

The assessment of telemedical procedures in countries of transition

Haris Boko

Medical School, University of Zagreb, Croatia

Different applications of the initial idea to overcome time and distance barriers in order to achieve satisfactory level of physical diagnosis and medical prognosis, are expanding so rapidly that telemedicine related procedures have become the utmost growing segment of health related markets. Telemedicine is not only use of telecommunications to assist in the delivery of health care but has significant social role in order to overcome various problems associated to demands of equal and adequate provision of medical services. Successful health policy leads to increased welfare through better health outcomes, greater equity, more consumer satisfaction, and lower total costs than would occur in the absence of public action. Managerial skills, technology assessment know-how and efficient transfer of technology is of fundamental value for better performance of health services, while such skills are in the shortest supply in all developing countries. Practical implementations of certain telemedical procedures are significantly biased by specific level of social development. These applications in countries in transition should be assessed in order to accelerate the process of training, diversify health providers, raise significance of cost-benefit approach, and lead toward more efficient and less expensive health care system, while maintaining potentials to preserve the main virtue of the former health system, namely the widespread coverage of population.

Key words: telemedicine; health planning; health planning technical assistance

Health in transition

Transition to an institutionalized, consolidated democracy requires to set bureaucracy capable of discharging their duties with reasonable efficiency, to provide effectiveness of its laws over a given territory and to orient state institutions towards decisions of the public benefit. The government's responsibility is therefore to ensure that everyone can

exercise fundamental rights, at least to the extent that society can afford. In health by means of constituting essential medical care package that might justifiably be financed by general revenues, sometimes with some contribution from user fees. These should be highly cost-effective services that would greatly improve the health, especially of the poor satisfying the argument that the basic health care is fundamental right. Beyond the well-defined package of essential services, the government's role should be limited to improving the capacity of insurance and

health care markets to provide discretionary care.¹ Higher developmental level will enable more comprehensive set of services above the minimum. However, on the account of gradually lower cost-effectiveness.

Governments mostly build facilities, buy equipment and supplies, hire and train people, set fees or other service conditions, regulate providers and insurers, disseminate information, determine overall policy and maintain surveillance of disease conditions. Most of failures to achieve better health outcomes derive, however, not from the wrong choice of objectives but wrong choice of policy instruments. Particularly from too much reliance on direct provision of care and central control of health facilities and too little use of the financial, informational and regulatory instruments of the government. Governmental task is to allocate resources so as to obtain the most improvement in health taking into account the private market's response to public sector spending. The responsibility is to shift the role from providing care to financing and stimulating competition among providers in order to enable clear distinction between essential and discretionary spending in the most cost-effective way. In the same time, however, to provide information and incentives to improve the allocation of resources by the private sectors.

In transitional countries of Europe governments were responsible for both the finance and delivery of health care while presently, health system is in the deep crisis.² Over employment, over capacitating, leaving of experienced professionals to practice fee-for-service medicine. Dramatic drop in spending is the reason of significant shortages of pharmaceuticals and equipment. The main strategic presumption of the public policy should be the necessity to preserve the main virtue of the previous system: widespread coverage of the population. Potentially, the most important force is decentralization of health services. That might be successful only if

local agencies have sound financial resources, administrative capacity and responsibility toward local population, while clinical and managerial skills of health professionals need to be substantially upgraded.

Technology assessment

One of the main developmental tendencies is that biomedical spending made of health the dominant financial sector. World health spending exceeded total of \$1700 billion and equals roughly to 8% of total World Gross National Product. Nearly 60% of the sum (\$1000 billion) is government spending. Established market economies (22 countries with population of 800 million, or 15% of World total) spend \$1500 billion, or almost 90% of World total.³ The industry is flourishing while technologies are becoming increasingly sophisticated. Within the last few decades amount of physicians has increased by five times worldwide, while hospital beds increased by four times.

