A Participatory Action Research approach to telemedicine supported health care delivery in rural Nepal

Tshering Lama

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ABSTRACT

Rural and geographically isolated, the majority of Nepalese communities have very low incomes, poor transportation, and scarce health care resources; these people provide the context for this study. The consequences of these deprivations include high maternal and infant mortality rates, high prevalence of infectious disease and poverty. There are therefore exceptional challenges and disparities in meeting health care needs. However the recent advent of modern information communication technology (ICT) or Telemedicine has unleashed a new wave of opportunities for supporting the delivery of health care services.

Despite suggestions that telemedicine will offer hope in developing countries there is only limited published evidence to support this claim. Telemedicine is and must remain a process of the delivery of care rather than a technology. The system must connect patients and healthcare professionals in a chain of care, rather than follow the wide array of existing or new and advanced technology.

The successful introduction of telemedicine with tangible outputs requires an in-depth understanding of the existing health care system of the country and its challenges; strongly expressed 'genuine need' for the service by all the stakeholders as interested partners (patients, practitioners, health care service providers and the public); the actual status of ICT infrastructure in the country and costs. This study used a Participatory Action Research (PAR) approach to explore the feasibility, acceptability and impact of a telemedicine system in partnership with Dhulikhel Hospital: Kathmandu University Hospital and with three of its 12 rural, remote outreach centres, and the populations they serve. Participatory, repeated data collection methods included surveys, interviewing, listening and being with staff and communities over a two year period. The researcher and researched engaged in a complex inter-locking journey from which the Unlocking, Unblocking and Validation concepts emerged.

The findings of this study emphasise the pivotal role that the rural health care workers play. Telemedicine not only has a place in improving access to healthcare through enhanced communication but it also empowers health care workers. These people need continued support to develop their competencies and boost their confidence within the changing health care environment.

In conclusion telemedicine is primarily about people rather than technology. Effective and holistic telemedicine development is built upon a combined, interactive model involving access, communication and empowerment.

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Declaration

I declare that the work contained in this thesis has not been submitted for any other award and that it is all my own work. I also confirm that this work fully acknowledges opinions, ideas and contributions from the work of others.

Ethical clearance for the research presented in this thesis has been approved. Approval has been sought and granted by the School Ethics Committee on 17th February 2008.

Name:

Signature:

Date:

1 Introduction

This project represents an inextricably linked journey between researcher, researched and research findings. Separation of each element is necessary in the telling of the story. However, the component parts are interdependent each constantly informing and being informed by the others. The setting for the study is rural Nepal. The researcher is a Nepalese, who grew up in a remote mountain village. After 6 years of studying academic public health at home and abroad the idea for the research emerged. The thesis presents an account of the introduction of a formal telemedicine system involving Dhulikhel Hospital and 3 remote health centres. The researcher played a key part in its conception and introduction as well as being passionately committed to improving health and wellbeing of his own people.

This thesis is about a Participatory Action Research (PAR) approach to telemedicine supported health care delivery in rural Nepal. This study was undertaken in a partnership with Dhulikhel Hospital, a local hospital in Nepal and its three rural outreach health centres in order to explore acceptance and use of telemedicine within their existing health care.

Rural health care in Nepal is in crisis (if it even exists) and hence one can argue that for the majority all health care is in crisis. The rural nature of most communities, with geographic isolation, low income, poor transportation, and scarce health care resources, the consequences of which include high maternal and infant mortality rate, high prevalence of infectious disease and poverty, mean that there are exceptional challenges and disparities in meeting health care needs. However the recent advent of modern information communication technology (ICT) or Telemedicine has unleashed a new wave of opportunities for supporting the delivery of health care services.

Despite suggestions that telemedicine will offer hope in developing countries there is only limited published evidence to support this claim and on the other hand telemedicine is and must remain a process of delivery of care rather than a technology (Wootton 2001). The system connects and supports patients and healthcare professionals in a chain of care rather than following the wide array of existing or new and advanced technology in communication which are being created to meet the needs of delivering healthcare.

The successful introduction of telemedicine with tangible outputs requires an indepth understanding of the existing health care system of the country and its challenges; strongly expressed 'genuine need' for the service by the all the stakeholders as interested partners (patients, practitioners, health care service providers and the public); the actual status of Informational Communication Technology (ICT) infrastructure in the country and costs. Rigorous research needs to be carried out with an appropriate methodology before implementing new systems to ensure the sustainability of the development. In response to these demands and challenges, this thesis presents a participatory action research approach to explore the feasibility, acceptability and impact of a "Telemedicine" system in partnership with Dhulikhel Hospital: Kathmandu University Hospital and with 3 of its 12 rural and remote outreach centres, and the population they serve.

Below an outline and brief description of the chapters is presented to give the reader an overview of the structure of the thesis.

1.1 Outline of Chapters

Chapter One presents an introduction to the thesis and the researcher, researched and the research methodology used and the interdependent nature of the researcher, participants and the findings in this project. This chapter further presents the outline of the thesis and the brief descriptions of the chapters that evolved within this thesis.

Chapter two presents an introduction and draws attention to the global problem in health care delivery and its challenges. It further highlights how the major global stakeholders in healthcare have taken on board the latest developments in ICT to address the global challenges in delivering health care to the most needy and vulnerable groups. Effective partnerships with other non- health bodies in addressing those needs are introduced. This chapter ends by introducing the aims and objectives of the study.

Chapter Three provides a review on the past and current literature on Telemedicine in the world. This chapter attempts to define terms around telemedicine followed by a brief history of telemedicine, the birth of modern telemedicine, its uses and finally a critical analysis of evidence of telemedicine in the context of developing countries like Nepal.

Chapter Four contains an overview of Nepal, focusing on rural and remote part of the country. The chapter addresses Nepali society with its diverse and complex nature and challenges; conflicts and their impact, Nepal political and economic situation of the country and finally the chapter presents the wider prospects of health care systems of Nepal. These include different networks of health care delivery: the role of government, Private Sector and not-for-profit Health service providers in Nepal. The chapter also explores Nepal's strategic planning and its challenges towards meeting the Millennium Development Goals by 2015 and raises the gap between rural and urban health care challenges. The chapter concludes by highlighting the key issues of Telecommunication infrastructure in rural areas.

Chapter Five provides a reflective account of the researcher's own journey in this PhD and his field-work experiences in Nepal, where he was born and returned after seven years study in the UK. The chapter highlights the role of the researcher who presents as a *halfie* researcher and his role as a catalyst in the study unfolds as he faces the conveniences and challenges of being an insider researcher. "About Me" is a personal account therefore the researcher in context is written in the first person.

Chapter Six provides the philosophical and personal justification of using Participatory Action Research (PAR) methodology and methods in exploring the feasibility of telemedicine in this research. The chapter introduces research participants and research sites (Dhulikhel Hospital and its outreach centres) followed by data collection, data analysis and ethical issues in this research. The chapter further provides the developmental nature of the research and how the research journey is embraced within the emerged themes of *unlocking, unblocking and validation*. The chapter concludes with the introduction to the next three chapters which present the findings related to the research topics under the phases *Developing phase* Chapter Seven), *Maturing phase* (Chapter Eight) *and Early Sustaining phase* Chapter Nine).

Chapter Seven presents the findings of the *Developing Phase* of Participatory Action research. The data presented in this *developing* phase are the result of the questionnaire survey and semi-structured interviews. The chapter presents stories and experiences of "being health workers in the remote areas" of all the participants and their views on how telemedicine could mitigate against some of the barriers of being in the remote rural areas. The chapter brings into light how important it is to deal with non-telemedicine related challenges before implementing telemedicine. Due to the approach in this research (PAR), the chapter concludes with a formulation of the action plan for the *Maturing* Phase this research.

Chapter Eight presents the *Maturing Phase,* of the findings and an ongoing process from the *developing phase* of the PAR project and is particularly focused on actions that are taken to implement Telemedicine in rural Nepal. These actions are telemedicine related actions, identified in the *Developing Phase*. The chapter presents the account of the actions as they were taken and further explores outcomes. The chapter concludes with an introduction of three broad themes that emerged from the *Maturing Phase:* access, communication and empowerment which are linked together by two positive reinforcement cycles.

Chapter Nine presents the *Early sustaining phase* of the findings. This chapter provides case examples as an early indication of the sustainability of telemedicine. The case examples presented in this chapter are divided into two categories a) Telemedicine cases dealt within the outreach centre b) Telemedicine cases referred to the hospital after primary management. The chapter concludes with consideration of the views of the partners whose enthusiasm and dedication was vital to the implementation and continuation of telemedicine.

Chapter Ten draws together the thesis into a *Discussion* and leading to the final conclusion. The chapter begins with revisiting aims and objectives of this research and conceptualizes on how PAR gave rise to *the developing, the maturing and the early sustaining* phases. The concepts of Unlocking, Unblocking and Validation emerged through the data analysis and are used as the key explanatory concepts. The complex

inter-locking journey of the researcher and the researched is explored using these concepts.

These phases and analytical concepts give rise to the development of the conceptual model of telemedicine. This chapter highlights interaction between access, communication and empowerment which are crucial for telemedicine to be understood. Telemedicine is primarily about people rather than technology. Effective and holistic telemedicine development is built upon a combined, interactive model involving access, communication and empowerment

Postscript:

The developments continued beyond the end of the project and the postscript briefly describes on-going actions that are taking place further illustrating the power of PAR in developing telemedicine.

2 Background to the research topic

Health has been emphasized as central to sustainable human development and must be on the key agendas of government policy around the world. The World Health Organisation (WHO) (1948) defines health as:

"a state of complete physical, mental, and social wellbeing and not merely the absence of disease or infirmity. The enjoyment of the highest attainable standard of health is one of the fundamental human rights of every human being without distinction of race, religion, and political belief, economic or social condition".

WHO, 1987

In 1977, the World Health Assembly adopted the goal of "Health for All". Subsequently, the declaration made at the international conference on Primary Health Care (PHC) held in Alma Ata in 1978 endorsed the goal of "Health for All by the year 2000" and clearly stated that primary health care is the key to attaining it. Access to basic health care services was affirmed as a fundamental human right by this declaration.

"*The Conference strongly reaffirms that health... is a fundamental human right and that attainment of the highest possible level of health is a most important world-wide social goal whose realization requires the action of many other social and economic sectors in addition to the health sector. (...) the existing gross inequality in the health status of the people, particularly between developed and developing countries as well as within countries, is politically, socially and economically unacceptable and is, therefore, of common concern to all"*

Alma Ata Declaration, 1978 in WHO, 1987

National governments throughout the world adopted PHC as their official blueprint for total population coverage with essential PHC services. But, the reality is that now 33 years later, many people in developing countries especially those living in rural and remote areas where most of the world's populations inhabit still do not have equitable access to even basic services (Strasser 2003). The evidence shows that whilst health is a Human Right - without access to services it remains an unobtainable goal rather than a reality for many countries (Walley *et al*. 2008).

Realizing the “Health for All” vision will be difficult, perhaps impossible, because of the burden imposed on a growing world population by old and new diseases, rising expectation of health, and the socioeconomic conditions that have, if anything increased disparities in health status between and within countries. In many places the gap is widening. The factors involved are broadly described as ‘social determinants’. In recent years, threats to the environment and human security are increasingly being recognized as challenges to human health that need to be urgently addressed. However in many countries, for example Nepal, PHC does not consider the social determinants of health, intersectoral collaboration or community participation.

Despite failure to address the broader determinants of Health by PHC, Dr Margaret Chan – as Director General of WHO highlights the critical link between PHC and universal access to health care:

“*Decades of experience tells us that PHC is the best route to universal access, the best way to ensure sustainable improvements in health outcomes, and the best guarantee that access to care will be fair.”*

Global Forum for Health Research 2008

The importance of access to good quality primary health services and their crucial role for the improvement of health outcomes was targeted by the Millennium Development Goals (MDGs Figure 1) adopted by the International community in 2000 who agreed to achieve them by the year 2015 (UNDP 2009). Three out of Eight MDGs (Goal 4, 5 and 6) are directly health–related (Figure 2.1). The other remaining five also include health-related targets and reflect many of the social, economic, environmental and gender related determinant that have an impact on people’s health (WHO 2005). Therefore, health has been the central to the global agenda of reducing poverty as well as an important measure of overall human development. These goals cannot be achieved if vulnerable populations (rural and remote population) continue to be denied access to health care services.

Millennium Development Goals (MDGs)

1. Goal 1: Eradicate extreme poverty and hunger
2. Goal 2: Achieve universal primary education
3. Goal 3: Promote gender equality and empower women
4. Goal 4: Reduce child mortality rate
5. Goal 5: Improve maternal health
6. Goal 6: Combat HIV/AIDS, malaria, and other diseases
7. Goal 7: Ensure environmental sustainability
8. Goal 8: Develop a global partnership for development

Source UNDP (2009)

Figure 2.1 Millennium Development goals (UNDP 2009)

For example, the reduction of maternal mortality by 75% by 2015 (MDG 5) depends on access to skilled care at birth and during pregnancy. In many cases the reality is somewhat different. Services are often not available within a reasonable distance or may be available but users cannot afford them, or they are not accessible for some organizational reason, such as limited hours of staffing, cultural barriers and so on. Other factors such as insufficient political prioritisation of health, poor governance, population growth, scarce health resource (Walley *et al*. 2008) and the absence of a properly trained and motivated health workforce (Willis-Shattuck *et al.* 2008) mean that many low-income countries like Nepal will not meet MDGs by 2015. These challenges are further discussed in Chapter Three: the context of Nepal later in the thesis.

Access to basic primary health care is still the key either to achieve "Health For All by year 2000" or to achieve MDGs by 2015. To accomplish equitable access to health services within a diverse society is one of a health system's most challenging tasks. Therefore, all the stakeholders in health care are increasingly voicing their concern that access to health care should be improved and are exploring multiple methods of delivering health care to those in remote and rural areas. The Royal Flying Doctor Service (RFDS), for example, in a developed country like Australia.

The Royal Flying Doctor Service (RFDS) has been established to bring these important health services to remote and regional Australian communities. The RFDS provides free

emergency and medical care to people who live, work or travel in remote and regional parts of Australia. This non-profit organisation is the oldest and largest airborne health service of its kind in the world. However taking doctors to the patients by aeroplane is only feasible for high-income countries like Australia, even though these services are not without hazards and disruption due to adverse weather conditions (Brisbane News: Flying Doctors plane Missing).

However, the recent advances in information and communication technologies (ICT) have created unprecedented opportunities by increasing the number of ways health care can be delivered. The possibilities for using Information and Communication Technologies (ICT) to improve health-care delivery (health telematics) are increasingly being recognized. The WHO (1998) has recommended that with regard to its "Health For All" strategy, that the WHO and its members states should:

"…integrate the appropriate use of health telematics in the overall policy and strategy for the attainment of health for all in the 21st century, thus fulfilling the vision of a world in which the benefits of science, technology and public health development are made equitably available to all people everywhere." (WHO 1998, p. 27)

The use of ICT in health care is further acknowledged in the United Nation Millennium Goals too. Goal 8 (Figure 1) Target 18 of the MDGs proposes a global partnership for development to make available the benefits of new technologies, especially information and communication technologies (UNDP 2009).

Besides UN, WHO, UNESCO and the International Telecommunication Union (ITU), several international organizations and institutions have been supporting the application of health telematics, especially in remote and rural areas (ITU, 1996). Many governments, including those of developing countries, have started to consider the use of health telematics because of the potential benefit these technologies might bring to healthcare.

"Health telematics" is an umbrella term encompassing all health related activities carried out over a distance by the use of information and communication technologies (Craig and Patterson 2006). Health telematics includes telemedicine, telehealth, tele-education, telematics for health research and telematics for health service management (WHO 1998).

Despite the use of many different terms such as ***telemedicine, telehealth, telecare, online health and e-health,*** they all have a common meaning, i.e. the use of information

technologies to deliver health care services at a distance. Amongst these, telemedicine is the one most widely used. However, the term telemedicine has begun to be replaced by the term telehealth, which was thought to be more "politically correct," but in the recent years this too has been overtaken by even more fashionable terms such as online health or E-health (Wootton 2001).

E-health can be defined as:

"…a technique of providing better healthcare by transforming health systems and business practices through the investment in and more comprehensive use of information and communication technology." (WHO, 1998)

However, much research has been carried out under the umbrella term telemedicine and has identified possible benefits to other sectors of the wider health care service (LaMay 1997). The popularity of the term telemedicine could be due to the wider public understanding of medicine as the main health service rather than having knowledge of wider public health issues. Furthermore telemedicine could be easily and widely acceptable due to its nature as a "quick fix" curative clinical service or rapidly accessible consultations around possible treatment required for a particular illness.

The term E-health implies a look at wider issues of public health: dissemination of health related information or services through ICTs and includes the use of the internet or other electronic media (Wyatt and Liu 2002). For example, electronic health records, e-prescribing system, diagnostic tools, sharing medical imaging and health websites for the public such as NHS choice. The NHS Choices (www.nhs.co.uk) is the National Health Service (NHS)'s website for the public in England and Wales, providing medical and lifestyle information and online health tools. The website is the government-sponsored web-based information portal in the National Health Service.

There are several such websites in existence, government, charity or even private funded across the world. Many of these sites do report huge numbers of users and testimonials of their benefits, however only a few rigorous studies exist to show benefit and cost effectiveness from the website facilities (Crocco, Villasis-Keever and Jadad 2002). The websites are seen as public health tools (access to health information: promotion, prevention and informed choice) (Newton, Andrews, Teesson and Vogl 2009). Forum based websites facilitate mutual support amongst patients suffering from similar conditions (Eysenbach, Powell, Englesakis, Rizo and Stern 2004). All above mentioned

cases were possible in higher- income countries where there have been major ICT investments and the value of ICT in health in terms of improving quality, cost and access to health care are well documented (Dzenowagis 2009).

The global picture of the value of ICT development remains mixed. As the uptake of ICT continues at an uneven pace and creates the 'digital divide', it remains as a major barrier in achieving global development goals (Dzenowagis 2009).

The "digital divide" (Dzenowagis 2009) is understood broadly to be the gap between those with access to ICT and its benefits and those without. The digital divide is evident in low-income countries, due to lack of infrastructure, lack of government policy encouraging and supporting ICT in development and basic technology is unaffordable by individuals due to the cost for even basic services are beyond the average income level. Due to these very reasons, well-intentioned ICT pilots (usually funded and led by international donors) or telemedicine projects end without ever scaling- up (Dzenowagis 2009). Due to the "digital divide" in many developing countries, both urban and rural health professionals and patients remain isolated from access to quality health information which is essential for development and improvement in health services (WHO 2004). Beside health professionals, access to quality and timely information from the frontline service providers is equally important for policy or decision makers too. The decision making in public health purely depends on the availability of reliable information highlighting the genuine "health needs" of the particular group of population, areas, region and the country. Due to lack of reliable and timely information, the policy makers (the Government) in the many developing countries have failed address the genuine need and thus have not allocated the limited resources effectively.

