

# Videobased Emergency Medical Interaction

Medical emergencies are often characterised by time constraints, insufficient information and uncertainty. A videobased system for emergency medical interaction provides high-resolution real-time video of the patient, and the situation can thus be discussed with colleagues in other locations. The system has been in use in Northern Norway Regional Health Authority since 2004. We believe that this form of teamwork ought to be used more widely.

Adequate emergency interventions, quick decision-making and good communication can be of decisive importance when sudden, unexpected illness or serious accidents occur. In 2004 we developed the Videobased Emergency Medical Interaction (VEMI) system as a supplement to ordinary telephone contact (1). The system was developed in collaboration between the Norwegian Centre for Integrated Care and Telemedicine (NST) and the Division of Emergency Medical Services at the University Hospital of North Norway in Tromsø, with a view to the long distances in the region and its scattered health infrastructure.

## What is Videobased Emergency Medical Interaction?

With the aid of the VEMI system, medical emergency teams or individual clinicians in municipal health centres, municipal casualty clinics or local emergency hospitals can consult with colleagues or teams of specialists in larger hospitals when a complicated medical emergency situation occurs. High-resolution video images provide an opportunity for direct visual clinical observation of the patient, while the teams can have a face-to-face discussion despite the long distances involved. Thereby, expanded «virtual medical emergency teams» can be established across institutional boundaries. The VEMI system has been installed in several regional medical centres, emergency medical dispatch centres and emergency hospitals in Northern Norway.

The technical installation includes two-way audio and video with multiple sources of simultaneous images. From the local hospital or municipal casualty clinics («legevakt-sentraler»), images are transmitted from two cameras showing the patient and the surrounding activities. One camera transmits images of the team in the hospital which is being consulted. Those who are being consulted can observe the patient's electronically monitored ECG, pulse rate, blood pressure, oxygen saturation and core temperature in real-time. To simplify work locally, they can also remotely control the camera and the microphones. Furthermore, they can zoom and pan the patient camera and thus undertake a detailed visual examination.

At the University Hospital of North



*From a training session of the VEMI system. The patient (marker) and the treatment team is at the Narvik division of the University Hospital of North Norway (UNN). Video conferencing is established with specialists at the UNN in Tromsø. The picture is taken in the conference room of the Division of Medical Emergency Services at the UNN in Tromsø. The lowermost screen shows real-time monitoring of the patient and the outgoing video of the conference participants in Tromsø. Photo: Mads Gilbert.*

Norway, the VEMI equipment is placed in the conference room of the Division of Medical Emergency Services in Tromsø, close to the the emergency medical dispatch centre. The equipment can thus be used for clinical conferencing while further transport of the patient is being organised and implemented by the dispatch centre.

## Experience from Videobased Emergency Medical Interaction

In our experience, the VEMI system has provided a useful tool to improve communication in several emergency situations. For example, a young doctor was assisted by a neurologist in assessing the treatment of refractory epileptic spasms, and a doctor at a municipal casualty clinic could be joined by various specialists at the University Hospital of North Norway in assessing a patient who had suffered burns with potential airway affection. We believe that

the choice of appropriate transfer and means of transport can thus be made easier, and in some cases emergency transport by ambulance helicopters has been replaced by transport by ambulance vehicles.

Longyearbyen hospital, Spitsbergen, has used the VEMI system since 2005. This hospital has a limited number of doctors and nurses who perform tasks that on the mainland are presumed to be undertaken by specialists. When several seriously injured patients from a single incident are being admitted, the total resources and capacity of the hospital may prove insufficient. The distance to Tromsø, the nearest city, measures 1 200 km by air, and at best, 7–8 hours may pass from the requisition of an ambulance aircraft to the arrival of the patient at the University Hospital of North Norway.

