the trial can be seen in Table 1. The trial did not incur any cost as some equipment is personal issue (headsets) and others were on loan from Project LARA.

The arduous course had sick parades both before and after loaded marches. Morning sick parades were conducted between 0515 and 0545 hours, afternoon sick parades were scheduled for 45 min after loaded marches were completed that day.

TRIAL RESULTS

Over the 3-week period, 34 patient encounters required input from an MO during sick parade. The required amount of MO input during sick parades was minimal and averaged less than one patient per clinic over the course of the 3 weeks.

The most common presentations requiring MO input were dermatological

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Table 1 Summary of equipment used to facilitate video telemedicine consultations

Equipment	Sennybridge (role 1)	Medical centre DPHC
Visual	Polycom EagleEye IV USB Camera*	
Audio	Plantronics Castilo P610M*	
Computer/Laptop	MODNET laptop	MODNET terminal
Monitoring	Tempus Pro	
Connectivity	D-Link 4G router*	Ethernet connection to internet
Mobile phones (for Pando)	Personal phone	Personal phone
Software	Skype for MODNET	Skype for MODNET
	Corsium	Corsium
	Pando	Pando

*Equipment on loan from Project LARA.

(n=11) and lower limb musculoskeletal (MSK) injuries (n=11). This was followed by gastrointestinal (GI) infection (n=4), upper limb MSK (n=3), acute neurological injury (n=2), with back MSK, respiratory and '*other*' all accounting for one consultation each. Only one patient that was seen during sick parade required hospital treatment. The injury was a shin wound that was rapidly reviewed by an MO over Pando, who advised that the patient required assessment and treatment in a hospital setting.

Forty-two per cent (n=13) patient encounters required prescriptions. Four patients were prescribed simple analgaesia (paracetamol and ibuprofen), five patients were prescribed co-codamol, one patient was prescribed buscopan and three patients were prescribed antibiotics. Doctors were also able to avoid unncessary antibiotic prescribing in three cases. Over half of medicines administered during the selection course were prescription-only medicines that would ordinarily require a prescription from a doctor (or independent prescriber).

The decision to recommend a medical withdrawal from the selection course cannot be done without consulting an MO. There were eight medical withdrawals during sick parades over the 3-week period. The reasons for medical withdrawal were GI infection (n=2), lower limb MSK injury (n=3), skin infection (n=1), back injury (n=1) and concussion (n=1).

Connection via a D-Link 4G router was variable and was affected by the local weather. This was augmented with an external 4G antenna to boost the signal, which improved image quality and reduced the minimal lag that was present. There were instances when examining skin infections that clinicians felt that the image quality was not adequate and switched to the use of Pando to view higher quality images.

Several clinics had to be conducted without a webcam facing the MO, and therefore neither patient and CMT being able to see the MO during consultations. The MO was still able to view the patient and CMT. Despite this, video consultations remained acceptable to patients, CMTs and MOs.

DISCUSSION

This trial demonstrated that the DMS is now able to provide video telemedicine consultations that appear, in this limited context, safe, reliable and cost-effective while also being acceptable to clinicians and patients and improving supervision and governance.

Medical support to this arduous course is normally provided by a team of CMTs providing close support on the hills and carrying out sick parades before and after marches in Sennybridge. This has traditionally been supported by MOs providing reach back via telephone for urgent and routine patient issues or travelling to Sennybridge to run clinics. The issues with this way of working is that it often leaves patients and medics waiting for prolonged periods of time for the resolution of non-urgent queries and it is time inefficient for MOs to travel to and from Sennybridge for short clinics. This trial demonstrated that the workload for MOs is sufficiently low enough to justify their absence with appropriate real-time remote supervision that can improve healthcare quality and maximise SP recovery time during an arduous course. In this one example, the organisation saved over £600 in travel costs and 60 hours of travel time by initiating remote supervision while improving the quality of healthcare and governance. A locum CMP costs £500/day and assuming 6 hours of clinical work per day, this equates to an opportunity cost saving in MO time that would have been wasted travelling of £5000 for this activity.

None of the cases that were seen during this trial required an MO to be physically present in order to consult, assess or manage a patient. This is in keeping with previous studies that have looked at the case-load of role 1 establishments. Hawksley *et al*[5] carried out a 6-month prospective case series of all patients presenting to a Regimental Aid Post during a summer tour in Afghanistan. They revealed that 47% of the 1903 episodes of care during this time could be dealt with by a CMT. Furthermore, they found that dermatological presentations were the most common among all. These findings are similar to the results of this pilot. Skin problems are very amenable to remote management if still images and text can be securely transmitted to a remote medical advisor.

