Developing Sustainable Telemedicine Services: a case study from Nepal

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Abstract. Establishing sustainable telemedicine services in developing countries is a challenging task due to socio-technical and economical barriers. Therefore, implementing an advanced technology all at once is usually difficult to sustain after pilot studies. In this paper we argue that successful telemedicine services depend on proper use of existing infrastructure as well as gradual and consistent implementation of new technology where users' perspectives are taken into account.

Introduction

The use of telemedicine may improve accessibility to health services and is considered as a prominent tool to improve health conditions in rural areas of developing countries (Wootton, 2008). Typical telemedicine services in developed countries include real-time videoconferencing, teleradiology, telesurgery and other advanced telemedicine technologies. These services and technologies have proven to be difficult to use in developing countries due to high installation cost, poor infrastructure and lack of computer skills among staff (Martinez et al., 2005). Despite funding from external sources for several pilot studies, the services fail to scale-up after the funding has dried up (Wright, 1999).

This paper addresses these challenges empirically by drawing on a case study from Nepal, where majority of people are living in rural areas. Due to limited health manpower, there is less chances of doctors being available around the clock in rural health centers which delays access to health care facility and increases the

cost of treatment. Telemedicine has become a need in rural areas of a country like Nepal, where poor infrastructures limit access to health facilities.

This is a qualitative case study based on interpretive research approach (Walsham, 2006; Klein & Myers, 1999). Data were collected through 10 semi-structured in-depth interviews, observations and informal discussions during July-September 2010. The study was conducted at Dhulikhel Hospital, the University Hospital of Kathmandu University which is located about 30 km Northeast of Kathmandu, the capital of Nepal. Apart from the therapeutic and diagnostic services, the hospital provides different community-based outreach services in rural areas. Currently, the hospital is running 14 outreach centers in different rural areas of Nepal.

Telemedicine development at Dhulikhel Hospital

In 2002, the hospital initiated a wireless walkie-talkie radio based communication, to provide quality health services for patients in rural areas. The setup was installed in two outreach centers and two radio setups were available in the hospital, one in guard's room and another in the Director's office. Paramedics at either one of these outreach centers used to seek help from the hospital during emergency situations or confusions. The message was first received at the guard's room and the responsible doctor was informed immediately. Accordingly, the doctor advised treatment or referral via radio placed in the Director's room. The obligation for doctors to go to the place where radio was located made this process bit time consuming. The recurrent technical problems halted the service in 2005. Lightning caused frequent problems in the repeater stations. Hiring technician from abroad and importing defected parts resulted in a huge maintenance cost. Also, communication via wireless radios for public use was prohibited at that time relating to the nation's political situation.

However, the process did not stop. Instead it was practiced through Global System for Mobile Communications (GSM) based mobile phone. Almost all the outreach staffs and doctors at the hospital had access to private mobile phones. The paramedics used to call the respective doctor directly for advice. To ease this communication method, Code Division Multiple Access (CDMA) phones were made available at all the outreach centers and special hotline mobile numbers were distributed at all the departments in the hospital in 2008. The motivation behind using CDMA phones was its better network coverage as compared to GSM service in rural areas of Nepal. With CDMA phones, paramedics would first call a hotline number instead of direct private number. The on-call doctor would then attend the call and advise accordingly. If the doctor on-call is busy then the paramedics are free to call other doctors of the department in their private mobile phones. Other than teleconsultation, the hospital also planned to initiate email based store and forward consultation for dermatology cases with internet

connection from CDMA phone. To fulfill the purpose, a Pentium 4 desktop computer and a digital camera were provided to outreach centers. However, this method was not practiced in all the outreach centers since internet connections were available in few centers only.

Several cases related to dermatology, gynecology, and emergency department have been successfully managed through this telemedicine service. Some of them were managed at outreach centers, whereas some required transfer to the hospital for further management. It had not only saved lives but also reduced recovery time and cost of treatment. In absence of teleconsultation, the situation might have been different. The patients would have to visit hospital without preliminary management resulting in further complications or death on their way. A paramedic said:

> When there was no teleconsultation, I had to give medicines haphazardly as per my knowledge. But after the telephone consultation started, case management became easier and successful. I could do the right thing at right time and prevent polypharmacy.

