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ARTICLE : REVIEW

Telemedicine: rural health and beyond

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Rural health care: a global problem

In a recent televised open debate program in Nepal, people from Achham, a remote district, complained that a doctor was at service in their district hospital for hardly 6 months in the last 6 years. The Public Service Commission of Nepal, which is responsible for the recruitment of doctors in such governmental hospitals, never gets enough applicants in the first place and the situation gets progressively worse with every further step such as the examination and appointment to the vacant posts at such remote hospitals. The country has seen a significant increase in the number of medical graduates after the 1990 re-establishment of democracy but there is still a lack of doctors in rural hospitals. Is the number of doctors serving in rural areas only a problem of developing countries? No, every country is facing this problem, the difference being only of magnitude. The geographical distribution of doctors is skewed towards urban areas in every country. In India, about 75 percent of modern (allopathic) medical practitioners are concentrated in urban areas¹, which cover 27 percent of the population. New Zealand also has the problem of retaining health care workforce in rural areas despite their enviable environment. The strain on the practitioners who remain threatens to compromise the availability and quality of the services they provide.² Even the United States of America is not free of such problems. Rural America has 20 percent of the nation's population but less than 11 percent of physicians.³ Similar to the scenario elsewhere in the world, the smaller and the more remote the place, the more difficult it is to attract and retain physicians in the USA.⁴

Developed countries like the USA and UK have partially solved the problem by recruiting doctors coming from developing countries in rural areas, but this has cost more to rural health of developing nations. To overcome the disparities in health care of rural people due to geographical barrier, telemedicine has been developed as a new system of health care.

Telemedicine: a promising solution

WHAT IS TELEMEDICINE?

Telemedicine is the delivery of health care services, where distance is a critical factor. Health care professionals use information and communication technologies to exchange information relevant to diagnosis, treatment and prevention of disease and injuries, research and evaluation, and the continuing education of health care providers. This is all in the interest of advancing the health of individuals and their communities.⁵

A BRIEF HISTORY OF TELEMEDICINE

Telemedicine has long been practised in one form or another, but in the real sense the development of telemedicine occurred in NASA's manned space flight program. "Telemedicine is really an outgrowth of the space program", as said Daniel Johnson former president of AMA⁵.

The author's areas of research interest are cardiology and oncogenetics. He also wants to understand and write about global health issues.

During the early stage of manned space program NASA's scientists were concerned about the physiological ill effects of zero gravity on astronauts' vital functions. They developed a telemedical system to monitor vital functions in the astronauts (telemetry). Telemedical capabilities for diagnosis and treatment of medical emergencies, establishment of health maintenance systems and biomedical experimentation developed as the space program needed longer flight time and orbital stations.⁷ Then, being virtually out of the scene for some time, telemedicine resurged in the 1990s because of rapid expansion of information and telecommunication technologies. Telehealth and telemedicine have become the WHO strategy for achieving equal healthcare for all since 1997.⁸

HOW DOES TELEMEDICINE WORK?

Telemedicine basically works using information and communication technologies in various forms and for various purposes. And accordingly are the services it provides.

- **Teleconsultation:** General Practitioner or any trained health care worker in the rural area transfers the patient's data, including images, through the Internet to an expert (consultant) for a second opinion. The expert, based on the information, can make diagnosis and write a prescription for the patient and relay it back to the patient. Through video conferencing, live interaction between the two parties can be organized and the health care worker can elicit the required information and perform examination of the patient as per the need of the expert.

- **Teleradiology:** In a rural area, specialist opinion can be sought from an expert radiologist in a city by transmission and display of digital radiological images. These include x-rays, CT scan and MRI images.

- **Telepathology:** Similar to the concept of teleradiology, here the histopathological diagnosis is made by an expert seeing the digital image of the slide sent via the internet.

- **Telehome nursing:** It is mostly applied to the patients suffering from chronic illness, in place of the traditional home visits. Here the patients are monitored and nursed from distance away while they are at home using electronic devices to measure the clinical parameters and advised via videophone.

- **Telesurgery:** Telesurgery is probably the most amazing development made possible by the modern day technology. Success in this regard came in 2001, when surgeons in New York performed

cholecystectomy of a 68-year-old woman in Strasbourg, France using remote-controlled robots and a high-speed cable video link.⁹ This procedure was expensive as it used especially designed fibre-optic link. To make it cost effective in 2003 surgeons in Canada performed telerobotic assisted antireflux surgery using regular national internet system with a special priority networking connection that allowed information signals to travel along the public information highway, but in a lane blocked off for its private use to avoid traffic jams.¹⁰

- *Telehealth*: Sometimes used interchangeably with telemedicine, telehealth includes a diverse group of health-related activities for distance learning in health care delivery settings for both health professionals and patients. This also encompasses the use of information technology in public health, research and administration of health services. The health care worker in the rural set up can get updated with the recent development in the field of medicine with online resources like journals and research databases. Nowadays, telehealth is also known by the names online health and e-health.