A large number of both first and repeat presentations were to review wounds and infections. The role of telemedicine to diagnose dermatological conditions[6–8] and manage wounds[9] has been advocated. This study adds to the growing body of evidence by demonstrating its safe use in the management of acute skin infections in the military population. Access to DMICP Fixed (via MODNET laptop) for recording of consultations, and use of Pando to transmit images of wounds and sites of infection proved to be invaluable in maintaining continuity of care as MOs managing sick parades changed through the course of the pilot. As the use of telemedicine in all its guises grows in the UK, the General Medical Council have set out specific guidance on how it should be used,[10] including specific guidance on the prescription of antibiotics.[11] This included guidance on when a face-to-face consultation may be necessary prior to prescribing antibiotics as well issues around consent and the continuity of care. Prescribing was a large part of the work carried out via telemedicine consultations during this pilot and were carried out in line with this guidance. The technology used as part of this trial was all relatively basic and would not need a large amount of investment to ensure this service was able to endure. The utility of telemedicine in conjunction with smart medical equipment to interpret or perform investigations in the military setting has been well described.[12 13] An emerging example of the feasibility of this technology comes in the form of Project MORPHO, a jHubMed project using point-of-care ultrasound with telemedicine capabilities.[14] Other novel telemedicine technologies under trial include the use of augmented reality tools to deliver training and procedural support remotely.[15] These technologies, in combination with the capability demonstrated through this trial, would significantly improve the ability of medical officers to consult and supervise remotely beyond what has already been achieved. In their editorial, Withnall *et al* discussed the possibility of this technology synchronising with patient medical records, which would be the next step in revolutionising the way healthcare is delivered remotely.

By virtue of the CMT-patient consultation being observed, MOs had the ability to give real-time feedback to CMTs on consultation style, examination technique and management. While the main aim of this project was not to act as an educational experience for CMTs, this was found to be a positive by-product of this pilot. Furthermore, passive learning can also occur through CMTs observing MO-patient consultations in a similar way to undergraduate medical education. Such telementoring is invaluable in developing a practitioner's ability to operate remotely while improving patient outcomes. Indeed, there is ongoing work around other use cases of telementoring such as Talbot *et al* piloting the use of surgical telementoring for leg fasciotomy.[16]

While the focus of this trial was aimed at determining whether treating patients remotely via video on exercise and deployment was feasible, it can also act as a template from which to develop DPHC video consultation in the firm base. As seen during the COVID-19 pandemic in 2020, novel solutions are required to manage our unique patient population abroad, and in the UK during times of extremis. The COVID-19 pandemic accelerated NHS use of video consulting to 98% of practices being video capable (from a baseline of 10%) as at 24 April 2020.[17] This addressed the requirement to protect staff and patients from avoidable risk of infection. Military forces require telemedicine primarily to project expert health services support to the point of need, where the character of conflict makes universal provision of capability within timelines impossible. The challenge now lies in identifying how best to employ video consulting in a way that maximises its benefits to both patients, healthcare providers and the UK Armed Forces. Evidence to date and case study findings show that where online consultations are implemented as part of a comprehensive primary care service, they enhance the experience of care for patients and support general practice in managing time and workloads, improving both access and sustainability.[18] NHS primary care includes contractual requirements that all patients will have the right to video consultation by April 2021.[18]

This pilot demonstrates that a '*hub and spoke*' method of providing health services support care to firm base exercises is possible. This system reduced the requirement to deploy MOs, who are now able to support deployed CMTs in delivering more effective PHC with secure video consultations and text and image-based messaging using a combination of in-service and commercially available off-the-shelf solutions. The potential for this format of medical delivery is more achievable now with an increase in the capability of technology and also with the increase in connectivity around the world. As of 2018, 70% of the population in Africa had 3G coverage and 93% of East Asia and Pacific had 4G coverage.[19] Now, with fewer technical limitations, telemedicine can improve healthcare quality and employ expensive medical resources more effectively, both in the firm base and overseas.

CONCLUSIONS

Video consultations and medical messaging, including clinical image transfer, within DPHC firm base settings are achievable now. We have successfully demonstrated the concepts are safe in this limited setting, improve the quality of care we provide for service personnel, augment the distribution of medical assets and generate efficiencies. The next steps are to deliver these capabilities further within the UK and use them to project clinical expertise to our deployed patients.

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