Despite the various strengths associated with deploying ICT projects in achieving "health for all" and "MDGs", it is equally clear that many aspects of MDGs will not be achieved without the well-thought-out use of ICTs (Greenberg, 2005). At the same time, it is difficult, if not impossible, to establish '"proven empirical links" between the use of ICTs and the achievement of the MDGs. As the UN ICT Task Force (2003) points out that measuring the impact of ICT on health generally seems to be fairly difficult because there are obviously many other factors that impact health.

In this section the global picture of using information communication technology in health care has been introduced, but it has also highlighted the failure to achieve Health

For All 2000 and the further widening gap in accessing health care between remote, rural populations and urban populations. The WHO and many international bodies have targeted e-health as a means of addressing some of these needs. The study presented explores how telemedicine was introduced in needy rural settings in Nepal.

2.1 Research Questions and Objectives

The successful introduction of telemedicine with tangible outputs requires in depth understanding of the existing health care system of the country and its challenges, strongly expressed 'genuine need' for the service by the all the domains (patients, practitioners, organisation and the public), the actual status of ICT infrastructure in the country and costs. Rigorous research should be carried out with an appropriate methodology before implementing new systems which all contribute towards sustainability of the project (Lama 2006).

In this study the focus is on the impact and acceptance of the provision of health care, advice and support via tele-communications in remote settings in a mountainous region of Nepal.

The purpose of this study was to explore, using Participatory Action Research methodology, the acceptance, understanding, applicability and efficacy of the use of telemedicine to support healthcare (i.e. through healthcare assistants) services in rural Nepal. In particular, the following research questions underpin the proposed study:

a. How can Participatory Action Research methodology inform the introduction, implementation and sustainability of telemedicine?
b. What are the barriers to the introduction and use of telemedicine?
c. How does the use of telemedicine influence and impact upon health care practice?

The study will focus on the following objectives:

- Building partnerships with all the stakeholders
- Exploring the current health care delivery in the villages

- Exploring available and an appropriate technology for telemedicine
- Evaluating the impact of Telemedicine on major stakeholders using the PAR approach:
    - Access to health care and information
    - Improvement in health and wellbeing of villagers
- Exploring the technical and resources feasibility and sustainability of the telemedicine system

3 Literature review

The focus of this thesis is on the provision of clinical care of patient-specific consultative support from clinician to health worker using electronic communications technology (Telemedicine). Due to a lack of literature and other primary research in the field of telemedicine, the literature review will first provide an in-depth understanding of what telemedicine is. The chapter presents a brief history of telemedicine; current trends; reasons for take-up; types of telemedicine in the global context and their importance in developing countries with Nepal as the main example.

3.1 Definition of Telemedicine

Telemedicine has been defined as the delivery of healthcare and the exchange of health information across distances, including all medical activities: diagnosis, treatment, prevention, education and research (Craig, 1999). Telemedicine is also defined as the use of telecommunication technologies to provide medical information and services (Perednia and Allen 1995). It may be as simple as two health professionals discussing a patient's case over the telephone, or as sophisticated as using satellite technology to broadcast a consultation between healthcare centres in two countries using videoconferencing equipment (Adewale 2004).

Telemedicine may have a more profound impact on rural areas of developing countries than on developed ones (Edworth 2001). For people living in rural areas, the distance to main metropolitan centres and difficulty of travel places restrictions on access to essential health care services, including specialist healthcare. In other words, telemedicine is the delivery of health care services to the underserved (urban and rural) through communication technology and has the potential to bring medical care to remote or isolated areas where healthcare is either inadequate or non-existent.

3.2 Brief History of telemedicine (e-health)

The purpose of this section is to present a history of telemedicine, its body of knowledge and practice, and how it has developed and evolved. Examples from the key driving forces that have made it possible for telemedicine to flourish will be given.

Telemedicine has a fascinating history; however most telemedicine has clearly occurred in the last 20-30 years, associated with advances in information technology. If, however, telemedicine is considered to be any medical activity performed at a distance (Tele derives from the Greek for distance), irrespective of how the information is transmitted, its history is much older. Craig and Patterson (2001) give an early example of **bubonic plague** as the first public health surveillance network in the Middle-Ages. In that period information about the plague was transmitted across Europe by such means as bonfires. In the mid-19th century the practice of physicians providing diagnosis and directions for cure of certain diseases was established through the postal service. Furthermore, in the same period, during the American Civil War, the telegraph was used to provide and plan medical care, for example, to transmit casualty lists and order medical supplies. Later technological developments permitted the transmission of X-ray images (Craig and Patterson 2001).

In the early part of the 20th century ordinary telephones were used to transmit Electrocardiograms (ECGs) and electroencephalograms (EEGs). Similar devices are still used today, e.g. the transmission of amplified sounds from a stethoscope. In the 1920s medical advice was given to seafarers, initially by Morse-Code and later by voice through radio communication (Amenta, 2000). By 1938, at least five maritime nations had established radio medical services for seafarers (in 1920 the Seaman's Church Institute of New York became one of the first to provide services). In 1935, the International Radio Medical Care Centre (CIRM) was established, whose headquarters are in Rome, Italy. It has assisted with over 42,000 patients in its first 60 years. The organization became the largest single user of telemedicine in the world to provide health care to seafarers (Amenta, Dauri and Rizzo 1998). In recent years, the concept of Radio Medical advice has been adopted to support passengers on long distance air journeys as well (In-flight medical services).

3.3 The birth of modern telemedicine

The recent development of telemedicine has been facilitated on two fronts. First, modern advances in information communication technologies: newer digital communication networks such as integrated services digital networks (ISDN) and broadband technology

techniques. Second, telemedicine has developed because of the pioneering efforts of a few organizations and individuals (Craig and Patterson 2006).

The National Aeronautics and Space Administration (NASA) is telemedicine's most noted pioneer. NASA has conducted experiments in remote monitoring, diagnosis, and treatment since the earliest manned space flights and has undertaken telemedicine demonstration projects in the developing world. These have been in India, the Pacific Basin, and the South Pacific, and in the aftermath of earthquakes in Colombia, Mexico and Armenia (Scott 1994).

NASA has maintained its interest in disaster assistance through telehealth technology. It has carried out experiments in remote and underserved areas of the United States (Scott 1994). Furthermore, in 1988, NASA conducted the first international health programme, known as Space Bridge (now called space for Russia), to provide medical consultation to earthquake victims in Armenia. This programme was based on technology originally developed for astronauts (Garshnek, 1991; Llewellyn, 1995). Consultations used satellite-based communication to deliver one-way video, voice, and facsimile medical care from four medical centres in the US to a health care centre in Yereven, Armenia, in areas of psychiatry, orthopaedics, neurology, infectious disease and general surgery (Garshneck and Burkle, 1999).

The invention of television played a major influence on the development of telemedicine. In 1959, the University of Nabraska built a close circuit microwave network to provide clinical services and medical research to rural communities. The system permitted interactive consultations between specialist and general practitioners and facilitated education and training at the distant site. Today in the United States, every state has some sort of telemedicine programme (LaMay 1997). More recently, there has been a major growth in real time telemedicine with the wide availability of videoconferencing. This has been made possible by improvements in digital communications and the introduction of low-cost computing. Many of the videoconferencing systems are now PC based (e.g. Skype).

The most recent developments of mobile phones and satellite communications have allowed mobile telemedicine. The mobile telemedicine solution no longer depends upon fixed-line telephone systems or transmission, but utilizes satellite and GSM mobile phone technologies to bring medical care to remote locations, including underserved sites in

rural areas, major emergencies or developing countries where there is a shortage of medical professionals (Stanberry 2002).

Finally, the development of broadband communication networks in developed countries and the increasing access in developing countries (mainly for wealthy families) makes feasible the provision of good quality home care services. This can support the preference of a large number of patients who may need and prefer specific health support at home. Guillen and colleagues have developed a telehomecare multimedia platform that runs over integrated digital networks and Internet protocols using videoconference standards and television sets for patient interaction (Guillen *et al.* 2002). This platform allows online remote monitoring of electrocardiogram, heart sounds, and blood pressure. The design and development of hardware and software components considered usability, affordability, and interoperability. The evaluation of the technical and usability aspects was carried out with 52 patients of a private clinic and 10 university students. The results showed high satisfaction rates in the global perception of users on the quality of images, voice, and feeling of virtual presence (Adewale 2004).

To conclude, distance medicine (telemedicine) or e-health is not a new concept or technique. It has been developed over a long period of time in parallel to developments in information and communication technology (ICT). The advent of modern ICT has unleashed a new wave of opportunities and threats to the delivery of health services (Write 1998). These trends are unlikely to stagnate. They will develop further as more advanced and sophisticated technologies develop daily in the world. Looking at the trends of digital technological developments and increased use of *Robots* in the field of science and technology, the day may not be far off when you see a surgeon in the UK operating on a patient at the Mount Everest Base Camp in Nepal!

3.4 Telemedicine and its application

The purposes for which telemedicine is used may be categorised as one or a combination of the following: clinical, educational and administrative.

3.4.1 Clinical

Telemedicine has been widely used for clinical purpose. Clinical services generally include interaction between clinicians (and may include or exclude the patient). For example, a village health worker in a remote area could telephone a specialist to discuss appropriate

clinical management for an unusual case. Alternatively, a digital image of an X-ray could be sent via email to a specialist to assist with diagnosis.

3.4.2 Education

For education, sessions may include the delivery of lectures and workshops to multiple sites using techniques such as videoconferencing and web-casting (Smith 2005). In Queensland Australia for instance, most videoconferencing equipment is currently used by hospitals for educational purposes. Educational sessions range from the delivery of pre-recorded lectures (videotape or DVD) to a group of students or other health professionals at a remote site, to interactive workshops conducted via videoconferencing involving several different sites simultaneously.

3.4.3 Administration

For administrative applications, communication between different sites for management meetings, interviewing distant or international candidates for positions and keeping contact with regional sites are all different types of telemedicine activity.

3.5 Types of telemedicine

Regardless of the purpose, the common threads for all telemedicine applications is that a client of some kind (e.g. patient or health-care worker) obtains an opinion from someone with more expertise in the relevant field, where the parties are separated in space, in time or both. Telemedicine episodes may be classified on the basis of:

a. The type of interaction between the client and the expert and

b. The type of information being transmitted.

The *type of interaction* is usually conducted in two main ways, i.e. store and forward (pre-recorded) or real-time (also called synchronous). The choice of method depends on what information needs to be transmitted, the availability of the appropriate telecommunications resource and the urgency of the reply (Craig and Patterson 2006; Smith *et.al* 2005).

3.5.1 Store-and-forward (Asynchronous)

In this method, information is recorded or stored and then transmitted to the recipient for subsequent reply. **Email** is a most common and appropriate means however correspondence may also include fax or post. This method is generally cheaper and more convenient. The experts or the recipient of the information can examine the material at their convenience. A common example of pre-recorded telemedicine is teleradiology, in which a digital X-ray image is transmitted to a radiologist for reporting.

3.5.2 Real-time (Synchronous)

In contrast to the store-and-forward method, in real-time interactions, there is no appreciable delay between the information being collected, transmitted and displayed. In other words, real-time telemedicine allows participants to send and receive information almost instantly with negligible delay. A common example of this method is a discussion about a patient over the telephone. A more complex example would be videoconferencing, though it requires more expensive equipment, videoconferencing has the added benefit of being able to view live video images (Craig and Patterson 2006; Wootton 2001).

The advantage of real-time telemedicine is that decisions may be made immediately at the time of the session, and if additional information is required, the clinician can request it immediately. Real-time telemedicine can be valuable when a patient in a remote location is linked up to their specialist via videoconferences for clinical consultation (Craig and Patterson 2006; *Smith et.al* 2005) either for general or emergency situation consultation.

The ***information transmitted*** between the two sites can take many forms including clinical data and text, audio, still images and video pictures. Combining the type for interaction and the type of information to be transmitted allows telemedicine episodes to be classified as in the figure 3.1.

Figure 3.1 Classification systems for telemedicine episodes

	Information transmitted		
Interaction		**Still Image**	**Moving Images** (Video)
	Real-time	e.g. teledermatology	e.g. telepsychiatry
	Store-and-forward (Prerecorded)	e.g. teleradiology	e.g teleneurology

In certain applications, such as teleradiology, a technique that involves the transmission of digital radiographs between institutions, it is possible for the interaction to be either pre-recorded or real-time; the latter requires that the expert be available to give an opinion as the image is taken and transmitted.

3.6 Importance of Telemedicine

Craig and Patterson (2006) state there are basically two reasons for use of telemedicine:

a. there is no alternative to telemedicine, or

b. telemedicine is better than existing conventional services.

Telemedicine clearly has a role in the case of emergencies in remote and rural environments where it may be difficult, if not impossible, to get medical care to the patient in time.

Therefore, the major potential benefit of telemedicine is to improve access to healthcare, a major concern for all the stakeholders in the health sector (Chapter One); it should also lead to fewer unnecessary referrals; improved consistency and quality of healthcare; decreased professional isolation; better CME (continuing medical education) and reduced health care cost (Wootton 2007). But examples of best practice are hard to come by.

3.7 Cost of telemedicine

There are several reports suggesting and estimating that telemedicine can be a cost-effective solution (Craig and Patterson 2006). Cost-saving is one of the reasons of adopting telemedicine for patients and health service providers but only a few studies showed the concrete evidence (Ekeland, Bowes and Flotorp 2010). Bergmo (2010) conducted a systematic review and reported that majority of the studies simply evaluate benefits in terms of the cost saving with no assessment of the health benefits for patient. However, sound, economic appraisals of telemedicine applications are only just beginning to appear (Craig and Patterson 2006).

A study carried out in the Amazon region of Peru on rural telemedicine showed that there was a direct saving (reduced number of personnel trips and urgent referrals) on conventional practice (Marinez *et. al.* 2004). Marinez *et al.* (2007) suggests that the additional operational cost (telephone and maintenance) introduced by telemedicine systems were lower than the direct cost. The study further suggested, based on cost analysis, that expensive, high bandwidth communication was not required in order to run an effective telemedicine system in remote areas like Alto Amazonas.

There have been some spectacular and costly failures with telemedicine in the world. For example, the South African government tried to implement a national telemedicine system in the 1990s, it soon failed due to limited or absent budgeting by the provincial department of health, failure to appoint people to manage telemedicine, limited bandwidth, poor change management and lack of buy-in (Mars 2009). More recently, the Malaysia government attempted to implement a national system –the project cost US$ 5.5 million and only a few hundred cases were handled because it was withdrawn for 're-planning' (Wootton and Tahir 2004).

3.8 Evidence for Telemedicine

There is general improvement in the quality of evidence in telemedicine research in recent years (Whited 2006) although the majority of this evidence is from small-scale pilot studies (Wootton and Bonnardot 2010). Whilst the reports on telemedicine suggest its potential benefit, there has been little adoption of telemedicine for routine healthcare delivery in developing countries (Wotton and Bonnardot 2010). This could be due to

current debate about quality of the studies, lack of appropriate use of methodologies and approaches (Lama 2006), lack of exploration of the soci-economic impact (Jennet *et al.* 2003), lack of economic analysis (Bergmo 2010) and lack of evidence on the factors promoting uptake of telemedicine (Ekeland, Bowes and Flotorp 2010) and in some cases publication bias (Wotton and Bonnardot 2010).

Above all, the "user" (patients, health workers and doctors) and other stakeholders' involvement in the research were not always stated explicitly.

Despite all the deficiencies presented above in telemedicine related research around the world, telemedicine is still growing rapidly as telemedicine looks promising to offer the potential to address unmet health needs and address new ways of healthcare delivery by building clinical and informational bridges between rural (users) and urban based available health care providers or between developing and developed countries. Due to the potential benefits and the support from the major health stakeholders, many developing countries have been piloting, adopting and researching telemedicine. However the success of a telemedicine service evaluated in one location should not be assumed to be generalizable elsewhere. All the assumptions of benefit of the service need to be researched with a high participation of the "user" and other stakeholders. The preliminary research or a pilot project enables researchers to understand societal and organizational readiness in acceptance of any new technology in their existing care system. As Gagnon *et al.* (2005) stressed human and organizational factors are the key elements in adopting telemedicine, the following section will explore evidence into the social and organizational aspects of telemedicine.

3.9 Social and organizational aspects of telemedicine

Published work on social and organizational aspects of telemedicine has originated mainly from the developed world yet there is no reason why their conclusions and lessons cannot be applied to the developing world like Nepal.

Whitten's group from Michigan has looked at what makes telemedicine interventions succeed (Whitten, Holtz and Nguyen (2010). The definition of success was sustainability beyond 10 years. The factors identified were, committed individuals, support from the organization and financial stability. In speaking of their own experience in Kansas Whitten and Allen (1996, pp.29) say, *"…organizational structure can channel those energies [of individuals], but cannot replace them."* The formalities of having a roles and

responsibilities defined were established as being a key in the achievement of having a long-standing programme. In general, a formally defined job description lends to an individual's feeling of job stability and reduces many work related uncertainties (Hardy 1993 in Whitten Holtz and Nguyen 2010).

May, Finch and colleagues have also addressed the reasons why some telemedicine projects become embedded in healthcare systems and why others do not. They have developed a model based on normalization process theory (NPT) which gives insight into these successes and failures (May *et al.*, 2007; Murray *et al.*, 2010; Murray *et al.*, 2011). NPT explores the issues around incorporation of complex interventions into everyday practice; in particular it emphasizes the need for an effective real world intervention to be implemented widely for long term impact. The usefulness to patients was a particularly important benefit in one study of three separate e-health applications in the UK (Murray *et al.* 2011)

On a grander scale Scott (2007) has formulated a country-level needs-assessment process that integrates telemedicine and guides future national strategic e-health plans. He recommends, a pragmatic approach, having the necessary ICT infrastructure, choosing the appropriate e-health (telemedicine) solution, ensuring that they are technologically appropriate and culturally sensitive, and have support from all stakeholders.

Despite there being limited published work from developed countries on the social and the organizational issues, these topics are central to the adoption of telemedicine. Lessons learnt from the published work could be even more relevant for developing countries with extreme poverty, limited health care services, low literacy level, huge cultural and linguistic differences. The next section of this chapter *Telemedicine in Developing Countries* will explore the telemedicine situation in developing countries.