To reduce both capital and recurrent costs without deteriorating the quality of care, governments should reallocate public policy spending toward the equipment that provide essential services, improve efficiency by rearranging the clinical protocols, and ensure control of specialized equipment. WHO estimates that the half of all the medical equipment in developing countries is not utilizable, due to lack of undertaken technology assessment procedures. Information on costs does promote allocate efficiency and therefore the most justified public measure will combine a strong rationale for public action with a cost-effective health interventions. Cost-effectiveness analysis requires data on expenditures and on health outcomes that are seldom quantified, and takes considerable time and efforts for public systems in developing countries to learn how to gather and use it.

The transition should facilitate involvement by the private sector by means of encouraging private finance and provision of insurance (with incentives to contain costs) for all discretionary clinical services, and delivery of services by the private sector, including those publicly financed. Governmental instruments should improve managerial skills of public service, ensure the delivery of the essential package and reduce expenditures for discretionary services.

According to the World Bank survey,⁴ the principal factor affecting health policy changes in transitional countries of Europe is to improve the management of public health services. The belief is that promising professionals should demonstrate not only the excellence in managerial skills, but also to possess analytical capabilities, political sensibility and ethical sensitivity. Consequently, transfer of technology and managerial know-how is becoming critical. The appropriate planning in health and well-trained management is therefore of fundamental value for better performance of health services, while such skills are in the shortest supply in all developing countries.

In its strategy for the forthcoming century, World Health Organization demands that "all member states should have established formal mechanism for the systematic assessment of the appropriate use of health technologies and of their effectiveness, efficiency, safety and acceptability, as well as reflecting national health policies and economic restraints". Technology does not refer solely to the instrumentation and people operating it,⁵ and accordingly, The Office of Technology Assessment of the US Congress defines medical technology as "drugs, devices and medical and surgical procedures used in medical care and the organizational and supporting system within which such care is provided".

Telemedicine

The task of telemedicine is to overcome time and distance barriers in order to focus on physical diagnosis and prognosis. It is most commonly defined as "instrumentation, monitoring and management of patients and the education of patients and staff using systems which allow ready access to expert advice and patient information no matter where the patient or relevant information is located".⁶ Telemedicine is not only use of telecommunications to assist in the delivery of health care but has significant social role in order to overcome various problems associated to demands of equal and adequate provision of medical services and health care. That include funds, expertise and resources which relate to the lack of facilities and systems due to the need to reduce the costs of health professionals and to ensure satisfactory level of health care in rural and remote areas.

Besides activities in improving health care, significant interest in telemedicine are of telecom operators since they can generate additional traffic over existing networks, have opportunities to extend telecom networks and of equipment providers that can achieve new sources of revenues. These advantages made of telemedicine related procedures the most rapidly growing segment of health related markets.

In undeveloped countries there is an urgent need in low-cost solutions in delivery of health services and access to appropriate expertise, especially in emergencies.

Factors to consider implementation of telemedicine are primarily to identify the types of medical services where telemedicine could be useful. To ensure efficient application, the available telecom infrastructure should be investigated, the diversity of engaged players has to be achieved, telemedical needs identified and the cost-benefit analysis evaluated.

Since the very beginning of telemedicine, in 1967 at Boston Airport, when collected X-rays were illuminated by ordinary light box, scanned by black and white television and transferred to video monitor at radiology department of Massachusetts General hospital, teleradiology is the leading telemedical application with approximately 70% of sales in telemedicine. It is defined as "the electronic transmission of images of the patients' anatomy and/or pathology from one location to another for interpretation or consultation".

Typical teleradiology equipment includes digital radiographic unit, software expenses and telecommunication lines.⁷ Digital radiographic unit employs X-ray detector of up to 41x41 cm in size and pixel pitch of less than 0.1mm with 16 bits of dynamic range (contrast). Photolithographic techniques are employed to create photodiodes using rectangular glass-panel substrate with successive thin-film layers of silicon, metals and insulators. Over the photodiode array is applied scintillation material (cesium iodide) which converts X-ray photons to visible light while amorphous silicon converts the light into electricity.⁸ Besides telemedical application substantial benefit of digital radiography is electronic storage when no darkroom, chemicals or hazardous waste to dispose is necessary. Such system allows computer-aided diagnosis and fewer numbers of retakes with wider dynamic range of images.

