Meeting Report

Critical care at the electronic frontier of the 21st century: Report from the 29th Educational and Scientific Symposium of the Society of Critical Care Medicine, Orlando, USA, 11–15 February 2000

David Smith

Current Science Ltd, London, UK

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Introduction

With the arrival of the Internet, cheaper and more powerful computers, hand held communication devices [such as mobile phones and personal digital assistants (PDAs)], and the ever-decreasing time taken for these technologies to enter everyday use, the world has truly entered the 'Information Age'. During the 4 days of the conference, a total of 15 talks, spread over six sessions addressed the problem of integration and optimal utilisation of these technologies by the critical care practitioner.

Telemedicine

The session entitled 'Technology/New Frontiers: Discussions in Telemedicine', attempted to explain the principles and capabilities of telemedicine, assess the possibilities for telemedicine in the intensive care unit (ICU) setting, and gain insight into how it will alter health care practices. Peter Angood (Yale University School of Medicine, New Haven, USA) defined telemedicine as '*the use of electronic and communication technology to provide and support health care, when distance separates the physician from the patient'*. He also asked the question 'does technology advance medicine, or medicine advance technology?' For telemedicine, the answer is probably that technology is driving advances in medical care more than medical care driving technology. Telemedicine can be a part of the clinical consultation, education or administration processes in settings ranging from the urban industrial and particularly rural environments, to nursing homes, correctional institutions and the home. Telemedicine can take many forms, from real time (eg live video and phone) and near real time (eg non-continuous monitoring) to store and forward (eg email). The advantages are the wider sharing and availability of knowledge and resources. The disadvantages are the current cost of telecommunications, software/hardware incompatibility, liability issues and the problem of medical licensing across states and countries. The first two problems are rapidly disappearing; the second two require some considerable thought. The perception is that telemedicine does not really apply to critical care because of its 'hands on' nature, but there are applications.

Todd Dorman described a trial of ICU telemedicine technology at John Hopkins University, Baltimore, USA [1]. The objective was to compare the mortality rate, length of stay (LOS) and cost per patient, of a remotely managed ICU, with standard ICU management. Data were collected from the ICU 6 months prior to the implementation of the remote access systems (control). The remote access system consisted of a mobile robot video camera system, computer scanners (for input of film material) and dial-up bedside monitors, connected to the hospital computer network and from there, to home computers. Stored data were also collected, and could be downloaded when required. The results were remarkable. APACHE III adjusted mortality figures showed a 30% reduction when compared to the control data, LOS was reduced by 30%, and the cost per patient was decreased by 25%, even when the cost of the hardware was included. Both nurses and residents gave very positive feedback, remarking on the value of the system as an educational tool. As a result of the success of this trial, a company [IC•USA (http://www.ic-usa.com])] has been formed to develop and implement the technology required for remote access ICUs.

Ann Thompson (Children's Hospital, Pittsburgh, USA) discussed the use of telemedicine in pediatric ICU transfer evaluations [2]. She noted that pediatric services are very limited outside major medical centers. In Pennsylvania, four counties have no pediatric physician, and for pediatric

ICU = intensive care unit; ISS = international space station; LOS = length of stay; PDA = personal digital assistant.

subspecialties, the majority of counties have no physician. The feasibility study looked at 15 patients admitted to the emergency department and evaluated as if for transport. The patients were evaluated simultaneously by a physically present physician, and a remote physician. The link up between the patient (and parent) was via a two-way high-resolution audio and visual system (allowing both parties to see each other). The two sets of data were then compared. The remote physician was able to detect abnormal findings in 87% of the cases, and normal findings in 93% of the cases. The use of an electronic stethoscope would probably have increased these values. The results indicate that remote assessment is feasible. According to Dr Thompson, for such a system to enter into widespread use, a number of factors must be dealt with. The concept of 'build it and they will come' simply will not work; a champion of this kind of technology is required. Relationships need to be built up between health care providers, and a skilled system administrator is vital. Probably the most important consideration is the need for the system to be easy to use by the doctor.