3.10 Telemedicine in developing countries

The purpose of this section is to present the potential of telemedicine in developing countries and how the process of this service could help to overcome several barriers faced by developing countries like Nepal. These barriers are described in depth in the next chapter "Nepal in Context".

In many developing countries, primary health care systems in rural areas are very inefficient due to various factors such as lack of information and communication

infrastructure, poor information sharing and lack of training and support for primary healthcare professionals. Furthermore, in the remote areas there is a lack of access to specialist care. Poor roads, difficult travel conditions and poor economic conditions are some characteristics of remoteness, which make the transfer of the patient to a major hospital facility impractical. Travel requirements for elective care can place a substantial financial and social-burden on the patients and their entire family.

However, the increasing availability and widespread use of cheaper more user-friendly telecommunication systems and equipment such as personal computers, internet access, satellites, videoconferencing, and telephones have encouraged many enthusiastic individuals, organizations (governmental and non-governmental) to implement telemedicine either formally or informally. Today telemedicine systems have been explored almost everywhere in the world (WHO 2009).

Over the last 20 years a substantial number of articles have been written about telemedicine in developing countries. There are editorials, commentaries, reviews, case reports, and accounts of technical innovation, as well as accounts of experiments and assessments on telemedicine mainly from developed countries (Figure 3.2,Wootton 2007), and many reports suggesting that telemedicine would be of great value in developing countries (Wootton and Bonnardot 2010). The opportunities for benefit from telemedicine are indeed great, so are the opportunities for harm (Rigby 2002). Rigby (2002) further warned in his letter to BMJ that the available health knowledge and evidence from the developed countries may not be appropriate for developing ones and sometime very difficult to measure the comparative impacts of telemedicine between countries. These are due to every country has different economic, social, health needs, political position and geographical conditions. Therefore applying research results from the rich world to address the health issues of the developing world could be convenient and potentially easy but with risk of exporting failure too (Miranda and Zaman 2010).

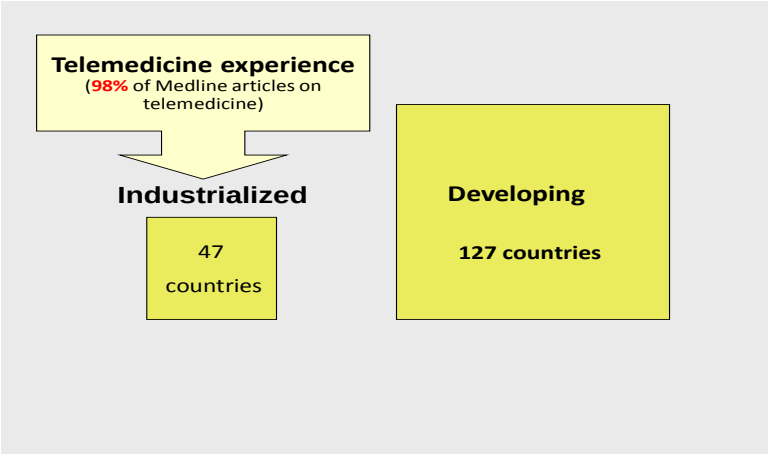


Figure 3.2 The telemedicine research gap (Wootton 2007)

There are a few empirical studies that have been conducted in developing countries. The examples from Ecuador (Mora et. al 2006), Colombia, Peru, Nicaragua (Martinez *et.al.* 2005), India (Ganapathy 2002; Desai *et al.* 2004), Thailand (Kasitirprdith 2001), Haiti Fraser *et al.* 2004), Nigeria (Adewale 2004) Cambodia (Bradnling-Benne *et al.* 2005), Ghana Cameroon (Scott, Ndumbe and Wootton 2005) and South-Africa (Mars 2009) all show that there are great expectations for telemedicine in developing countries, which in principle can benefit many players: local authorities and government (cheaper specialized services); hospitals, primary healthcare centres (improved service, increased supply of expertise); patients (changes in state of health and quality of life, savings in costs and time); healthcare personnel (increased proficiency); employers (reduced absenteeism from work); and the social insurance system (reduced reimbursements) (Lama 2006).

Wootton and Bonnardot (2010) conducted a systematic review on the research papers reporting actual experience with telemedicine in developing countries. They reported that the total of 202 potential articles were sought for review and only 38 relevant papers were identified. Out of 38, the majority of studies (26) were experimental and 12 were observational (*descriptive report*). Wootton and Bonnardot (2010) reported that the quality of the reports and studies were rather weak with only one study by Johnston *et al.* (2004) falling into the high quality score band in their review. All studies reported positively in favour of telemedicine in developing countries and used it primarily for educational and clinical purposes (Wootton and Bonnardot 2010).

There are a few examples of telemedicine which have proven feasible and useful in developing countries. One of the good examples is the service founded and operated by Swinfen Charitable trust (SCT) (http://www.swinfencharitabletrust.org). The Charity is

managed and co-ordinated in the UK and links have been established between hospitals in developed countries. The SCT has indicated that there is a possibility of taking such a scheme to the rural settings of Nepal and other developing countries. Since 1999, this service has provided free medical advice to doctors and other health care professionals working in about 20 countries including Bangladesh, Bolivia, Ethiopia, Iraq, Nepal. The technological requirements for the service include a standard digital camera and a computer with access to e-mail via the internet. (Swinfen *et.al*.2002 and 2003; Vassallo *et. al*. 2001; Wootton, 1997). However, the project has been limited to doctors from the cities in developing countries communicating with more than 180 volunteer specialists representing over 60 different specialist fields in the UK and Australia (SCT 2009), hence, giving excellent specialists advice.

The numerous objectives of telemedicine and its applications are to enhance citizens' equality in the availability of various medical services and healthcare despite geographical and economic barriers. Telemedicine should reduce direct and indirect costs (loss of production or income) to patients and the healthcare industry, and save travel time and costs for both practitioner and patients from one geographical location to another. Finally, telemedicine should improve consultation and co-operation among various units of healthcare, both specialist care and primary care, by bridging the distance between practitioners and specialists.

As chapter one highlighted, access to basic healthcare has been the central to the global agenda. Despite the agenda supported by the major stakeholders in the health sectors (Chapter One), many developing countries have been failing to deliver basic primary health care and limited or no access to specialist care for the majority of those in rural and remote areas due to several barriers (highlighted later in the Chapter 3: Nepal in context). However, as this chapter highlighted telemedicine offers great opportunities for rural and remote underserved and developing countries like Nepal where access to basic care is the major concern (WHO 2009) despite the huge gap in evidences to determine its success around the world. Within the existence evidences in telemedicine, there are hardly any empirical research evaluating the organizational impact which involves its acceptability and its use by village health workers (primary health care workers), patients and clinician (tertiary care providers) alike.

Therefore, the successful introduction of telemedicine with tangible outputs requires an in-depth understanding of the existing health care system of the country and its challenges (including technological challenges) through rigour, multi-disciplinary and participatory research approaches and to ensure the sustainability of the development before implementing the “new” way of delivering care in the developing countries.

In response to the above demands and challenges, the next chapter (Nepal in context) will explore other factors that need be to taken into consideration and understood before implementing any such intervention in healthcare settings. The chapter will further look into the wider challenge that the country faces as well as technical challenges for implementing ICT in the rural setting. The chapter will explore the wider picture of a developing country, its challenges and issues that need to be taken in to consideration before applying any new interventions and furthermore to make telemedicine, accessible, affordable, and feasible.

4 Nepal in Context:

This chapter explores other factors that need be to taken into consideration and understood before implementing any (new) intervention in healthcare settings. The chapter will further look into the wider challenge that the country faces as well as technical challenges for implementing ICT in the rural setting. The chapter will explore the wider picture of a developing country, its challenges and issues that need to be taken in to consideration before applying any new interventions and furthermore to make telemedicine, accessible, affordable, and feasible.

Nepal is a relatively small landlocked country with 28 million people (WHO 2009), situated in the northern hemisphere, occupying only 0.03% and 0.3% of total land area of the world and Asia respectively. Nepal has an extreme topography with altitude ranging from 70 to 8848 metres and a climate which varies from tundra to polar. The country stretches from east to west with a mean length of 885 Km (longitude 80° 04’ East, to 88° 12’ East) and widens from north to south with mean breadth of 193 kilometers, (latitude 26° 22’ North, to 30° 27’ North) covering total area of 147, 181 square kilometres. Nepal borders to the north with Tibet (an autonomous region of China) and to the east, west and south with India.

Nepal is divided into three east-west ecological zones: (Fig 4.1) the Northern Range - Mountain (highest mountain in the world the Mount Everest); the Mid-Range- Hill (1000 to 4000 metres in altitude), and the Southern Range: Terai (Flat Land: lowest 70 metre above sea level).

In the Northern Range, the Himalayas form a ridge of mountains which includes eight peaks higher than 8,000 metres, including Mt Everest on the border with China. The Middle Range of Nepal is formed with mountains, hills, valleys and lakes. The Kathmandu valley which contains the capital city of Nepal lies in this region. The Southern Ranges which border with India (East- West and South) consist of dense forest areas, national parks, wildlife reserves and conservation areas.

Administrative and politically, Nepal is divided into 5 development regions, 14 administrative zones, which are divided into 75 districts. Each district has been further divided into 3913 Village development committees (VDCs) and 58 municipalities as front line administrative units which are further divided into smaller political units called wards.

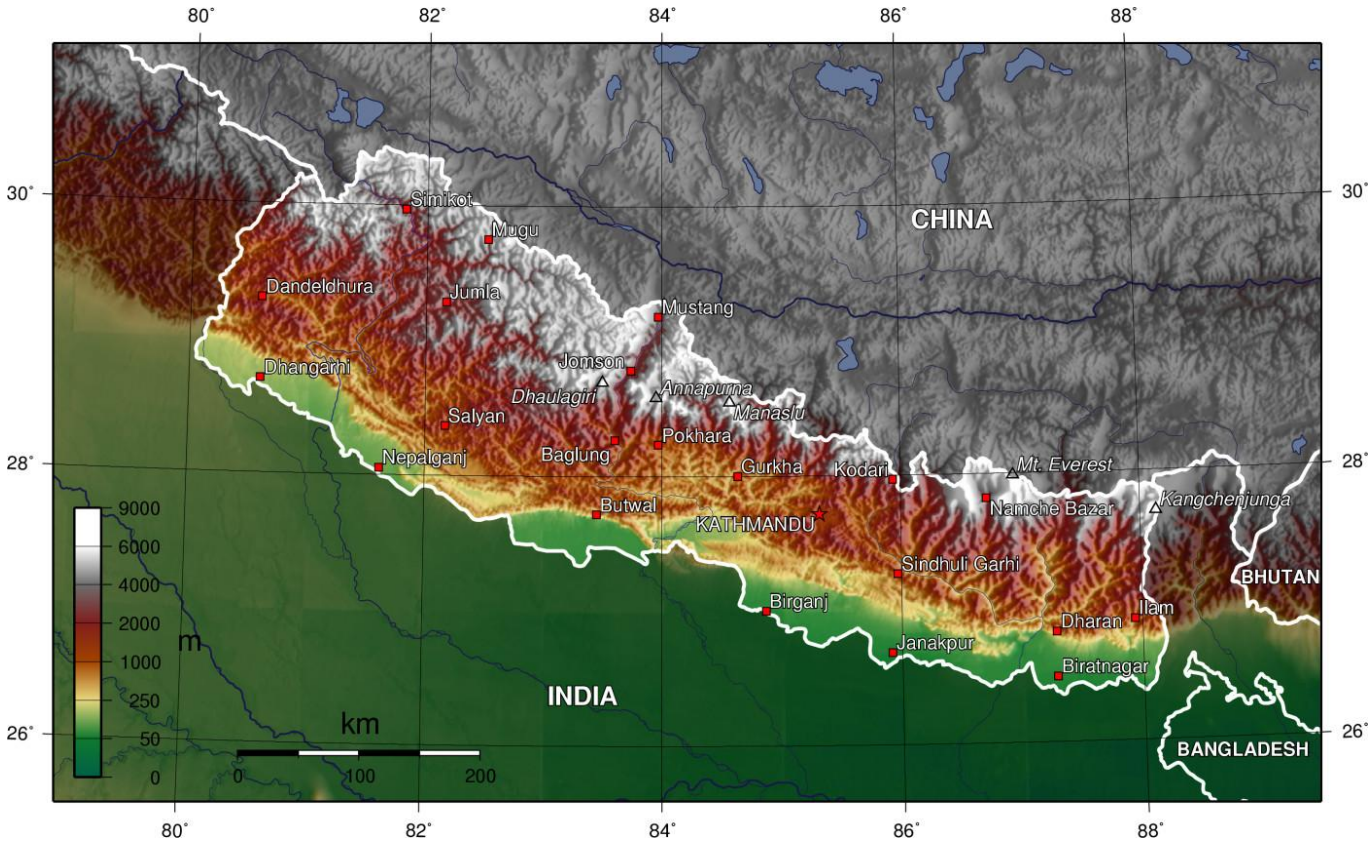


Figure 4.1 Map of Nepal (www.undp.org.np/.../ dcr96/development_map.htm 2009

The topography that leads to its renowned physical beauty makes it very fragmented; many parts are inaccessible by modern transport and there are lacks of communications and health facilities. There are few cities and 86% of the population live in rural areas, more than half the population is deprived of basic and primary healthcare services (Dixit 1998; Paalman 2003).

4.1 Nepali Society

Nepal is renowned for its socio-cultural diversity of 103 castes and ethnic groups speaking 92 different languages and 9 religions (UNDP 2009). Despite high social diversity, the state imposed a single Hindu religion and Nepali language upon all the country's distinct populations opening the way to pervasive exclusion and discrimination. This was the case until the popular People Movement II in 2006 when the country declared a secular state. However, inequalities and exclusion in Nepal still exist: gender inequalities due to the

patriarchal society; *Dalits* (untouchables) due to the hierarchal caste-based system. For Adivashi *Janajatis* (indigenous) people the chief obstacle in the preservation of their culture, religion, and language remains inequality and discrimination. For many others, it is unfair distribution of national resources across the geographic locations. Furthermore, the country still is a very traditional, hierarchical, caste system with strong religious and family traditions and a feudal structure. The sources of these inequalities and exclusions which can be seen widely in Nepali society are discussed below with examples.

4.1.1 Inequality and Exclusion in Nepal

Even in 21st century, one can see at least the following seven sources of inequality and exclusion in Nepal:

a. **Unequal gender relations:** that stems from traditional socio-cultural structures that define the formal and informal rules for women's participation in relation to opportunity, decision – making, access to resources and control over them. *Example: only around half of women participate in decision making about their own health care, making major household purchases and visiting family and friends. However, one third of women do not participate in any of the above decisions at all (Demographic and Health survey: 2006).*

b. **Caste differential due to social stratification** by the hierarchies stipulated by the Muluki Ain (the national code of 1854) that characterized *Dalit* as "untouchable". The national code defines caste in terms of ritual "purity" and "pollution." Brahmans and Dalits occupied the top and bottom ranks of this hierarchy respectively, while the ethnic groups now known as *Adivasi Janajati* fall in middle ground, though there are several distinctions amongst them too. *Example: Dalits children do not eat their midday meals with other children in some remote schools. Though this kind of discrimination is decreasing it still exists in many remote rural areas. In the mid and far western parts of Nepal and many parts of the Terai, this customary cruelty still exists (UNDP 2009)*

c. **Caste and ethnicity differences resulting from the norms and socially defined practices of dominant caste groups:** these define the degree and form of discriminatory practices towards disadvantaged *Adivasi Janajatis*. Example *Adivasi*

Janajatis were mostly peasants, labourers and micro-enterprise merchants in the caste hierarchy and they are subsequently sub-classified according to their consumption of alcohol *"Matuwali" (drunkards)* and enslaved. Brahmans and Chhetri neither drank alcohol not were subject to slavery and considered to be superior to *Janajatis.*

d. **Linguistic discrimination** arising from domination of Nepali Language over the other native tongues and the consequent exclusion of non-Nepali speakers. For example, Nepal's *Adivasi Janajatis* people are disadvantaged in accessing to education and other public services as many indigenous children and elderly people do not understand or speak Nepali as of their mother tongue.

e. **Religious differences and domination***,* which acts similarly, favours Hinduism above other faiths and belief systems. For example, the New National Code of Nepal (*Muluki Ain*) of 1963 prohibits killings of cows because it is a Hindu deity, and those who violate it may become imprisoned for 12 years, equivalent to life imprisonment. Even after the People Movement II in 2006, longer public holidays are given on Hindu festivals and the government also allocates budgets every year for promotion Hindu festivals but hardly any or does not allocate any resources for other religions.

f. **Spatial exclusion** derives from isolation in geographic areas remote from Kathmandu and other urban centres, or from state-biased policies that affect the disadvantaged regions. For example the extent of relative deprivation of the people in the remote rural districts of the Hills and Mountains is very high and lack of development in these areas never been government priority and recently further fuelled by the Moist insurgency from 1996 until peace deal in 2007 (UNDP 2009; Lawati 2001).

g. **Geo-political discrimination is** an exclusion linked to location that also reflects socio-political differences. This geo-political discrimination widely exists between the *Phadi* (Hill inhabitants) and *Madhesi (*plain or lowland inhabitants). For example, political participation and administration exclusion widely persists.

All these stratifications have been reinforced by the government policies, especially the party-less system (Panchayat) of 1960, which proclaimed Nepal as a "Hindu Kingdom" and 'Nepali or 'Khas' as the "the only official language". Simultaneously, Panchayat ignored

Nepal's multi-religious, multi-nationals, multi-cultural and multilingual character and created a "Khas" linguistic and cultural chauvinism. The policy survived even after the restoration of democracy in 1990.

In contradiction to the above arguments: Nepal has ratified all the key UN conventions on discrimination. Furthermore, in 2008 the Constitution Assembly Election took place in Nepal to eliminate all these self–reinforcing cycles of discrimination and inequality through increased equality of representation in state structure. However despite UN conventions and wider representation in the Constitution Assembly, these have only been on paper and appear symbolic. Discrimination remains wide spread in the country.

In summary, huge inequalities and exclusion exist in Nepal. These inequalities and exclusion are prevalent in many cases, higher amongst the certain regions, groups and within particular groups as explained above. In short, for women, the chief obstacle to human development is the patriarchal society; for *Dalits* it is the hierarchal caste-based system; for the *Adivashi Janajati*, it is identity, culture (religion and language) and resources; for *Madehsi* it is language and regional autonomy. Furthermore, for the people of the mid-west it is a scarcity of resources closely bound up with their deprivation of physical connectivity with better developed areas.