The predominant software standard is DICOM (digital imaging and communications in medicine) that was set up to define network interface and data model for imaging devices that can facilitate information systems integration. Contemporary version is DICOM 3.0 that employs V42bis error correction and compression protocol, blitz string encoding algorithm and MPEG (motion picture expert group) and JPEG (joint photograph expert group) standards for moving and still image compression.

Main fields of applications besides radiology is surgery, dentistry, ophthalmology, home health care, rehabilitation, psychiatry, nursing and dermatology. Two basic techniques are employed: IATV (interactive live tele-video remote transmission of images across computer/television lines in which participants can interact through visual imaging information) and S&F (store and forward imaging that provides the ability to store and transmit diagnostic images to remote locations for interpretation).

Main obstacles of contemporary telemedical applications consist of usual hesitation to application of new technology and doubt of insurance providers to cover risks of remote consultation. Controversial are the issues of unauthorized access to confidential personal medical records and physicians licensing and the lack of generally accepted standard and compatible hardware on both ends of telecommunication link that can deter cost-effective implementation. General shift from rural to managed care is an obvious tendency.

Telemedicine in countries of transition

Telemedical applications in countries of transition are confronted with different problems than in both highly industrialized societies and in undeveloped countries. These countries might become biggest beneficiaries of the new technology since these health systems are not characterized with insufficient access to health services, with expenses confronted with vast rural distances or absence of medical facilities and telecom infrastructure. On the other side, provision of telemedical services is less for-profit influenced and controversial legal issues are still no significant obstacle in larger implementation of the new technology. The cost-benefit approach show great potentials since for the relatively low-cost additional specialized equipment used on existent telecom network, medical

professionals can be in touch with high-tech medical techniques and managerial skills. A great potential for on-line training and emergency advisory instructions is obvious. Internal health structure is characterized by significant difference in quality and quantity of health services between central and provincial regions.⁹ Telemedicine can improve socially unacceptable health related disadvantages of regional-level health provision as well as assist in solving the problem of over employment in central regions on the account of underemployment of skilled health professional in provinces. It can be a powerful tool in assembling of medical record simultaneously editable by multiple physicians enabling interface linking multiple distributed data repositories while maintaining full data integrity.¹⁰ Stronger implementation of telemedical services will allow better regulatory mechanism rather than state provision of health care. It allows potentials that the main advantage of the former health system, namely widespread coverage of population be maintained and essential package of health services be provided in its whole on every location and by well-trained professionals. Telemedical applications will improve the number of skilled professionals and accelerate the process of training, diversify health providers, raise significance of cost-benefit approach, and lead toward more efficient and less expensive health care system.

References

1. Borenzstein E, Kumar MS. Proposals for privatization in Eastern Europe. *International Monetary Fund Papers* 1991; **38**: 300-26.
2. Berg A. Measurement and mismeasurement of economic activity during transition to the market. In M. Blejer (ed): *Eastern Europe in Transition: From Recession to Growth?*, World Bank Papers. 1993; **196**: 39-63.
3. International Monetary Fund. *World Economic Outlook*. Washington, 1996, 118-64.
4. Berg A, Sachs J. Structural adjustment and international trade in Eastern Europe. *Economic Policy* 1992; **14**: 117-73.
5. Battista RN, Hodge MJ. The development of health care technology assessment. *International Journal of Technology Assessment in Health Care* 1995; **11**: 287-300.
6. Field MJ. *Telemedicine - A guide to assessing telecommunications in health care*. New York: National Academy Press, 1996.
7. Williams OL, Singh SK. Managerial guidelines for implementing teleradiology systems. *Administrative Radiology Journal* 1997; **16**: 47-52.
8. Furslund DW, Cook JL. The importance of Java and CORBA in medicine. In D.R. Masys (ed): *Proceedings of the 1997 American Medical Informatics Association Annual Fall Symposium*. Hanley & Belfus 1997, 364-8.
9. Sideman S, BenDak JD. Assessing medical technology in less-developed countries. *International Journal of Technology Assessment in Health Care* 1997; **13**: 463-72.
10. Williams OL, Singh S. Teleradiology: Opportunities, problems, implementation. *Radiology Management* 1996; **18**: 33.