Management of information

Dr Daniel Sands (Beth Israel Deaconess Medical Center, Boston, USA) neatly illustrated the reality of the technology explosion by noting that, whilst the time taken for 30% of Americans to own a telephone could be measured in decades, the Internet was being used by 30% of Americans within 7 years of its availability. Internet usage in America is now believed to be somewhere around 50%. Dr Sand's talk, entitled 'Clinical use of email with patients: perils and promises' provided an assessment of the use of this technology in patient care. The important properties of email are its asynchronous nature, informality, permanence and lack of richness. Only 5% of physicians are using email to communicate with their patients, with the perceived problems being security, legal liability, inappropriate usage and the lack of demand. Security is probably not a real problem. There are (admittedly clumsy) encryption programs available, but the greatest security is simply the volume of email traffic being transmitted. Aside from a malicious individual deliberately attempt to target a particular physician's email, the biggest threat comes from leaving email available on the computer screen. This is little different from leaving a patient's confidential notes open on a desk for all to read. Legal liability is a more interesting issue. In the US to date, there have been no legal rulings in this area, however Dr Sands argues that email is an excellent tool for defence against medical malpractice suits because, unlike a poorly documented phone call, email is permanent. When considering the demand for such a service, Dr Sands noted that 22 million Americans regularly look for health information via the Internet; just because they haven't asked about email communication, doesn't mean they aren't interested. Dr Sands has a website with advice for those considering the use of email in doctor patient communication [http://ccforum.com/frame.cfm?nextframe=webview2&unique_id=1303].

Gerard Fulda (from the Department of Surgery, Christiana Hospital, Newark, USA) spoke about the use of mobile computing in patient management. In introducing his subject, he asked the audience how many used a PDA; approximately 40% of the audience raised their hands. He then asked how many used their PDAs in clinical applications; two hands were raised. He has undertaken a usage program in his department using the Palm IIIx [Palm Inc (http://www.palm.com/home.html)] PDA. These have run a database called Handbase (which will interface with Microsoft Access), and have been used successfully to collect patient data. There are other applications as well. Hospital protocols and guidelines can be stored, searched and recalled when required. The Principles of Critical Care (Merck) and Harrison's 'Companions' handbooks are available for PDAs. A number of drug databases are available, both free [ePocrates qRx (http://www.ePocrates.com)] and commercial [Lexi-Comp (http://www.lexi.com)]. Handheld computers have only recently been available, doubtless many new applications will become available for critical care practitioners.

Extreme telemedicine: critical care at the final frontier

One of the final sessions was dedicated to the particular problems of critical care in space. Interestingly, it transpires that to date the most serious health problems have been minor burns (during the fire on the Mir space station) and a case of suspected appendicitis; there has never been a serious injury in space. Telemedicine is vital for the success of the international space station (ISS), and for the planned, manned missions to Mars (where hospitalisation will not be remotely practicable). To demonstrate the issues involved in a remote diagnosis of an injury occurring on the ISS, the Society for Critical Care Medicine linked up with NASA for a live telemedicine broadcast from the ISS mock-up at the Kennedy Space Center. Whether by design or by accident, the satellite link (used to clearly demonstrate the issue of time delay) initially behaved somewhat unpredictably, illustrating the need for a clear understanding between the Earth based physician and the orbiting astronauts. The important point to note about long term missions in space, is that whilst there will be a medical officer onboard, s/he will have fairly basic training, and will require considerable guidance from the ground based physician. NASA has spent considerable time developing the technology needed to allow a physician to acquire the necessary information to arrive at a diagnosis. Real time video was used in making a visual assessment of the 'patient' (who had been hit in the chest, whilst outside the space station, by a gas tank travelling at high velocity. When the physician requested a close up of the patient's chest, the medical officer simply switched on

a head mounted high-resolution video camera, and was able to provide the necessary picture. The physician then talked the medical officer through an assessment of the injury, concluding that the impact had caused a rib to puncture the patient's lung, necessitating an immediate emergency evacuation from the space station. Throughout the assessment, the physician had been able to constantly monitor the patient's vital signs. Interestingly, despite the problems in obtaining a high quality picture via the satellite link, the vital sign telemetry was always present.

The future

As cost savings become ever more important, and the technology becomes more reliable, better-integrated and less expensive, telemedicine will assume an increasing role in critical care. It seems strange that the needs of the patient may, at times, be more effectively served, by a physician who is physically disconnected from the patient, and not by the traditional 'hands on' approach.

References

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Author's affiliation: Current Science Ltd, 34–42 Middlesex House, Cleveland Street, London W1P 6LB, UK

Correspondence: David Smith, Current Science Ltd, 34–42 Middlesex House, Cleveland Street, London W1P 6LB, UK