4.2 Conflict in the Nepali Context

Nepal went through 10 years of armed conflict from 1996 till 2006 when the Communist Party of Nepal (Moist) declared a 'People's War (*Jana Yudhha).* The outbreak of violence was attributable to many factors; not least the immense divide between rural and urban areas: while Kathmandu urbanites enjoyed some of the highest living standard in South Asia, the great majority of rural lacked access to clean water, electricity, roads fit for motor vehicles, education, health and telecommunication (Shields and Rappleye 2008). As their name suggests, Nepal's Maoist envisaged the conflict as a classic class struggle against a 'feudal autocracy' (Bhattarai, 1998, 2003) with initial demands were based on the redistribution of wealth, privilege and political power by breaking oppressive relationship through restructuring the economy, government and society (Shields and Rappleye 2008). The conflict further fuelled by many years of inequalities and exclusions within Nepali society which are discussed above **Inequality and Exclusion in Nepal.**

The conflict resulted in a culture of violence marked with massacres, torture, disappearances, displacements and a general anticipation of terror that eclipsed faith in the state and paralyzed individual and group efforts to rebuild structures of governance. More than 13,346 people dead by the end of 2006; more than 50,356 people were displaced by the end of 2004, the greatest number in the Mid-Western Development region. Even after the signing of Comprehensive Peace Accord (CPA) in November 2006, another 551 people were killed in 2007 and 541 in 2008 (UNDP 2009) the highest tolls were in the rural and less developed areas, regions and excluded groups of population including rural agricultural labourers who are most vulnerable in-terms of both education and material assets.

The continuation of the conflict certainly brought these disadvantaged groups even lower and has resulted in the further deepening of geographical inequalities. The fighting damaged physical infrastructure, along with the schools, health centres and other social facilities, worth five billion rupees, that served largely the rural poor (UNDP 2009).

The restriction imposed on the mobility of rural people together with the inability of outreach staff to visit health facilities, acted to continuously curtail access to quality health services by many who needed them most, particularly women, children, and vulnerable groups in remote areas. Some experts estimate that public health care dropped by 25 % because of insecurity and difficulties of movement alone (UNDP 2009). This figure takes no account of the psycho- social effects of conflict, including losses in social capital in-terms of the destruction of mutual trust and confidence.

4.3 Nepal political situation

Nepal is a country at a cross roads, experiencing an “open moment” in its history. The New Nepal has taken a federal character, vastly altering administrative and decision-making powers, but mostly in theory.

In April 2006, several weeks of mass protests, followed by several months of peace negotiations between the Maoists and government officials, culminated in a November 2006 peace accord and the promulgation of an interim constitution. Following a nation-wide election in April 2008, the newly formed Constituent Assembly declared Nepal a federal democratic republic and abolished the 200 year old monarchy at its first meeting

the following month. The Constituent Assembly elected the country's first president in July 2009. The Maoists, who received a majority of votes in the Constituent Assembly election, formed a coalition government in August 2008, but resigned in May 2009 after the president overruled a cabinet decision to fire the chief of the army staff. In May 2009, Nepal's parliament elected veteran communist leader Madhav Kumar Nepal as the country's new prime minister. His role was short-lived however. He was forced to resign in June 2010.

With the election of the Constitution Assembly on 10 April 2008, Nepal entered a new phase. The new constitution promised to adopt an inclusive democratic and progressive state restructuring to eliminate the centralized and unitary character of the state in order to address the concerns of women, Dalit, Indigenous Nationalities, Madhesis and those more generally oppressed and neglected under past regimes. The constitution included minorities and those who live in the "backward" rural and remote regions. In short, the "New Nepal" aims at ending discrimination based on class, caste, language, gender, culture, religion and region. However in reality, peoples' raised expectations from the 2006 people's movement (Janaadolan) and the dreams of the New Nepal were dashed due to persistent strikes and blockades by various groups. The law and order situation remains difficult with regional, ethnic and political tensions. However, there are more challenges to come.

Table 4.1 A chronology of key events leading to the current state of Nepal politics:

1990	The multi-party system was revived and a new 1990 constitution of Nepal was prepared	2008 28 Feb	Nepal Government and the United Democratic Madhesi Font signed an eight-point agreement, which brought to an end of 16 day long general strike in the Terai
1996 13 Feb	The communist party of Nepal (Maoist) launched the People's War.	2008 10 April	A constitution Assembly election was held throughout the country Former Maoist rebels win the largest bloc of seats in elections to the new constituent assembly, but fail to achieve an outright majority.
2001 1 June	King Birendra, Queen Asihwarya and other close relatives were killed	2008 28 May	The first meeting of the Constitution Assembly was held, it formally abolished the monarchy and proclaimed Nepal as republic stated in the Interim Constitution of 2007
2001	A state of emergency was declared after more than 100 people were killed in four days of conflict	2008 July -	Ram Baran Yadav becomes Nepal's first president. (Two months after the departure of King Gyanendra)
2005 1 Feb	King Gyanendra dismissed Priminister Dueba and his government declared a state emergency and assumed direct citing the need to defeat Maoist Rebel	2008 15 Aug	A Coalition Government under Maoist Leadership was formed, with Nepali Congress going into opposition.
2005 Nov	The Maoist rebels and the seven political party alliance agreed on a programme aimed at restoring democracy	2008 Dec	14 Committees including 10 thematic, 3 process and 1 constitutional committee ware formed and the drafting a new constitution begin
2006 24 April	King Gyanendra agreed to reinstate parliament following a 19 days Janandolan (people's movement or uprising) which violent strikes and protests against direct royal rule GP Koirala was appointed Prime Minister	2009 May	Prime Minister Prachanda resigns in protest against "unconstitutional and undemocratic" move by President Yadav to block the sacking of the army chief. Maoists leave government after other parties oppose integration of former rebel fighters into national army.
2006 21 Nov	The government and Maoist signed the Comprehesive Peace Accord declaring a foram end to a 10-year rebel insurgency and transforming the Nepali state	2009 May	Veteran Communist leader Madhav Kumar Nepal named new prime minister
2007	Maoist leaders were elected to parliament under the terms of the Interim constitution of 2007. Violent ethnic protest demanding regional autonomy erupted in southeast part of Nepal	2010 January	PM Madhav Kumar Nepal warns that time running out to consolidate peace process and write new constitution by May 2010 deadline.
2007 April	Former Maoist rebels join the iterim government, thereby moving into the political mainstream	2010 May -	Governing coalition and Maoist opposition agree to extend deadline for drafting of new constitution to May 2011.
2007 May	Election for Constitution Assembly was postponed to November 2007 and again shifted to 10th April 2008	2010 June -	PM Madhav Kumar Nepal resigns, following prolonged pressure on him from Maoists to step down.

Source adapted from BBC News (http://news.bbc.co.uk/1/hi/world/south_asia/country_profiles/1166516.stm)

4.4 Economic situation of Nepal

Nepal is one of the poorest countries in the world with a GDP per capita of only $470 (estimated FY2009) and 31% of the population live below the poverty line (World Bank 2009). However, over the last decade Nepal has made considerable progress towards reducing poverty, with the headcount poverty rate falling dramatically – from 41 percent to 31 percent between Fiscal Year 1995 /96 and Fiscal Year 2003/04. However, rural –

urban disparities still exists with rural poverty at 35% compared to 10% in urban areas and only 3% in urban areas of the Kathmandu Valley (Central Bureau of Statistic Nepal 2004). These wide discrepancies are further found depending on geographic location or region, ethnicity, caste and gender.

The economy is characterised by a large agricultural sector which provides livelihood for 80% of the population but more than 70% of people are subsistence farmers (World Bank 2009).Therefore, the agricultural sector only contributes 39.2% of GDP, with a high under-employment rate and low productivity. The stagnation of agriculture has been associated with an increasing reliance by rural households on non-farm income which derives from migrant labour in urban areas as well as employment abroad (WHO 2006). Remittances (money from outside) play a major role, both as a source of foreign exchange and as a source of income for many households. Ministry of Finance (MoF 2005) reported that the household receiving remittances went up to 32% in 2004 from 23% in 1996. By 2009, remittances have become one the biggest contributions to the national economy being 22% of the GDP (World Bank 2009). Such trends suggest growing urban pressures as well as significant changes in the rural economy and society as many villages are left with elderly, women and children.

Nepal's development challenges remain great. Delivering services and fostering economic activity in a landlocked country with rugged topography is difficult and costly. Economic growth for FY 2010 is expected to be less than 4 percent. Lower than anticipated agriculture growth, a further fall in the contribution or manufacturing to growth due to long hours of power outages (*Loadshedding)* frequent strikes and highway blockades called (*Bandh)* and low government expenditure have been major factors. These blockades and power outages further hindered rural and remote areas people in accessing resources and services when they are so much in need. For example, effect of power cuts in the hospitals hindered in conducting lifesaving operations (IRIN News 2009). Road blockades (strike) further hinders emergency vehicle to reach to its destination and doctors not able to reach to the patients too.

4.5 Education system in Nepal

Nepal has national and international commitment to “education for all” which lays out strategy for achieving the MDGs for universal primary education by 2015 and gender equality in enrolment at all levels of education (UNDP 2009). In order to achieve the MDGs goal, Nepal adopted both formal and informal educational strategies. The formal education comprises, pre-primary education (Early Childhood Development Centres); Primary Education (grade 1-5), Secondary Education (Grade 6- 10), Higher Secondary Education (Grade 11- 12) and Higher Education (University and Open University). Beside the formal education pathway, there are several Technical educations and vocational training institutes which have been established (Department of Education Nepal 2009).

Aside formal education, in order to increase literacy level, government further adopted a non-formal education scheme targeting mainly women, *Dalit* (Low and untouchable caste), backward indigenous and ethnic minority through its community study centres (Department of Education Nepal 2009).

Nepal made encouraging progress in net Primary Enrolment in schools has increased from 81 per cent in 2002 to 89 percent in 2007 (World Bank 2010). Despite all the significant improvement in educational attainments in Nepal, inequality persists in literacy rates across all the region, castes and ethnic groups and by gender (as motioned above Inequalities and exclusion). For example, only 26% of Nepalese women are literate, compared to 62% of men (World Bank Nepal 2010). Amongst the school children, dropout is epidemic and is continuing. According to Department of Education of Nepal out of the 7.3 million students enrolled in grade 1 to 10 in 2009 / 10, approximately 5 million dropped out and majority of them are female students and from the remote and rural schools.

Although primary education is free, government schools are often inadequate and overcrowded. Many schools in remote areas are very basic and even sometimes unsafe. Often these schools have no blackboard, no proper playground and very little furniture. Even supplementary materials like libraries, children's books, and computer labs are rare.

During the course of the conflict Nepal’s schools became both an ideological and literal battlefield (Caddell, 2006) between Maoists and Royal Nepal Army and both sides in the

conflict attempted to demonstrate their superiority by exerting influence over schools. Furthermore, Maoist extorted money from teachers, required schools to support the Maoist agenda in the curriculum and abducted students to attend indoctrinations camps. During the conflict time in rural areas, many schools had either collapsed or were shut-down (Sharma 2004).

The conflict and inequalities to access to education have direct or indirect implications for current and future impact on other development including health development. The relationships between education and health have been extensively documented and observed in many countries. For example, there is a direct impact of maternal literacy levels on child health: low literacy level of a mother seriously affects her ability to seek care and adhere to treatment when needed (Pirisi 2000). Furthermore, the more educated are likely to live longer, not just in the USA and Canada but also in developing countries like Bangladesh (Hurt, *et. al* 2004).

4.6 Health in Nepal

According to the Ministry of Health's (2003/04) Annual report, the top diseases with respect to morbidities in Nepal are: Skin diseases, Acute Respiratory Infection (ARI), Diarrhoeal diseases (CDD), Gastritis, Intestinal worms' infestation, Ears and Eyes infections. Furthermore, mortality and morbidity rates amongst rural populations are alarmingly high from endemic diseases such as Malaria (in Terai area), Tuberculosis, Leprosy, Sexually Transmitting Infections (STI), Rabies, vector borne diseases, agricultural related diseases and injuries which continue to prevail at a high rate (DOH 2009). All these diseases are preventable but if left untreated, some will later develop into major illnesses which ultimately lead to loss of life and place a high economic burden on families when failure to seek timely intervention has meant that many Nepalese have lost their lives on the way to the nearest health care facilities.

4.6.1 Nepal Health Care Service system

The healthcare delivery network in Nepal has been poorly developed. Healthcare practices in the country could be classified into three major categories: popular folk medical care, which relied on a jhankri (medicine man or shaman); Ayurvedic treatment;

and allopathic (modern) medicine. These practices are not necessarily exclusive; most people used all three, depending on the type of illness and the availability of services, sometime even simultaneously. Despite the popularity of folk and Ayurvedic treatments, and modern medicine, providing public healthcare services and facilities are largely the responsibility of the Ministry of Health (MOH) in the government. Nepal Ministry of Health has three departments:

a. Department of Ayurveda
b. Department of Health Services
c. Department of Drug Administration

4.6.2 Department of Ayurveda (Herbal Medicine)

A large segment of the population benefits from the Ayurveda system, mostly in conjunction with the modern medicine system. Ayurveda is the most ancient medical system based on the herbal, minerals and animal products. The department runs one central level hospital with 100 beds – Nardevi Ayurvedic Hospital with specialized services, one regional hospital (30 beds) in Dang, 14 Zonal Ayurvedic Dispensaries, 59 district Ayurveda Health centres and 214 rural dispensaries. Nearly 200 doctors are registered with Nepal Ayurveda Council. This department supports homeopathic and Unani medicines although they are not practiced on a large scale.

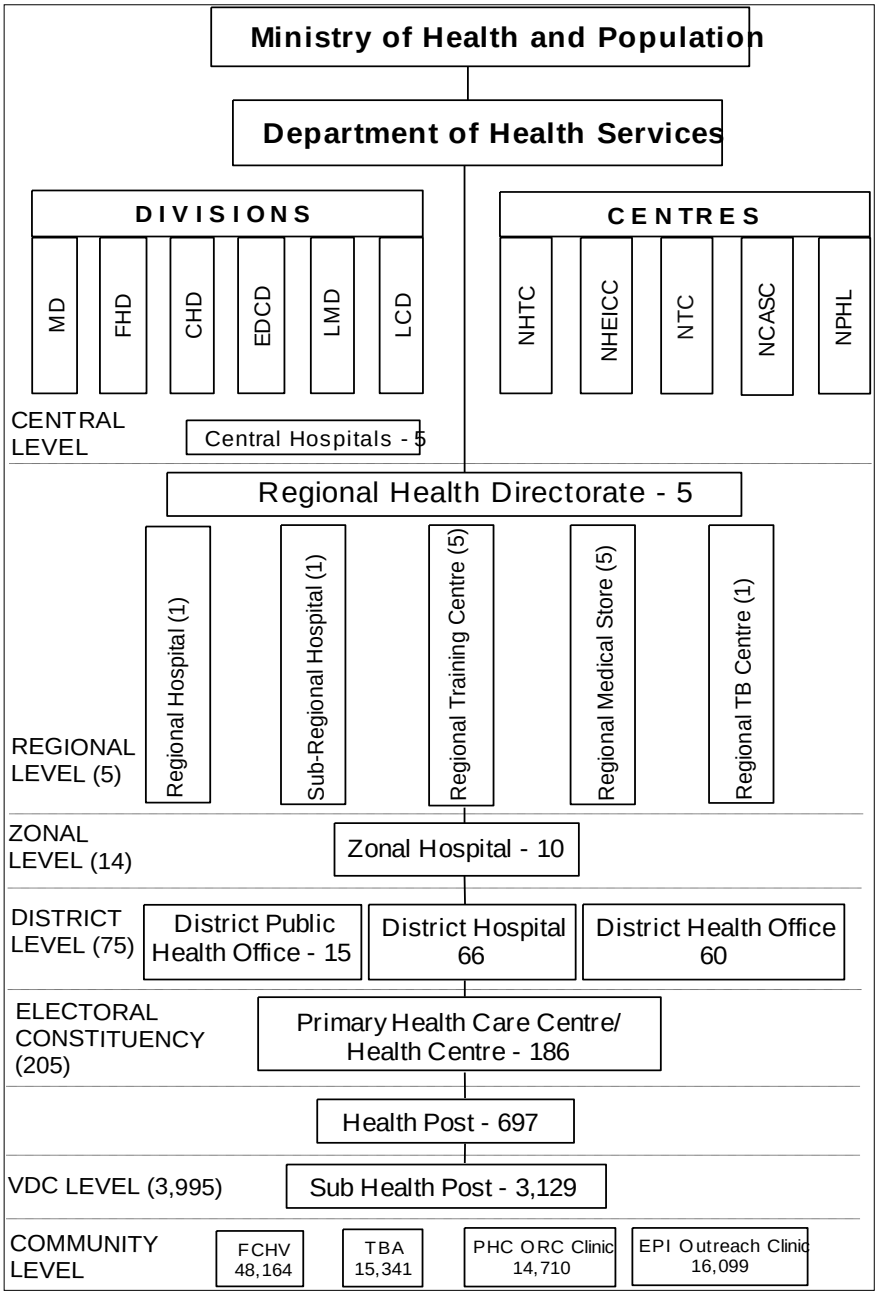
4.6.3 Government Health Care System: Department of Health

The National Health care system is composed of multi-tiered facilities that match up with the political administrative divisions. The central section of the Ministry of Health (MoH) is responsible for policy-making, planning, financing, and international cooperation, human resources, monitoring and evaluation. The MoH is directly responsible for the Central and Zonal hospitals. Out of 14 zones, there are 11 zonal tertiary care Hospitals. Out of 75 districts, 62 have District Level Hospitals however District Health Officers (DHOs) are allocated in all 75 districts of the country. The Department of Health Services (DoH) is responsible for the provision of all health services at the district level and below (see Figure 3.2) and produces very informative annual reports. Every region has

appointed Regional Health Directors, who are responsible for technical matters as well as programme supervision. At the district level and below, District and Village Development Committees are responsible for the delivery of health services (Dixit 1999; DoH 1998; Palman 2004).