Beyond boundaries

Telemedicine can run beyond national geographical boundaries and bring the concept of a global health care village into reality. People from developing countries can benefit from the clinical expertise in developed countries, and developed countries can get services like teleradiology and telepathology from well accredited doctors in developing countries at a significantly low cost, which is made possible only through the use of the internet. The developed countries can also benefit from the medical expertise in the developing countries. In September 2003, Dr Ashok Sethi, Chief of Interventional Cardiology at Escorts Heart and Research Centre, New Delhi, demonstrated angioplasty procedures live via a satellite link to an annual meeting of heart surgeons in Washington, D.C.¹¹

Telemedicine has created a global debate as to whether it can provide health care to disadvantaged rural people or not. There are, on one side, enthusiasts of telemedicine who envision the potential in telemedicine to put an end to the present disparity in health care service to rural areas, whereas others are of the opinion that it is not perfect solution to the present problem and may even do harm to the development of local resources. The enthusiasts argue that telemedicine helps to redistribute knowledge and expertise to rural areas in a cost effective way. There is evidence that telenursing can be cost effective, electronic referral and teleconsultation can be cheaper, and teleradiology, which is widely used in the USA, is found to be safe and in right circumstances economical.¹²

However, some people think that telemedicine is going to affect the traditional doctor patient relationship and argue that it can impair the clinician's decision-making. There are the issues of maintaining confidentiality, guidelines of practice to ensure safety and standard and legal issues, which are still not perfectly clear in the case of telemedicine. There is fear that the use of teleconsultation through a local clinician on a larger scale may stifle the development of local resources and lead to dependence. The remote consultant may prescribe treatment not knowing what is available, affordable, or acceptable locally.¹³ The establishment cost and maintenance of the service can be a great challenge to run telemedicine in remote rural areas of developing nations where there are either no, or intermittent, power supplies, and phone lines are unreliable.

Richard Wooton, currently the editor of a specialised peer reviewed journal of Telemedicine and Telecare, once expressed concern that commerce might become the driving force behind the spread of telemedicine.¹⁴ Still, many people fear that telemedicine is market driven, with technological push (and associated big commercial interest) being greater determinants in its development than the clinical pull.

CONCLUSION

Telemedicine is unlikely to ever be as good as face to face consultations.¹⁵ However, owing to the constraint of human resource and time, telemedicine helps greatly in delivering health care service to deprived people of rural areas worldwide, and educating the health care professionals and patients in much better way than what has been practiced conventionally.

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FEATURE : CONFERENCE REPORT

The 2005 Annual Scientific Meeting of the Australasian Society of Aerospace Medicine and the 5th Asia Pacific Congress of Aerospace Medicine

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The 2005 Annual Scientific Meeting of the Australasian Society of Aerospace Medicine (ASAM) and the 5th Asia Pacific Congress of Aerospace Medicine convened at the Gold Coast International Hotel in Surfers Paradise, Queensland, Australia from the 15th to the 18th September 2005. It was hosted by the Aviation Medical Society of Australia and New Zealand (AMSANZ; www.amsanz.org.nz), Australasian Society of Aerospace Medicine (ASAM; www.asam.org.au), and the Asia Pacific Federation of Aerospace Medicine Association (APFAMA). Delegates were comprised mainly of doctors, who were Designated Aviation Medical Examiners (DAME), aerospace medicine researchers including a large delegation from the Chinese Society of Aerospace Medicine, members of the aviation industry and representatives from the military.

Aerospace medicine is the medical specialty that is concerned with the interaction between the aviation and space environment and human physiology, psychology and pathology. All medical practitioners need to know something about aerospace medicine because everyone who flies experiences some form of decompression related alteration in physiology. Ninety percent of people who fly get Jet Lag (fatigue), oedema, or microvascular venous failure. The remaining ten percent experience asymptomatic Deep Vein Thrombosis (DVT), symptomatic DVT, Pulmonary Embolism (PE) or, very infrequently, death. In our lifetime, space tourists may present with orthostatic intolerance (hypotension associated with fluid shifts).

Themes of the conference included aviation psychiatry, aeromedical operations and space physiology. Research presented included plans for artificial gravity during interplanetary missions, vestibular-oculomotor deficits experienced by astronauts post-flight (Space Adaptation Syndrome) and the related spatial disorientation during shuttle landings (which result in 70 percent of landings rated as poor including one being near catastrophic), mental stress and cardiovascular variability in student airline pilots, aeromedical evacuation operations in Banda Aceh, and anti-SARS experiences in China.

The impact of fatigue in the aerospace industry was the main focus of the conference. Professor Philippa Gander from Sleep/Wake Research Centre at Massey University and Dr John Caldwell from the US Air Force were the keynote speakers. Fatigue is physiologically induced by increasing the number of continuous hours of wakefulness and sleep loss. Circadian factors are also important and cause the body to perform like an orchestra during the pre-performance tune up. Fatigue is already a significant problem in the aviation workplace given long periods monitoring automated systems and, with respect to aircrew, changes in time zones and the length of flights. Fifty percent of military pilots, 71 percent of corporate pilots, and 80 percent of commercial pilots admitted that they had fallen asleep or nodded off in the cockpit during



Fifty percent of military pilots, 71 % of corporate pilots, and 80 % of commercial pilots admitted that they had fallen asleep or nodded off in the cockpit during flights.

It is therefore not surprising that the 3 - 7 percent of all aviation accidents that are recorded as fatigue-related is considered to be just the tip of the iceberg.

Sixteen hours of continuous wakefulness is required to induce serious behavioural detriments similar to alcohol intoxication. Specifically restricted sleep causes:

- irritability
- degraded alertness
- slower reaction time
- poor psychomotor skills
- slower cognitive processing
- cognitive fixation
- less creative problem-solving
- immune suppression
- increased appetite (for junk-food)