The use of user friendly technology is one of the reasons behind successful teleconsultation but still not enough for consultation in medical field. Developing sustainable relationship between the users is as important as the technology. A doctor quoted:

> The physical link [technology] needs to be reliable, but we need to have human relationship also. It is necessary to know 'where the person fits in the system', 'what grade they are', 'what experience they have' and 'in what situation they are working'.

Paramedics are the only trusted health person at the outreach centers. They summarize patient's condition to the doctor within few minutes over phone and treatment is done as suggested. Hence, while briefing over phone the doctor should feel that he is at the site to treat the patient as in face-to-face contact. The doctor should know the level of knowledge and to what extent the paramedic can follow. If this relationship is absent, then the technology alone cannot lead to successful consultation, which is one of the most important findings from this study. With reference to this, a doctor quoted:

> Even telephone conversations can save life, there needs to be good communication. I could consult well because the paramedics knew me and I knew them and their capacity to handle cases. I am aware of the drugs available there as well as how far they can follow me. So I could guide precisely as if I was there.

This understanding between each other and the settings was possible because of interaction and cooperation during the doctors' frequent visit to outreach centers and training programs for paramedics at the hospital. Also, paramedics gained knowledge through teleconsultation thereby motivating them to utilize the service frequently. One of the paramedics quoted:

> Telephone consultation is not only for patients' health management. It has also enhanced my knowledge and can be taken as means of educating paramedics at rural health centers.

Slow and consistence progress in the telemedicine services has been the agenda for the hospital to sustain the service. The respondents preferred to utilize

the current telemedicine resources to the fullest, so that they could be perfect in using basic technology which will help them to adjust with any changes occurring in future. A doctor stated:

> In context to Nepal, people cannot adjust easily with technology. We have to plan stepwise, because if the users don't know about telephone consultation and basic software, they cannot perform well with live communication and advance software.

Discussion and conclusion

Telemedicine at Dhulikhel Hospital has evolved slowly and continuously with the available technologies (Wootton, 2008). It has appeared as an infrastructure developing upon an installed base, i.e. previous ways of coping with similar conditions and introduction of technology as a solution (Bowker & Star, 1999; Hanseth & Monteiro, 1998). Furthermore, the service is not only limited to a specific person or purpose. It covers wide range of medical specialists and supports the doctors, paramedics and patients for diagnosis, treatment and education purposes. However, the acceptance of technology depends on the interest of the paramedics to consult the doctors; and also the doctors' interest to respond to their queries. This study indicates that failures might occur while developing an infrastructure, but trust between the users and strategic movement for system implementation is necessary to meet the goal. We noted that basic requirements such as training, building relationship and understanding between users which are normally omitted during implementation phase are important to sustain a telemedicine program.

References

Bowker, G. C. and Star, S. L. (1999): *Sorting things out: classification and its consequences*, The MIT Press, Cambridge, Massachusetts.

Hanseth, O. and Monteiro, E. (1998): '*Defining Information Infrastructures.' Understanding Information Infrastructures,* pp. 37-54.

Klein, H. and Myers, M. (1999): 'A set of principles for conducting and evaluating interpretive field studies in information systems', *MIS Quaterly*, vol. 23, no. 1, March 1999, pp. 67-94.

Martinez, A., Villarroel, V., Seoane, J. and del Pozo, F. (2005): 'Analysis of information and communication needs in rural primary health care in developing countries', *IEEE Transactions on Information Technology in Biomedicine*, vol. 9, no. 1, March 2005, pp. 66-72.

Walsham, G. (2006): 'Doing Interpretive Research', *European Journal of Information Systems*, vol. 15, 3 August 2006, pp. 320-330.

Wootton, R. (2008): 'Telemedicine support for the developing world', *Journal of Telemedicine and Telecare*, vol. 14, no. 3, April 2008, pp. 109-114.

Wright, D. (1999): 'The sustainability of telemedicine projects', *Journal of Telemedicine and Telecare*, vol. 5, no. Suppl 1, 15 March 1999, pp. 107-111.