The District Public Health Officer is responsible for all primary health services in the district and also responsible for the clinical care at the district hospital. Under the DHO is a network of health facilities. There are two or three Primary Health Care Centres (PHC) which function as mid-level care centres, but not the level of hospital, with one appointed medical doctor and several other junior health workers. Furthermore, within the catchment areas of PHCs there are 7 -8 Health Posts (HPs) and finally sub-health posts (SHPs) at the village level. The SHPs act as the primary care centres at the village level with referral made to higher level facilities as the need arises (Figure 4.2). There are 180 primary health centres, 711 Health Posts and 3179 Sub-Health Posts in Nepal (WHO 2006, DoH 2003, Dixit 1999; DoH 1998; Palman 2004). These HPs and SHPs are staffed by a variety of different levels of trained health workers: Health Assistant (HA) and Auxiliary health Workers (AHW) also known as Community Medical Assistants (CMAs) and ANM (Auxiliary Nursing Midwife).They are usually referred as Mid-level Health Care workers (MLHCW) or commonly known as Village Health Workers (VHW).

Besides two departments mentioned above (Ayurveda and Department of Heath services) the Ministry of Health also has a dedicated department to regulate all the functions related to drugs: **Department of Drugs Administration**. The department regulates all the rules and regulations around use and miss-use of drugs and also control the production, marketing, distribution, export-import, storage and checking quality and safety of drugs in Nepal.



Acronyms			
MD	*Management Division*	*NTC*	*National Tuberculosis Centre*
FHD	*Family Health Division*	*NCASC*	*National Centre for AIDS and STD Control*
CHD	*Child Health Division*	*NPHL*	*National Public Health Laboratory*
EDCD	*Epidemiology and Disease Control Division*	*FCHV*	*Female Community Health Volunteer*
LMD	*Logistics Management Division*	*TBA*	*Traditional Birth Attendant*
LCD	*Leprosy Control Division*	*PHC/ORC*	*Primary Health Care Outreach Clinic*
NHTC	*National Health Training Centre*	*EPI*	*Expanded Programme on Immunisation*
NHEICC	*National Health Education, Information and Communication Centre*		

Figure 4.2 Structure of the Ministry of Health (MoH2006)

Beside trained and paid staff, there are several active community based health volunteers called Trained Birth Attendants (TBA), Female Community Health Volunteer (FCHV), Maternal and Child Health Worker (MCHW) operating in all 75 districts providing basic health care in the community. UNICEF (2006) reports that the Female Community Health Volunteer programme has been critical to reducing the mortality rate of children under the age of five, since it started in 1988. They are participating in the campaign of distributing Vitamin A, polio eradication, de-worming and providing basic healthcare. Furthermore, these volunteers focus on motivation and education of mothers and community members for the promotion or safe motherhood, child health, family planning and other community health services.

Although, the system sounds very impressive and well organized, in many situations it hardly functions at all; utilisation of public health services is low, staff do not want to work in rural and remote areas, and supplies and drugs are inadequate (Justice 1989; Palman 2004; DoH 2003). These challenges were further highlighted by WHO in 2005 where it was found that many Health Post and Sub Health Posts had poor building maintenance due to inadequate budgetary allocation, insufficient water supply or sewerage systems, lack of electricity and standard items of furniture and equipment. Furthermore, the payments for service providers in the public sector were generally low, physician (health professionals) supplemented their income with other works such as private practice. This further contributed to the booming of the private and charitable health care service sector.

4.6.4 Private Health Care provider

The failure of the government health care system and the ever increasing demand and expectation for better health care facilities (both by users and providers) resulted in a number of nursing homes opening in the capital and other urban centres of the country since 1986 (Dixit 1999). After the initial years in business, flexibility in rules and regulations and other facilities (subsidises) provided by the government, the nursing homes changed their names to hospitals and research centres. A number of other specialised private hospitals started soon after. However the quality of service provided by the private hospitals was out of the reach for many Nepalese people. As a result, the gap between the '*haves' and 'have nots'* has increased to a strikingly high level. In

consequence, Nepal still ranks at the lower end of the South-East Asia Region (SERA) countries according to WHO Core Health Indicators (WHO 2005) with high maternal mortality and morbidity rates, high child and infant mortality and a low ratio of health professionals to people.

4.6.5 (I)NGO Hospital

Due to the increasing inequalities in health many community led NGOs and Missionary health centres were started with the aim to provide quality and affordable health service. Many of these centres were and still are semi-private where patients pay a very minimal fee for the service. One of the hospitals based on this principle is Dhulikhel Hospital who is partner for this research and the detail of the hospital and its three outreach centres participated in this research are described in the Methodology chapter later in the thesis.

The challenges for public health are further tested by an acute shortage of doctors, nurses and hospitals per capita in the country. For example, the ratio of doctors to people was 1:18,439, Nurses 1:4,987 and one hospital bed for 2,349 people in 2006. (MOH 2006, WHO 2006).

Despite the overall shortage, the majority of the health professionals and best equipped hospitals are based in the capital Kathmandu and other major cities. These resources are not accessible and affordable for the majority of the population who live in rural areas. The rural people of Nepal are more vulnerable than their urban counterparts mainly due to the late discovery and reporting of ailments, transport times to urban based healthcare facilities and inexperienced primary health-care providers with high workloads in rural areas. Furthermore, health workers in rural areas (who serve most of the population) are isolated from specialist support and up-to-date information (Fraser and McGrath, 2000).

4.6.6 Who pays for health in Nepal

Finance is a major constraint in delivering good health care for the people of the country. The total government budget over the Fiscal Year 2002/03 was $48 per capita, and 19% of GDP expenditure was used for debt repayment. The Budget allocation for the health sector is relatively lower than for other sectors: for example education receives 3 times as

much. Only 5.1% of the total budget is spent on health; this is one of the lowest health expenditures in South Asia (Palman 2004, WHO 2004). Despite the low budg*et al.*location in the health care by government, only 68% of the budget allocated is actually utilized appropriately and the funds distributed mainly in the urban areas.

Nearly three-quarters of health care costs are met by private sources and are mostly out-of-pocket. The situation has attracted many commercially oriented health care providers. However for the majority of rural populations who are in the greatest need, such highly priced private health care is beyond their means.

Despite all the factors influencing health policy, financing health care remains one of the government's priorities. Green and Thorogood (1998) suggests that one of the major reasons for increasing costs in health care is the constant development of medical technology, such as new equipment and more sophisticated drug treatments. These developments create difficulties in allocating funding in a country like Nepal where many children are still dying as a consequence of poor sanitation and malnutrition. There is a great need for co-operation amongst the donor agencies, to find ways of providing development assistance that strengthens national ownership and that builds nationally managed systems through continual engagement of donors to achieve the good health of citizens.

4.7 Nepal future Plan

The second Long-Term Health Plan (1997-2017) of Nepal, aims to benefit the most vulnerable – women and children, the rural populations, the poor and the under-privileged and the marginalized groups. It aims to promote equitable access by extending quality services to remote areas with full community participation and gender sensitivity by technically competent and socially responsible health personnel. The main targets are as follows:

a. Reduce Infant mortality rate from 75 /1000 live births to 34 (48 / 1000 in 2006)
b. Reduced under-five mortality rate from 118 per 1000 live births to 61 (61/1000 2009)
c. Reduce total fertility rate from 4.58 to 3.05 (3.1 in 2006)

d. Increase life expectancy from 56 to 69 (63 for both in 2009 estimate)

e. Reduce maternal mortality ratio from 475 per 100,000 live births to 250 (281 by 2004)

f. Increase the contraceptive prevalence rate from 30% to 50%

g. Reduce Low birth weight to 12%

h. Provide essential health services to 90% of the population within 30 minute of travel

i. Make essential drugs available round the year in 100% of facilities

j. Equip 100% facilities with full staff to deliver essential health care services.

k. Increase total health expenditure to 10% from 5.1% of total government expenditure

According to the long term plan, many of the MDG targets are on improvement and should be achieved sooner than the year 2015. However these data vary from place to place and there are questions raised towards quality and reliability of data coverage. These are due to multiple challenges described earlier and furthermore lack of baseline data. Furthermore, problems arise in monitoring process of MDGs due to unavailability of regular data flow in the country.

The majority of the population in Nepal live in the remote, rural and poorer areas. In contrast, most of the best-equipped hospitals including teaching hospitals and medical experts are located in the urban areas. This situation has prevented the majority of people in remote rural areas from reaching healthcare practitioners to meet their medical needs. However, the recent advent of Information Communication Technology (ICT) promises to unleash new opportunities in the delivery health services. The possibilities of using Information and Communication Technologies (ICT) to improve health-care delivery are increasingly being recognized by the World Health Organisation (WHO) and the United Nation Educational Scientific and Cultural Organisation (UNESCO). The International Telecommunication Union (ITU) with several international organizations and institutions has been supporting the application of ICT, especially in remote and rural areas (ITU 1996). The challenges of implementing telecommunication in a country like Nepal need to be taken into account. The following section explores Telecommunication infrastructures in rural areas.

4.8 Telecommunication infrastructure in the rural areas

Telecommunications is one of the major components of telemedicine. Like lack of access to many other modern services, many rural areas in developing countries are without access to telecommunications. Communication networks in rural areas are always the last to be considered because they involve difficult and often inaccessible geographical terrain and adverse climates. They yield very little return in investment to telecommunication carriers and service providers. However, the increasing need for rural areas to communicate with the outer world demands optimum global solutions to resolve the problem. The establishment of telecommunication networks in rural areas could lead to a better quality of life for rural people, which is the main objective of building telecommunication networks in rural and remote areas. Furthermore spreading communication and telemedicine networks in rural areas will have wider benefits than just for medical purposes such as for income generation through small businesses; education, emergency treatment and military management.

4.8.1 Telecommunication system in Nepal

Nepal is relatively new in development of Information Communication Technology (ICT). The first computer was introduced to Nepal in late 1971 and it was only in 2004 that a second mobile phone operator was licensed. Until 2004, the telecommunication sector was dominated by the public operator Nepal Telecom which has been providing both fixed and mobile telephony.

In Nepal, in recent years, the Nepalese telecommunication has changed considerably. The country has attempted to modernise infrastructure through introducing new services such as mobile telephones. Furthermore, the development in ICT in recent years has been changing with more private operators entering the ICT field, including fixed wireless local loop operator in the capital city (United Telecom), a new mobile phone operator (Spice Nepal/ Ncell) and a rural operator that provides VSAT-based connectivity. Despite the changes, Nepal Telecom still is the biggest telecommunication provider with the most network coverage in Nepal.

In 2006, Nepal Telecom introduced CDMA (Code Division Multiple Access)-based phone system with an aim of developing rural telecommunication infrastructure in Nepal. The CDMA based phone system has brought a revolution in rural communication in the country and with wide network coverage (almost 76 out of 77 districts) where GSM network signal cannot reach. Besides providing mostly voice service, Nepal telecom also provides data services through CDMA system. Many rural and remote parts of the country are still without access to telecommunication services, even though the expansion of the network to remote and rural areas has been a policy objective for several years.

4.8.1.1 Key factors of rural communication

The issue of defining "rural" has taken up much time at many meetings around the world. Usually it is very difficult to reach agreement, and different groups in different countries come up with and use different definitions. The key is what purpose the definition is used for.

Developed countries tend to define rural (often remote at the same time) as related to the size of communities (population) and, in terms of remoteness, distance. This is less useful in developing countries where size of the population bears little relationship to the degree of development, infrastructure and services. But normal characteristics of rural areas in technical terms be it health or telecommunication, can be defined:

a. Difficult topographical conditions such as mountains, hills, deserts, rivers, lakes, and long distances between settlement areas, which cause the construction of telecommunication networks to be costly.

b. Severe climate conditions that make heavy demand on the equipment such antenna and remote switches, and may add to the cost of installation as well maintenance. Furthermore different climatic conditions in a country demand different kinds of technology that suite the conditions.

c. Lack or absence of public facilities such as clean drinking water, reliable electricity supply, access roads, regular transport, and an existing communication infrastructure.

d. Underdeveloped social infrastructure such as health, education, business and lack of most government services

e. Low level of economic activities. The existing economic structure is mainly based on agriculture, fishing, and handicrafts. Therefore, few opportunities exist in rural areas in terms of jobs. Low-paying work leads to low family income and little demand for communication.

f. Scarcity of technical personnel even with nominal telecommunication knowledge because of low educational level and high illiteracy rates.

g. Very high demand for voice communications and a steadily growing demand for data communications.

The above mentioned characteristics provide only technical insight into rural areas. There are many cultural and deep-rooted traditions that make it difficult not only for any network operator to install the basic network infrastructure in rural areas, but also for service providers to provide public telecommunication services with an acceptable quality by traditional means at affordable prices, while also achieving commercial viability. However, there is little alternative to developing telecommunication infrastructures in order to improve the quality of lives of people living in rural areas in developing countries (Craig and Patterson 2005). For ICT to offer sustainable health improving potential a partnership approach would be very essential. Furthermore, basic necessities; like clean water should not be made an option of choice with IT development.

4.9 Telemedicine in Nepal

Telemedicine services are spreading globally with ever increasing claims around benefits of telemedicine for rural settings in developing country like Nepal. These claims have stimulated the interest of the government, private hospitals and NGOs in Nepal too. A number of rural hospitals and villages in Nepal are linked with urban based hospitals and specialists, and some with foreign hospitals and specialists and many are on their way to implementing these links, including within the government health system (Table 4.2). However, apart from Government Initiative, the rest are all run by charitable organizations.

Hospital	Type of TM	Date Started	From	To	Specialities	Cases in 6/12 mnth	Funding
Government	Email and Video conferencing V-sat.	Planned	18 District Hospitals	Specialists	Various	0	Ministry of Health
NSI	Email	2000	Mission Hospital	International	Various	20	Charitable
Nyaya Health	Email	Planned	Health centre	Hospital		0	NGO
Patan	Email	2001	Hospital	International	Ortho	1	Charitable Hospital
STM telecom	Satellite broadband	2007	Villages	Hospital		Low	private
PHASE	Telephone cdma	2006	Health post	Specialist	Obs Paed GP	10	NGO
Kathmandu Model Hospital	Email wire less	Planned	Health posts	Hospital	Various	0	Hospital
OM Hospital	Email and Video conferencing	2004	Hospital	Apollo hospital	Various	11/9	Hospital / private
Dhulikhel Hospital	Telephone CDMA	Oct 2007	Health Posts	Hospital	Med, Derma	10	Research

Table 4.2 Range of organizations involved in telemedicine in Nepal (Source: Telemedicine Conference 2008)

The developments of telemedicine in Nepal are certainly encouraging and many now have existed for nearly a decade. However, the uptake of the telemedicine service is very slow and evidence of success is limited. Several actions attempted with great enthusiasm though mainly based on trials, have been very encouraging which further highlights an urgent need to address the unmet health issues of remote and rural areas in Nepal. This enthusiasm and urgency further demonstrates the need for in-depth and robust research with an appropriate methodology in exploring the acceptability and feasibility of telemedicine in the context of Nepal.

For the sustainability of Telemedicine, community involvement is very important and though cost effective in the long run, cost must always to be taken into account when launching such schemes. It is essential to view the big picture through integrated solutions while implementing telemedicine in the rural areas.

5 The researcher in context: Halfie researchers

5.1 Introduction

Abu-Lughod (1991,p.137) uses the term 'Halfie' which is useful to describe the identities and experience of researchers 'whose national or cultural identity is mixed by virtue of migration, overseas education, parentage'. The researcher's Halfie status is derived from living in two different countries (Nepal and the UK) for a certain period of time and holding two different social identities between Nepal and the UK. In this chapter, the researcher shares and reflects on his personal account of the PhD. "About Me" is a personal account therefore the 'Researcher in Context' is written in the first person.

5.2 About Me

I am Tshering Lama, a graduate of Northumbria University with Master of Public Health (MPH) and BSc (Hons) Health Development Studies degrees. My home is in a very remote part of Nepal: the village of Sermathang in the Helambu Region (to the North East of Kathmandu) at an altitude of 3000 metres.

I attended the village school and became actively involved in the health issues in the village at the age of 13 as a volunteer village health worker. In my spare time, I visited the sick, treated minor illnesses and learned to detect serious illnesses and to refer them to city hospitals with help from the books "Where there is No Doctor" and "Helping Health Workers Learn" written by David Werner (http://hesperian.org). This initiative further involved teaching the population of the village literacy and numeracy skills, and basic preventative health measures.

I went to Kathmandu (the Capital City) and was able to study A-levels and worked as a volunteer at the only children's hospital in Nepal. I won a scholarship to Norway in order to attend an International Student Festival and took part in Global Health debates. I was also able to attend a Harvard University Symposium (in Singapore) where I was awarded the "Outstanding delegate" award for participation and presentation of my health initiatives in a rural area.

My higher education (BSc Hons) in the UK was sponsored by a very generous British family and friends. Since I arrived in the UK, I have been involved with several volunteering projects. I was awarded both a Millennium Voluntary Award and the first

Lord Glenamara International Scholarship in recognition of my efforts to improve public health and the environment while studying in the UK (http://www.northumbria.ac.uk/static/insightarchive/338475).

In 2006, I was also named as the International Student of the Year 2006 for the North East and had the unique opportunity at the time, of a reception with the then Prime Minister, Tony Blair in 10 Downing Street. Due to this, I was subject to extensive media coverage in Nepal and later that year our university further honoured me by establishing 20 special scholarships for Nepalese students under my name "*Tshering Lama Northumbria University Scholarships"* (www.northumbria.ac.uk). These events received enough media attention to change my life forever.

During my course of studies (both Masters and BSc), I concentrated my efforts into the health of developing countries. Most of my assignments and projects were in the context of developing countries, especially Nepal. These endeavours certainly gave me a wider understanding of the health care situation in developing countries.

I started to reflect upon the challenges and frustrations faced by myself as a village health worker and a volunteer in the children's hospital. I started exploring possible solutions and attempts made by individuals, organisations (both national and international) and the Nepalese government to overcome such challenges. Both the previous courses were fantastic, giving me a platform from which to understand and look for possible solutions. I came to believe and realize that the "Health For All" vision is and will be a difficult one, perhaps impossible, because of the burden imposed by growing populations, by old and new diseases and rising expectations of health and socio-economic conditions (WHO and the World Bank 2002). These have, if anything increased the disparities in health status between and within countries (UNDP 2009). I consulted experts who had knowledge of some solutions to the challenges that countries like Nepal face and I was introduced to Telemedicine and its possible benefits for countries like Nepal.

Indeed, the recent advances in Information and Communication Technologies (ICT) have created unprecedented opportunities in the number of ways health care can be delivered. I carried out a systematic appraisal for my MPH thesis on "***Is telemedicine a viable strategy for healthcare provision in the rural areas of developing countries like Nepal? A systematic appraisal of telemedicine and its feasibility, cost-effectiveness and sustainability in rural areas of developing countries".*** This confirmed and gave me more

assurance that the recent advent of information communication technology (ICT) and the application of telemedicine promises to unleash new opportunities for the delivery of health services in remote rural areas. This further encouraged me to enrol for the PhD in order to explore and research in depth the potential for ICTs to improve health and health care in Nepal.