On Friday 5 August 2011, a British group of 13 travellers on a school excursion were

attacked without warning by a 250-kilo polar bear near the Van Post Glacier on Spitsbergen. One person was killed and four were seriously injured. All available health personnel had been summoned when the patients arrived at Longyearbyen Hospital: three doctors (one general surgeon and two orthopaedists), three nurse anaesthetists and three operating theatre nurses. The VEMI system was rapidly set up with contact to the Division of Medical Emergency Services in Tromsø. In the VEMI room in Tromsø, participants included on-duty neurosurgeons, a plastic surgeon, an ENT specialist, a thoracic surgeon, a general surgeon, an anaesthesiologist, an intensive-care specialist, an air ambulance doctor, a medical emergency specialist, a radiologist and representatives of the division and hospital administrations. The latter had joined to assess the scope of the accident and the resource needs for the following hours and days. When the patients later arrived at the University Hospital of North Norway, clear plans for each patient had been established on the basis of the VEMI conference. Since the detailed scope of their injuries and the main clinical problems were already known before the patients arrived on the mainland, excessive resource standby, for example in the operating theatres, could be avoided.

### **An additional value beyond the telephone?**

Previous studies indicate that video conferencing in medical emergency situations has reduced the need for transport of patients (2–4), improved the quality of clinical treatment (5–8) and helped reduce geographical differences in trauma treatment (9). Most studies of video conferencing in medical emergencies have concentrated on minor traumas and less complex conditions for which the treatment team in the resource hospital has had only one specialist available.

In a previous study, we used simulated scenarios involving critically ill and seriously injured patients to investigate qualitative aspects of the VEMI system when interdisciplinary treatment teams at Longyearbyen Hospital collaborate with teams of specialists at the University Hospital of North Norway, Tromsø, Norway (1). In group interviews, the specialists in Tromsø stated that they became more involved in the treatment provided at Longyearbyen Hospital when they could see the patient and follow the development of his or her pulse rate, blood pressure and other vital variables. Most of them felt that the VEMI system helped speed up and improve the establishment of a shared interpretation of the situation, and that this was a more effective form of communication than the traditional contact by telephone. The importance of structuring and guiding

the communication to avoid unnecessary interruptions was also pointed out.

Several studies have shown that video conferencing in medical emergencies helps to establish more confidence and a better shared understanding among the medical emergency personnel (1, 10, 11). This will most likely result in more correct decisions and better treatment of patients in situations where time is of the essence. There is a need for further knowledge on how emergency medical video conferencing can be organised in the best possible manner, on the situations and the types of problems for which this form of communication is appropriate, on whether the distribution of roles and responsibilities is altered, and on clinical effects.

### **A useful tool**

In complex medical emergencies, clinicians and other response personnel should be able to jointly discuss treatment strategies and organisation of the response effort, as is the case in locally co-trained trauma teams and emergency teams in hospitals. In our experience, VEMI enables a rapid and simple establishment of «virtual emergency medical teams» that can assess critically ill and injured patients across large distances. VEMI also appears to be a useful tool for coordination of efforts between hospitals as well as between frontline services and primary hospitals, and for choice and organisation of types of transport and degree of emergency to the next level of the treatment chain.

The typical patient arriving by ambulance in the municipal casualty clinic is an elderly person with multiple medical problems. The Norwegian Coordination reform presumes that the municipalities should assume a larger responsibility for the treatment of these patients. Triage of this group of patients is a difficult task. The challenge consists in ensuring that those who can be provided with appropriate treatment locally are treated in their home municipality, while patients who need specialist treatment are transported onward. In such situations, collaboration with a geriatrician or an internist through VEMI may be useful. The currently ongoing establishment of a nationwide, regionalised trauma system presupposes clear criteria for transfer of trauma patients from local emergency hospitals to regional trauma centres (12). In some cases, such decisions may nevertheless prove difficult and need to be made under critical time constraints. Collaboration between trauma teams in local emergency hospitals and trauma centres through VEMI is likely to improve the shared understanding of the situation, optimise local stabilisation and provide a better basis for decision-making with regard to priorities and choices of inter-hospital transport, accompanying personnel and the degree of emergency.

Experience from the qualitative study of virtual scenarios indicates that VEMI can be used by personnel who have never used this form of communication previously, and that VEMI-based communication functions better after only two or three training sessions (1). In the same way that personnel practise trauma treatment through ATLS and BEST training, regular practice of VEMI is likely to strengthen cooperation across institutional boundaries and geographical distances in difficult medical emergencies where time is a crucial factor. Video conferencing reduces the time before the patient can be examined by a specialist located in another hospital. This may have a positive effect on patient treatment and the priorities involved before, during and after the transport to the next treatment level in the chain of survival.

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The author has completed the ICMJE form and declares no conflicts of interest.

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