My PhD has been a centre point of my academic journey: the centre point between a "Learning phase" and a "learning and action phase". Therefore I consider that my PhD was (is) a "Bridge" between these two phases. Furthermore, in order to implement the knowledge and see the impact on the real lives of people in Nepal, I had to build a bridge (*Process of translating knowledge into wisdom*). In my opinion people in Nepal poses wisdom but they need to have the knowledge (right information and right methods) to translate into action. The people in the University, my lecturers and PhD supervisors have given much information and imparted knowledge but I couldn't convert these into wisdom until I started engaging in this project. Therefore applying Telemedicine in the remote part of Nepal has been my first attempt of applying knowledge into action. I further personally regarded the opportunity of conducting this research, with help from my academic supervisory team, the research partners and many others who supported me directly or indirectly, as invaluable experience through which I would be able to enhance my goal of applying my education and knowledge back home in Nepal.

However, working with people in applying knowledge with passion is certainly challenging. On many occasions the challenges came with many facets, both personal, professional; as a Nepali and as an academic researcher. Great faith in me and genuine support from supervisors and the research partners was needed. A very demanding academic disciplined approach and faith in myself was paramount. A *"can do attitude"* played a pivotal role in maintaining my role as a "bridge" or "catalyst" in the research. The changing and interwoven roles are described below.

5.3 Building bridges between the researcher and the research participants

Introducing myself to the research participants was not much of a difficulty due to my early achievements and the recognition I earned in the UK. When I first went into the hospital as a researcher, I had a wonderful welcome by the hospital and they gave me assurance of full support towards the research project. However I had to demonstrate and build a new level of understanding with research partners beyond my existing (little) fame in the country and hard earned University degree. Therefore I invited my supervisor team to give me the needed academic credibility to my work. These visits were very important for me and for the research elements which required "Unblocking, Unlocking and Validation". Professional barriers between myself (a non-clinical public health researcher) and the research partners (clinical health professionals) were unblocked due to the supervisors' professional and institutional credentials. These visits further supported the unlocking of access to the research partners and provided the requisite added validation to the project.

The visits were equally important for me in "Unblocking, Unlocking and Validation" at the University level too. For example, after their visits to Nepal, on many occasions it became easier for me to explain the real world research situation. Their understanding of my explanation of the nature of the messiness of PAR was enhanced and I was able to more legitimately defend delays in the research development. The details of supervisors' visits are presented in the Methodology Chapter and under Preliminary Consolidation (Section 6.8)

In addition to introductions and the supervisors' visits it was essential to share the journey with the participants. This was achieved through close engagement with over a period of time and is described further in the following section.

5.4 Listening more listening and again listening

Listening took place at different levels in this research. In the early phase of the research, the participants only answered the questions I asked either by filling in questionnaires or via interview- a typical researcher and participants' relationship. This early phase was certainly a challenging one: as it was not participation in the PAR sense at all and in many cases they hesitated to answer the questions and get involved in the discussion; for example in the area of job satisfaction. In many cases, I asked the question to myself.

Indeed why should the participants tell me, if telling me wouldn't improve their working life or even their personal lives? On the other hand, I realized that none of the interventions would work and be sustained if we failed to acknowledge the existing situation and challenges of the participation. Therefore, I decided to open up and declare myself as a Nepali first rather than a western graduate researcher. I started spending more time with the research participants listening and observing.

Listening, observing and being with them and taking little actions where and when possible gave me the key to enter the completely different world of the health workers in their Nepali context. The *Unblocking* had begun. I felt more accepted amongst the group: I was invited and joined the lunches with the hospital staff where they shared their hopes and fears, joy, laughter and tears amongst colleagues. In many cases some of the participants directly came to share their aspirations with me. I gradually understood and had the opportunity to experience the first-hand account of being a health professional in Nepal. Listening and further observation gave me an in-depth understanding of how organizations function and what the health professionals' daily routines were. On many occasions they told me how things function and who I should talk to in-order to implement a new system within the existing system. There was so much more which needed to be done in the hospital and the outreach centres before I could even start my project. I had to listen more**.** While doing so, health professionals shared their hopes, fears and challenges. The research participants not only shared with me their challenges but offered possible solutions to overcome those challenges too. These "listening" periods gave me a wider understanding of a vital component. The research participants sometimes just needed someone to listen to their concerns and they needed to feel valued.

Thus early bridges were established between, myself, the hospital and my supervisory team. However, much 'work' was needed to mature the engagement with participants. The next section addresses some vital aspects.

5.5 Building the Bridge in both directions: University commitments and Moral commitments

Due to my "Halfie" researcher role, I had to demonstrate my capability (ies) in a way that both the people in Nepal (where I was working) and the UK understood (UK referring to my research supervisors).

In the context of Nepal, I experienced a separation from the local people (including my parents). Sometimes they struggled to understand what my academic life was all about. The challenges of acquiring knowledge and having a disciplined approach within an academic environment were alien to most. For many participants in Nepal there was a need for action or physical demonstration to be witnessed where the contribution of my knowledge was apparent.

For the University, demonstrations were needed of smooth and continued progress towards the completion of the PhD and making an original contribution to knowledge. Therefore, in this research I had to look forward and backwards fighting battles in-front and behind me, depending on which way I was facing. In many cases the *bridge(s)* were simply my *passion* and my sheer *determination* to implement knowledge into action with the help of this research. The passion was, and still is, working with both the people in Nepal and the people in the academic world of the University through implementing knowledge into practice in the best possible way.

The level of bridging is further explored in this research and is required for the tangible outputs. As the research unfolded and due to the flexible nature of PAR, the following levels of bridging evolved. In many cases these bridges (relationships) already existed but just required acknowledgement, nurture and improvement which occurred during the life span of the research and are discussed in the later chapters of this thesis.

5.5.1 Bridging on different levels:

- Between outreach Health Workers and Villagers
- Between Outreach Health Workers and Government Health workers (sharing resources)
- Between Outreach Health workers and Doctors
- Between Outreach Health workers and Management committee (Director)
- Between Technology providers and Hospital
- Between all the Telemedicine advocates and implementers
- Between myself and all above

In this developmental research journey I had to demonstrate the engagement in participation and build the bridges as identified. However the challenges for me as a

insider were in terms of establishing the rigour of the method, questionnaires, semi-structured interviews and reflection. These were all carefully documented alongside other records of information gathering and the development of these data provided an audit trail of the research evidence. Furthermore, credibility of my analysis is demonstrated through the extensive use of the evidence, that is in the words of the participants, (albeit transcribed and translated).Thus rigour helps to establish the trustworthiness of the themes which are based on data not insider bias.

Hence as researcher I have used both Nepalese and UK academic status to enhance the participation and assure the rigour, credibility and trustworthiness of the outcome.

In short, this chapter has highlighted the position of being a “Halfie” researcher as a “mixed blessing”. The chapter has considered the issues relating to the importance of my (as a researcher’s) credibility towards this research in the specific context of Nepal. Despite PAR being a powerful methodology to explore the introductory use of telemedicine, it was not spared from shortcomings and criticism. Thus methodological challenges and pathways are the focus of the following chapter 5. From the next chapter, the project will be presented in third person objectives. Although I return to the third person such prose does not, and indeed cannot, deny my deep emotional involvement in the project.

6 Methodology and research journey

6.1 Introduction

This chapter highlights the philosophical and personal justification of using Participatory Action Research (PAR) methodology and methods in exploring the feasibility of telemedicine in the context of rural Nepal. The justifications involve the rationale of choosing a particular research methodology (PAR), insider-outsider researcher tensions, key milestones and influences (the reader is reminded of the Researcher in Context chapter), and research methods including sampling, data collection, data analysis and ethical issues.

The chapter highlights the importance of reflexivity within PAR during the researcher's own personal and professional transformation. The transformation of the researcher and the researched are embraced throughout the research journey within the themes of "Unlocking, Unblocking and Validation".

6.2 Choosing a research methodology - Participatory Action Research

Participatory Action Research (PAR) was selected for this research as it is the ideal approach when exploring local knowledge and perception with respect to understanding the people and translating knowledge into action.

Another reason for using PAR is that it goes further than Action Research (AR), extending appraisal into action by and with the community (participants) and endeavouring to be an empowering process rather than one in which the participants are subjugated and exploited (Gibbon 2002). Participatory Research (PR) and AR share many similar values and employ common methods in different setting (Reason and Bradbury 2008). Both of these approaches have their own strong research ontological paradigms. PR is the process of restoring confidence for the participants in which they can be empowered through engagement and can face problems that are identified. AR is a process to explore ways of taking action to improve learning with social intent (McNiff and Whitehead 2006).

The researcher's personal justification for using Participatory Action Research (PAR) is found in the definition of participatory research as;

"A growing family of approaches and methods to enable local people to share, enhance and analyse their knowledge of life and conditions, to plan and to act" (Gujit and Kisadha 1994 cited in Gibbon 2002).

PAR works with a community and brings people together as a family. The participants are groups of people who share a common interest but may not live in the same geographical location or indeed show the same social status or privileges. Furthermore, the approach ensures that sufficient deliberation occurs with all those involved in the process to ensure that everyone feels involved and has a sense of ownership of the outcomes. There is a high degree of participation by the project beneficiaries in all the phases of the project execution (Koch and Karlick 2006).

Further reasons for using PAR in this research are found in Hall (1981, p7) who states that PAR is an integrated activity that combines social investigation, educational work and action and is designed to support those with less power in their organization or community setting (2001, p 171). McTaggart (1997) sees PAR as emphasizing 'real' participation and 'worthy' action.

There is a philosophical distinction (Tolley and Bentley, 1996) between the PAR approach and other qualitative methods: this is based on the roles played by the researcher and the researched. In empiricist research, the roles of the researcher and respondent within the research process are distinct. The researcher defines the questions for the research and determines how data collection is to proceed. Both the research problem and the methodological tools are predetermined. The informants provide information but are seldom involved in the collection or analysis of data.

PAR's philosophy is outlined further by Fals-Borda and Rahman (1991) in *action and knowledge.* It is an innovative approach to rural social change, which does not consider institutional boundaries but actively involves people in generating knowledge about their own condition and how it can be changed. PAR is not static and fixed; it is a dynamic process that can change with time and situations as deemed necessary.

Despite being a strong methodology to explore wider aspects of health needs in a country like Nepal with a huge diversity of people and topography, the methodology has its own

drawbacks. First and foremost is the word "participation" itself. Participation invariably means different things for different people and is therefore a highly contested term. To add to the confusion, participation is often called (or equated to) many things such as "engagement", 'empowerment', 'involvement', 'consultation', 'deliberation', 'dialogue', 'partnership', 'outreach', 'mediation', 'consensus building', 'civic science'(Chilvers 2009) and the list goes on. The term is further contested when translated into the Nepali language. During translation the researcher used the nearest meaning possible for the word participation itself: for example, by using words like involvement, engagement, partnership and support.

Beside the word itself, one of the fiercer critiques of participation globally is that proponents and deliberative theorists have been 'naive' about the complexities of power and power relations (Cooke and Kothari, 2001: 14) and overly optimistic of the potential to equalise power and resource inequalities. Instead of seeing power as something held in the hands of a few waiting to be redistributed most criticism has been around *planning* (e.g. Flyvbherg, 1998); Tewdwr-Jones and Allmendiger, 1998) and *development* (e.g. Cooke and Kothair 2001).

A Foucauldian approach to understanding power is that it acts everywhere and circulates through networks of discourse, practice and relationships (Foucault 1980). The researcher acknowledges the complexities of power relations and their practices that exist especially in Nepal. This complexity was evident in the fieldwork as power struggles exist in every level of the society. It is equally important to understand these and how they relate to responsibilities. In many circumstances, the power relations and responsibilities in Nepalese society were the key to forming a partnership with stakeholders for this project. The stakeholders, including the researcher, had varying degrees of expertise and experiences of power. These came into use, for example, in mobilizing resources and in articulating concerns. The research was more easily facilitated when organized through the medium of dominant local stakeholders or 'leaders'. Questions of control and power emerge as natural phenomena in PAR and are hopefully resolved through dialogue, listening, and learning (Lincoln and Guba 2000; Marin, 2001).

One of the key strengths of PAR is through the role of the researchers. Participatory Action Researchers are flexible and reflexive rather than linear and structured. Participatory Action Researchers become co-learners and facilitators. Collaborative research is where researcher and the researched work together on the project which is

co-designed, initiated and managed by the researchers. Furthermore, the researchers take into account the wholeness of the inquiry and through reflexive looking, learning and action co-generate meaningful practical knowledge (Greenwood and Levin, 1998).

The researcher's role and influence over the research process has always been questioned in PAR. One of the best-known critics of PAR is Meulenber- Buskens, (1996, p. 47) who states that:

"[PAR] is as an alternative research approach that already indicates a certain stance on science, on society and on human beings. Regardless whether a specific research project has been initiated by a group / community or by a researcher / research team, the trap for participatory researcher (s) to become patronising and manipulating has already been laid. The implicit, perhaps unconscious attitude of knowing better and wanting to do good seem to be in contradiction with the feelings of respect and equivalence one should have toward the research participants"

This researcher is fully aware of the need to tread a careful path between generating sufficient interest for participation and not raising false hopes. Identifying honesty and the limitation of what can be achieved at the outset is an important part of establishing trust. These actions took considerable time as the researcher explained and listened to participants' questions about the project. However time-consuming, the process enhances effectiveness and saves time and money in the long run. The unfolding inquiry process involves iterative cycles of self-learning, reflection and action (Heen 2005; Koch, Man, Kralik and Van Loon 2005; Greenwood and Living 2000).

Cornwall and Jewkes, (1995) argue that in PAR, the "outsiders" (researchers) and "insiders" (respondents) are partners, sharing and learning together. Chambers (1983, p12) has said that the "outsider are convenors, catalysts and facilitators." However on several occasions due to the nature of the research, the researcher had to play dual researcher roles of insider and outsider.

The dual identity of a researcher both as “insider” (Nepalese, born in a mountain village) and “outsider” (researcher) serves as a resource to facilitate the participatory work. However, there are advantages of a dual identity - *ensuring an authentic account as a Nepalese* - and disadvantages - *arising from the potential bias from being too close to research subjects*.

Burgess (1984 in Allen 2003) observes that as the debate about familiarity and strangeness has become polarized in the literature, situations are neither totally familiar nor totally strange. The researcher’s insider/outsider status changes at different points in a research project and is different with different groups and different individuals. In this shared and participatory action research, the ‘insider’ perspective of the Nepalese researcher is balanced by the ‘outsider’ perspective as the principal investigator in order to make the strange familiar and the familiar strange.

The researcher does have several advantages of being an insider such as easy understanding of what is (was) going on, prior knowledge of where and how to gather data, being sensitive to age, gender, ethnicity, religion and castes of research participants. Combined with being responsive to and respectful of all groups this enabled wider participation in the study. The dual identity of the researcher is further discussed in the previous chapter, “The researcher in context.”

In many situations, the status as ‘insider’ of the researcher is obfuscated by the status of being ‘outsider’. For example, the need for an introduction defines the researcher as somebody who is a stranger to all the research participants with different ethnicity, educational and training background and approaches towards research.

In exploring this project in Nepal, with PAR methodology, the researcher had to function in first, second or third persons depending on the situation. Reason and Bradbury (2008 page 6) differentiated first person practice ‘work for oneself’ ; second person ‘work for partners’ and third person ‘ work for people in the wider context.’ Heen (2005) describes her uneasiness in first person inquiry to over - inquire, and suggests instead to ‘let the wholeness be’ (p.275). This researcher too felt discomfort in first-person research, particularly revealing self-inquiry of his personal journey and self-discovery, thoughts and tensions, yet this is the process that creates the wholeness of the project.

6.3 Contextual use of PAR

This section describes how PAR methodology was adapted for use in this particular study. The overarching themes of "Unlocking, Unblocking and Validation" are defined in this section as they emerged as key transforming signposts throughout this research journey. The dynamic and the circular relationship between these overarching themes become clearer as the thesis unfolds.

Unlocking refers to the process of talking to each of the stakeholders to find out their views on current health care delivery in rural Nepal. In doing so (talking), the concept highlights their own potential for making contributions and identifies blocks to further progression of the research study.

Unblocking refers to the process which works out the methods of removing those blocks identified during the unlocking process. It also embraces changing attitudes to and correcting misconceptions of the research techniques involved.

Validation defines a specific outcome which have been achieved after the process of unlocking and unblocking. These outcomes may range from changes in attitude of participants (subjective) to cases dealt with by telemedicine techniques (objective)

These themes will be visited and re-visited several times as the researcher and the researched travel complex interlocking pathways in this project. The researcher's own Unlocking, Unblocking and Validation experiences were highlighted in the Chapter 5 and will be revisited again in the discussion chapter (section 10.2).

6.4 Methods

Participatory Action Research (PAR) is more of a holistic approach to problem solving rather than a single method for collecting and analysing data. In the study presented the participants led the direction of travel and partners were involved in solving issues. Data collection evolved, followed by actions taken. There is further discussion of the evolving process in the next chapters. This chapter now explores the sampling method, data collection and data analysis framework.

6.4.1 Location

Research participants or partners were identified through using the existing infrastructure of Dhulikhel Community Hospital and its outreach clinics. The research sites were negotiated with the hospital and three village health posts with a similar catchment area but different geographic location and demography were indentified. Figure 6.3 shows their locations in relation to the topography of the area. A brief introduction to the hospital with three of the outreach rural village health posts: Bahunepati Health Centre, Kartike Deurali and Bolde Health Centre, follows:

6.4.1.1 Hospital

Dhulikhel Hospital (figure 6.1) is located in Dhulikhel Municipality which is the headquarters of the Kavrepalanchowk (Kavre in short) district, and has a population of about 14000 people. Kavre district has the population of about 1.6 million people. Dhulikhel is situated 1650 metres above sea level and is 30 Km northeast of Kathmandu, the capital city of Nepal.

Figure 6.1: The ever expanding buildings of Dhulikhel Hospital

Dhulikhel Hospital (a Kathmandu University Hospital) is an independent, not for profit and non-governmental (NGO) institution which was started out as a community health centre

with four beds in two rooms in 1996. The hospital made rapid progress with collaborative support from the Municipality of Dhulikhel, NepaliMed Europe (an International Non-Governmental Organization) and Dhulikhel Health Service Association. In 14 years, the hospital has grown, expanding from four to 317 beds and from two doctors to more than 72 fulltime doctors, 130 nursing staff and more than 400 other staff including administrative and support staff providing quality, equitable and affordable health services in the region (DH Annual Report, 2009).

In 2010 according to its prospectus the hospital attracted patients from a population of approximately 1.9 million people from Kavrepalanchowk, Sindhu-palchowk, Dolakha, Sindhuli, Ramechhap, Bhaktapur and other surrounding districts. Indeed Dhulikhel Hospital has already provided services to people from more than 50 out of the 75 districts in Nepal (Dhulikhel Hospital Prospectus 2010).

In 1998, in collaboration with Kathmandu University, the hospital started health science academic programmes in the field of General Medicine (Health Assistant) Physiotherapy, Nursing, Laboratory and Ophthalmology assistant courses to meet the need for mid-level health care professionals. In 2004, Dhulikhel Hospital started a medical school and has been producing doctors and other health service professionals for Nepal.

6.4.1.2 Outreach Centres

Besides hospital based tertiary care, from 1999, the hospital also started providing basic health services to people in the rural areas through its own outreach centres with a philosophy of serving the most needy and vulnerable groups of the population. Currently, there are 12 different outreach health centres under the management of Dhulikhel Hospital (Figure 6.2) in different parts of Nepal.

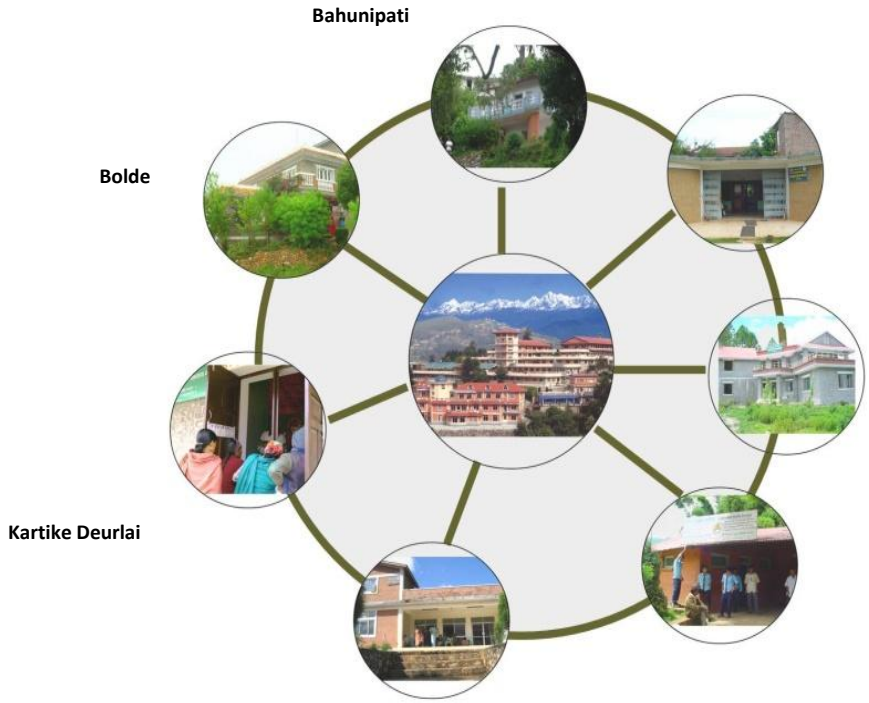


Figure 6.2: Dhulikhel Hospital's outreach centres in 2009

Each of the outreach centres are run under direct supervision of the hospital. There are two to three residential staff (HA, CMA, ANM) in each outreach centre which provides health services to local people 24 hours a day. The health services include basic management of illnesses, medicine dispensing, dental services, minor surgical procedures, family planning services, maternal and child health care, conduction of deliveries and proper referral services. Laboratory facilities for basic investigations are available in the centres at Bahunipati, Dhading, Bolde and Baluwa.

All the centres have particular days for doctors from the hospital to visit. This day is also used to provide specialist services (for example visits by the paediatrician, obstetrician and gynaecologist, surgeons and from other disciplines). In order to provide specialist care and support at the point of need, the hospital started a wireless Radio Link system. Unfortunately this failed due to the lack of an initial feasibility study and frequent breakdown of technology. However despite all these challenges, the hospital is committed to serving people in better and more effective ways. Due to the common

interests amongst the partners (researcher and the hospital) the decision was taken to extend this project jointly using a more sustainable approach. (A formal letter from the hospital: Appendix 1).

The philosophy and vision of serving the remote populations is unique in Nepal to this hospital. The shared vision in providing improved health care in the remote areas between the hospital and the Telemedicine Project through participation with community and involvement of all stakeholders would not have been possible in the other hospitals. Dhulikhel Hospital and its three outreach centres- Bahunepati Health Centre, Kartike Deurali and Bolde Health Centre - were the sampling venues and chosen for the research case studies. The health centres are introduced briefly in this chapter, however clear pictures of the health centres will evolve in the later chapters in the thesis. The locations of these health centres relative to the hospital are shown in the figure 6.3. The distances as the crow flies between the hospital and health centres are only about 15-20 kilometres. The time taken to travel between the hospital and the one centre can vary between 3 to 8 hours due to the poor roads and mountainous environment.

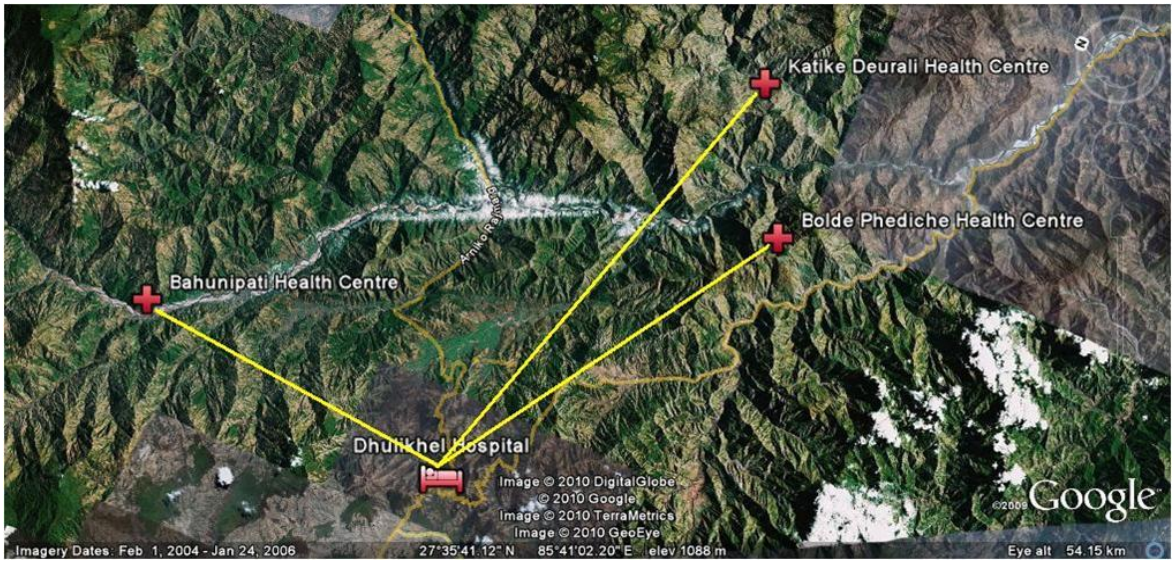


Figure 6.3 Aerial view of the location of the research sites:

	Bahunipati	Kartike Deurali	Bolde Phediche
Population served (estimated)	30,000 (est 2009) In the radius of 2 – 6 hours walking distance	20,000 (est 2009) In the radius of 2 – 6 hours walking distance	10,000 (est 2009)
Distance in travelling from Dhulikhel Hospital majority are dirt roads	3- 4 hours Depending on time of the year (4 wheel drive) Local bus 4-5 hours (2008 – 9)	5- 6 hours (4 wheel drive) (No accessibility in rainy season walking 1 day) 1 Local bus daily – 7 hours	5- 6 hours (4 wheel drive)and walk for hour to the health centre 1 Local bus daily – 7 hours
Number of staff	2 CMAs, 1 ANM, 1 lab technician (joined in 2010) and 1 helper	1 CMA, 1 ANM and 1 Helper	1 CMA, 1 ANM and 1 Helper
Infrastructures:	Own building Electricity (Generator back up) Lab Pharmacy Phone	One big hall rented from local school No Electricity (No Generator back up) No Lab Pharmacy Phone	Own building Solar power Lab / portable ultrasound Pharmacy Phone

Table 6.1 Basic information on the three outreach centres for the project

6.4.1.3 Government Health Centres

Besides the existing Dhulikhel Hospital's network, the researcher together with the hospital and outreach clinic staff agreed to include Melamchi Primary Health care (PHC) and Sindhukot Ilaka Health Post. These are part of government health services located near to Bahunipati health centre with which they had informal partnership working relationships.

Melamchi PHC centre is responsible for eight Village Development Committees and an approximate population of 100,000. The PHC was staffed with one Medical Doctor, one Staff Nurse, three Auxiliary Nursing Midwives (ANMs), two Community Medical Assistants (CMA), one Village Health worker, one Lab technician and two Helpers. The opening hours for the PHC were 10 am to 2 pm from Sunday to Thursday and on Friday the centre only opens from 10-12. It is closed Saturday. Patients have to pay Nepali Rupees 5 to as

registration fee on normal days; however the centre runs out-of-hours emergency services with a cost of Rupees 50 per patient. (GB Pound 1= Nepali Rupees 120).

Sindhukot Illaka Health post was manned by one Health Assistant and one Auxiliary Nursing Midwife during the research visit. Two CMAs and one Village health worker were out of station; however the purpose of being out of station wasn't disclosed during interview. The centre was supposed to be staffed with 1 Health Assistant, two CMAs, one ANM, one Village health worker and one helper.

The centre had an informal link with Bahunipati health centre for referral purposes, sharing government provided resources for free distribution such as contraceptives (government allocated), immunization and TB medicines.

6.4.2 Participants

Three groups of research participants were recruited: doctors from Dhulikhel Hospital, Village Health Workers from Dhulikhel Hospital's Outreach centres and health workers from Government health centres.

6.4.2.1 Dhulikhel Hospital doctors

The doctors who participated in this research were fulltime and specialized in different disciplines. Their normal duty was from 8am till 4pm however they also had to cover on call shifts on a rota. Besides their clinical commitment, they also have to take classes for medical, nursing and allied health sciences students. Furthermore, many doctors have a responsibility to visit Dhulikhel Hospital's outreach centres once or twice a month.

These participants were identified using a convenience sampling approach and given the information sheet (appendix 2) before taking part and asked to sign a consent form (appendix 3). This information sheet and consent form was made available in both English and Nepali languages. During the life of the project the participating hospital staff were invited to offer their comments on specific telemedicine case studies.

6.4.2.2 Dhulikhel Hospital outreach staff

There were two to three residential paramedical staff in each outreach centre of Dhulikhel Hospital who provided health services to the local community 24 hours a day. These included basic management of illnesses, medicine dispensing, dental services, minor surgical procedures, family planning services, maternal and child health care, deliveries and proper referral services.

Their qualification backgrounds varied: Health Assistant (3 years course) Community Medical Assistant (CMA) (18 month vocational training) Auxiliary Nursing Midwifery (ANM) (18 month training). These professions are trained to provide primary level paramedic services in the health posts and sub health posts. (HA CMA AND ANM all described in Chapter 4 Nepal in Context under section 4.6).

6.4.2.3 Government health workers at Primary Health Care Centre

Out of six government health workers participated in the survey, four were available and agreed for interview from a Primary Health Care (PHC) centre and sub health post. One was a doctor, one Health Assistant (HA), one community medical assistant (CMA) and one auxiliary nursing midwife (ANM).

6.4.3 Role of Patients / villagers

Villagers / patients and their family members have only been involved in this research as recipients of a telemedicine consultation. Through the principle of PAR it was hoped to involve villagers / patients at the start of the study. However the level of participation changed as the research progressed due to the nature of the health care system in Nepal, in which patients were only the passive recipients of the service. They are more concerned about having health care facilities in their village rather than the level of care they can get in the centre. In many respects the researcher was forced to conclude that "they don't know what they don't know." This also raises a particular question around how ethical it is to be raising expectations which may not be deliverable by the researcher. Local people have limited prior knowledge of their own needs. Therefore they were only involved in the case studies where they received medical care. So, the actual data collected focused on service providers rather than patients or villagers.

6.5 Data Collection Methods

In this project, the researcher used a number of strategies to ensure a comprehensive account of the experiences of the study participants. In the first stage of the research, multiple data collection methods were used. These included questionnaires, interviews with doctors, Health Workers and patients, and observation of their practices, which were used to obtain a comprehensive account of the participants' experiences. The findings informed the next phase of the research.

Figure 6.4 shows the overview of methods used in data collection and how the methods are inter-linked to each other forming a particular pathway for a comprehensive data collection in this research. Furthermore, the cycle formed between interviews and listening and being with methods of data collection generated case examples. The methods used in these unusual pathways of data collection are highlighted later in this chapter.

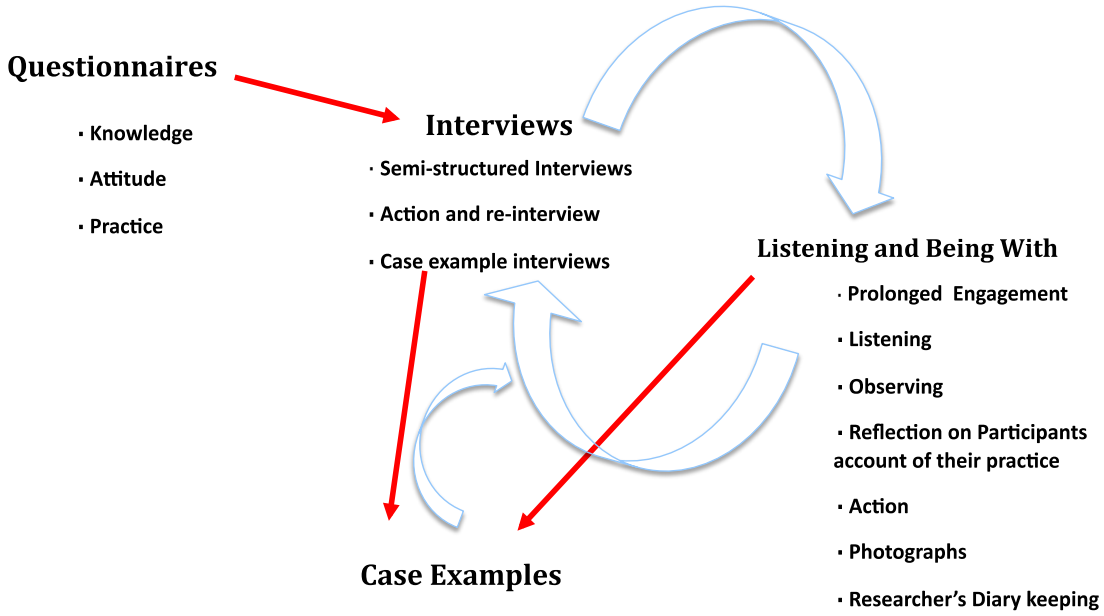


Figure: 6.4. An Overview of Methods used in Data Collection.

6.5.1 The questionnaires

The main objective of conducting survey questionnaire (appendix 4) was to explore "knowledge, attitude and practice" of Telemedicine amongst health workers and their understanding of the role of ICT in health care delivery. The reason of using the survey is it is one of the most common ways or methods of collecting required information from a sample or the population of interest (Bowling and Bell 1999). The questionnaire has current relevance because it provides an insight into the future trend and pattern of use of Telemedicine. Furthermore, the surveys are capable of measuring many dimensions of the same phenomenon, so carried out with closed questions, which usually takes about 10 minutes to complete and mostly a matter of ticking boxes to indicate participants' opinion. Most of these questions were kept short and with simple language. Participants were given various options to express their opinion using Rating scale and likert-scale for easy response and independent response for each item (Sproull 1995).

The questionnaires (appendix 4) were administered according to the availability of the health workers during the second and third visits to the hospital outreach centres and at the government health centres in rural locations. Before the survey was conducted the health workers were given enough time to go through the participant's information sheet (appendix 2) and sign the consent form (appendix 3). This survey focused on several variables, specifically:

- *Demographics: Age, Gender, Ethnicity and Occupation of participants*
- *Communication - how help with specialist was sought and knowledge of different modes of communication and possibility of using email and internet in the future*
- *Satisfaction with consultation*
- *Influential factors and personal beliefs in telemedicine*
- *Effectiveness of telemedicine in different diseases*

The majority of health workers were happy to be interviewed after the completion of their questionnaire which made data collection more convenient. The semi-structured questionnaire was used to guide the interview (Appendix 5).

Doctors were not given questionnaire as the questions were very basic. For example measuring knowledge using likert-scale on use of computer, phone and video-conferencing and so on. This information became evident from early experience in the

hospital where almost all the doctors were using their personal computers. However, doctors participated in semi-structured interviews later in the research.

6.5.2 The interviews

Semi- structured interviews were conducted with doctors, outreach health workers and government health workers which allowed the aims and objectives of the study to be met, whilst enabling exploration into possible new areas of interest (Mays and Pope 1996). The interview method of data collection was particularly useful in exploring in-depth understandings about the personal context behind a participant's experience and the meanings they attribute to these experiences (Koch and Karlic 2006). Interviews further provided the opportunity to discuss possible ambiguity, which increases validity (Clifford, 1997). Therefore, in this research open ended questions were used focusing on two main topics: a) general questions *(regarding their background)* and b) more specific on telemedicine (their experience and perception on telemedicine systems in Nepal) (Appendix 5).

Each of the interviews lasted from 30 minutes to 1.5 hours and was scheduled at a time and place convenient to the participants, in mutually agreed settings. Most were held either in the Health centres or within the hospital where ever was most comfortable for the participants. The interviews were audio-taped with the consent of each individual and then transcribed and translated where necessary and analysed (Koch and Karlic 2006) (see Appendix 6 for sample).

6.5.3 Listening and Being with

Listening took place on different levels in this research. In the early phase of the research, the participants only answered the questions asked either by filling in questionnaires or via interview- a typical researcher and participant relationship. This early phase was certainly a challenging one: as it was not participation in the PAR sense at all and in many cases people hesitated to answer the questions and get involved in the discussion; for example in the areas of job satisfaction.

The researcher felt that a true and complete picture was missing from the survey and interview methods of data collection. The researcher decided to be a Nepali first rather than a western graduate and researcher by spending more time with the research participants informally, listening and being physically present and joined several doctors visits and outreach health camps with medical doctors (A personal account of a Remote Surgery camp Appendix 8) with participants and supporting them where and when possible. For example he took part and defended the health worker when villagers complained about their practice. Spending time ("Being with") with the research participants further helped the researcher to share his own personal journey. Gradual acceptance of the researcher "one of us" rather than "one of them" was fundamental to building trusted relationships (Koch and Karlic 2006) in this inextricably linked journey between the researcher and the researched.

"Being with" the participants gave the researcher an in-depth understanding of their (participants') everyday activity gaining a richer, pluralistic view of the research site (McDonald 2005: 461). The researcher was permitted access to settings and situations that he would otherwise not gain permission to enter. There are, of course, some difficulties associated with this, including negotiating access with participants. In the case of this study this entailed negotiating access to hospital departments (including the operating theatre) and patients; this was given after prolonged engagement and the relationship between the researcher and the researched became stronger as the time went on. Prolonged engagement facilitated understanding of the realities on the ground, and built trust and rapport, which in turn ensured a better quality of information (McDonald 2005; Koch and Karlic 2006). As the relationship developed, it "Unlocked and Unblocked" hospital staff's attitudes and acceptance and "Validated" the aims of the researcher.

The researcher took note of obvious issues that the participants emphasized during the interview and feedback sessions. The key issues were dealt as soon as possible, by the researcher in collaboration with respective stakeholders where and whenever there were possible (action). For example, the outreach centres' partners came up with a recommendation to have telephones installed and it was possible for the researcher to facilitate this which added validity to the project and helped in the building up of trust. The complete analysis of data was performed at the end of the study.

In this study the researcher had the opportunity to observe and experience the dynamic changes in the knowledge, attitude and practice of all the stakeholders. Furthermore, as the relationship became stronger between stakeholders and the researcher, reality in the developmental nature of research (PAR) evolved and led to a completely different understanding of difficulties of telemedicine interventions.

6.5.4 Case examples

As the study progressed case examples were selected by the health workers from the outreach centres to include a variety of conditions and situations where telemedicine was used. The views of health workers and doctors on the different cases examples were presented and the accounts of patients and their families were included wherever possible.

6.6 Research Phases - Developing, maturing and early sustaining

Initially the intention was to use an Action Research (AR) cycle to drive the research process. Several models of this have been studied. For example, the Stephan Kemmis Model (cited in MacIsaac 1996) where each cycle has four steps: *plan, act, observe, reflect*; Stringer's (1999 cited in Koch and Karlic 2006) process came up with three basic phases of the action research cycle *Look, Think and Act* and Gerald Susman's (1983) model distinguishes five phases within each research cycle (Figure 6.4), which were adopted for this research initially.

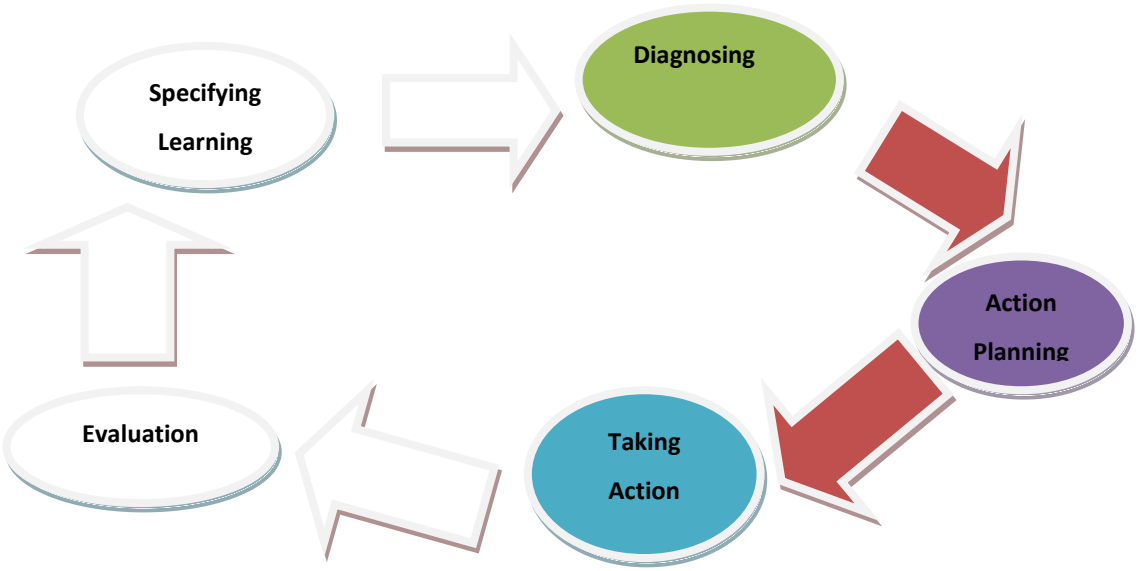


Figure 6.5: An Action Research Cycle: Adapted from Susman 1983.

This implies (as shown in figure 6.5) that each component of the cycle leads to the next and the process is completed in an orderly manner. Once one cycle is completed another starts incorporating the results of the previous cycle. However, this project did not lend itself to this neat cyclical approach. Some blocks identified in the diagnosing phase were dealt with rapidly (Section 7.4 formulating the plan for action and Chapter 8 the Maturing phase). Others either took much longer or had not yet even been identified. Consequently, different components of the cycle and even different cycles (1st, 2nd and 3rd) were going on at any one time. Therefore, three phases of the research, rather than discrete cycles were identified:

1. Developing Phase – in which *unlocking* occurred with the identification of blocks / barriers
2. Maturing Phase – in which the *blocks* identified were considered and most were dealt with
3. Early sustaining Phase - in which telemedicine appeared to *validate* the research process

Although the timing of these phases still overlapped they fitted the research process better. The findings will be presented separately for each phase.

6.7 Data Analysis

There is no one way to analyse PAR data. Grbich (1999) states that due to the dynamic nature of qualitative research, the use of one approach may not be entirely appropriate. In order to analyse a relatively small amount of data from both quantitative (survey questionnaire) and qualitative interviews, observation and research notes have been dealt with manually and using Microsoft Office programmes (Excel and Word). Questionnaire responses of the outreach centres were analysed using Excel and the interviews were transcribed, translated and analysed by the Framework Technique (Swallow, Newton and Lottum, 2003). Examples of translation of interview can be seen in appendix 6.

6.7.1 Analysis Framework Technique

Qualitative analysis was undertaken based on the Framework technique (Swallow, Newton and Lottum, 2003). See Figure 6.6 for an illustration as to how this was applied in this study. The researcher has ensured that the original meanings are kept intact by referring to copies of the original transcript throughout (Carpenter, 1997). To summarise, the data are themed and coded. The analysis includes both open and axial coding (Silverman 2001). In other words data are conceptualised and classified as events, acts and outcomes.

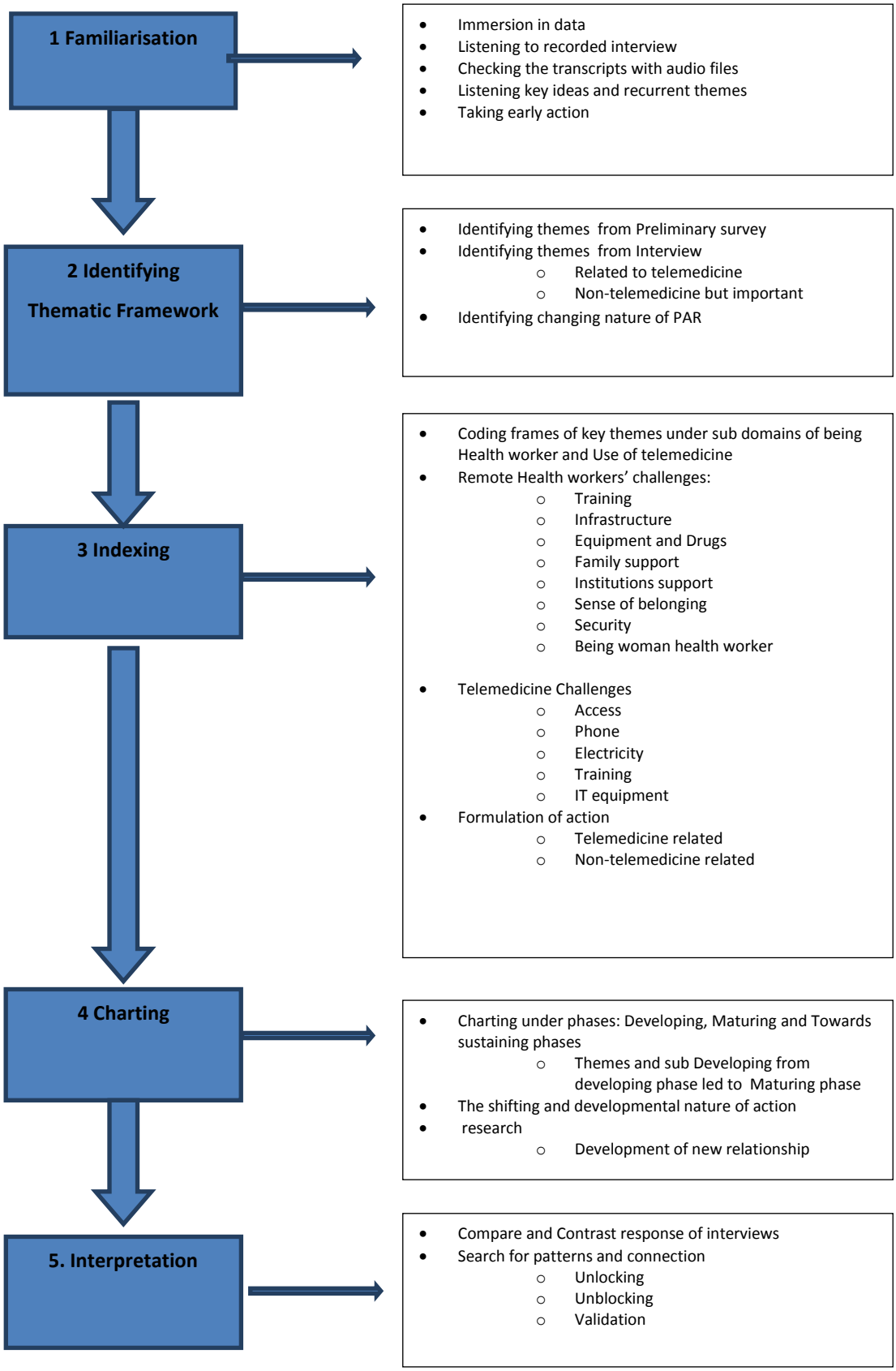


Figure 6.6 The stages of framework analysis and an example of its application. Adapted from Swallow, Newton and Lottum, (2003)

6.7.1.1 Familiarizing

The researcher listened to all semi- structured recorded interviews many times before and after transcribing and translating. The process of translation and transcription was far more time-consuming than anticipated. Furthermore, some of the transcriptions were shared with one of the supervisors and discussed with the researcher. All these helped to familiarise the data for the researcher and contribute towards opening (Unlocking) his mind and enhancing (Unblocking) his understanding.

6.7.1.2 Identifying themes

Initially open coding was done by assigning the general themes as used in the semi structured interviews; for example “Being a health worker” and “Use of telemedicine”. However each broader theme was developed into sub-themes during the open coding of each transcript. The, “Being a health worker” topic unfolded a wider range of issues both in personal (family, security, access, personal development) and professional (training, isolation, supports) aspects of being a health worker. These themes are further highlighted in the findings chapters. The researcher identified and coded themes related to telemedicine and non-telemedicine aspects. Clear pictures began to emerge (unblocking) as accounts were visited and revisited.

6.7.1.3 Indexing, charting and interpretation

The indexing and charting were classified and analysed under “Developing Phase”, “Maturing Phase” and “Early Sustaining Phase”. “Unlocking, Unblocking and Validation” concepts emerged as interpretation progressed and resulting actions were produced (Chapter 7, 8 and 9).

6.7.2 Ensuring rigour, credibility and trustworthiness

Qualitative research has been criticised as lacking scientific rigour (Mays and Pope 1996). Therefore, evaluating the merit of qualitative research using criteria intended for quantitative research (reliability and validity) would cause devaluation of the study (Gibson and Martin, 2003). More appropriate terms "Rigour, credibility and trustworthiness" as opposed to "reliability and validity" are introduced in this section. The researcher believes that being a first person researcher allowed him to explore what the researcher brought (brings) to the relationship within the community and this strengthens his validity as a researcher to the participants and the project.

Silverman, (2001) stated that potential problems in qualitative research are associated with anecdotalism, misunderstanding by the interviewee and researcher bias. Several steps were taken to limit this: the use of semi-structured interviews minimised the potential bias of the researcher, by focusing on the expertise of the interviewee, while still allowing comparability for analysis. Furthermore, to ensure credibility in this study, prolonged engagement with the project (Koch and Kralic 2006), "Listening and Being with" to build trusted relationship and observation (McDonald 2005: 461) of the dynamics of change in this research project, multiple sources of data with actions were taken (more detail in the later findings chapters 7, 8 and 9).

Furthermore in PAR, a reflexive dialogue occurs amongst participants, where they examine their motivation, assumptions, various roles, tension and power imbalances to create a congruence and credibility in what and how topics are researched (Naylor, *et al.*. 2002; Rowan 2001). Gray *et al.*. (2000) note that PAR is based on relationships. Relationship building was highlighted earlier in this chapter.

6.7.3 Transferability

Transferability suggests that the processes discovered in qualitative research can be expected to replicate themselves in similar circumstances. As the research project moved from data collection to integration of the insights learned across organizations (Dhulikhel Hospital and Government Health Centres), research methods and participants researched, the researcher became increasingly aware of emerging themes. These changed from adapting to a new technology to highlighting more crucial issues which

needed to be addressed around being a health worker and its challenges. These concerns were found in both Dhulikhel Hospital and Government health centres. As a result the researcher became increasingly removed from the project sites as he strove to ensure that the approach may be transferable to other contexts. The importance of valuing human relationships begins with trust building (unlocking) and understanding each other's position and moving forward (unblocking).

6.8 Preliminary Consolidation

After the researcher had introduced himself in the hospital and before the research survey and interview started, there were two events which increased the credibility of the researcher and the research. They also served to enhance the Unlocking (developing phase) and assisted Unblocking (maturing phase).

6.8.1 Advisors and Supervisors visit to Nepal

One of the researcher's advisors, Professor Victor Patterson, and his wife, Dr Jane Patterson (a General Practitioner) came to Nepal. Professor Patterson made a presentation on *Doctors and Telemedicine* to the hospital staff highlighting how doctors and the hospital would benefit from using telemedicine. He also considered its challenges. This *unlocked* the potential of telemedicine for the hospital and *unblocked* mistaken ideas of what telemedicine involved. It also paved the way forward for the researcher to work effectively with medical professionals in the hospital setting.

Later in the research, Dr Joan Aarvold, the researcher's second supervisor and course leader (B.Sc. and MPH), visited Nepal and reinforced this credibility. Her presentation to doctors in the hospital acknowledged the researcher's academic capabilities and helped to *validate* the research process.

6.8.2 Organizing a national level conference in Telemedicine

It was felt to be important to find out whether any similar unpublished work was going in Nepal. So, in collaboration with the Nick Simons Institute (http://nsi.edu.npInternational), a Non Government Organization, a one day conference on the topic '*Success and failure of telemedicine in Nepal*' was organized. All the people known to be working in Nepal in the field of telemedicine were invited. Nepal Telecom, Ministry of Health and different hospitals, NGOs, INGOs, internet and computer providers in Nepal were also invited to participate.

Professor Richard Wootton, Editor in Chief of the *Journal of Telemedicine and Telecare,* was invited as a chief speaker for the conference. Professor Wootton was familiar with the research ideas following his input in the early phases of the project. In his presentation, he highlighted the importance of research and development in telemedicine and suggested caution to those implementing telemedicine due to the availability of funds and technologies. His visit *unblocked* attitudes, and gave extra credibility and *validation* to the project. The conference also provided reassurance that no one in Nepal was doing a feasibility study on telemedicine using PAR. (Appendix 7: The conference report and the list of participants).

6.9 Ethical considerations

The researcher worked within the required ethical governance framework of Northumbria University acknowledging the importance of considering ethical issues when working together with people. In the research a high level of ethical practice has been adopted which strives to:

- Achieve mutual respect
- Be honest about researcher's own objectives
- Be honest about what the people can hope for
- Be clear that the research findings will be discussed before disseminating especially to the policy makers; while trying to influence policy which should have an impact at community level; and
- Be able to acknowledge that some of these expected changes cannot be guaranteed

(Gibbon 2002, p 548)

In terms of ethical concerns, the usual standards of action research were followed: permission was obtained, confidentiality maintained, and identities protected (Bell 1999). To elaborate ethical issues, the development of the work remained visible and open to suggestion from other partners. The researcher ensured that participants fully understood the intention of the study (Silverman, 2001) through translating an initial letter of explanation into Nepalese, and by explaining again verbally both in formal and informal meetings. Permission was obtained before making observation or examining documents (including clinical records) produced for other purposes (e.g. for the baseline study), description of the participants' and partners' work and points of view were negotiated (Silverman, 2001) and responsibility for maintaining confidentiality accepted. Frost and Cliff (2004) have raised some interesting ethical issues regarding anonymity and confidentiality. They claim that stories are usually unique, personal and idiosyncratic. Making stories 'confidential' is more than changing the name of the person. These issues were further discussed with partners. (Appendix 2: the participant's information sheet and Appendix 3: the consent).

In this project, written agreement was gained from the partners. Now and then, the researcher reminded participants that they were free to decline participation in the project without affecting their care or treatment (service users) and their job (service providers).Where appropriate, images (photographs) and other medical images and information for the use of telemedicine purpose were explained to the patients before tele-consultation took place. Furthermore, the agreements were gained from villagers during the visit and verbal consents were gained from the villagers before they participated in any form of data collection.

The ethical committee of Northumbria University approved the project (Appendix 9). At the time the project started there was not a comparable ethical committee in Nepal.

6.9.1 Ethical consideration in developing countries

As mentioned above, the researcher followed the academic ethical prerequisite in conducting research of obtaining informed consent. This is fundamental to classical and western models of ethical consideration and is oriented towards individual participants in the research (Bhutta 2002). Bhutta further stresses the dilemma of ethics in public health when dealing with inequality.

'It is in the field of public health that the application of the broad principles of ethics of public health lags far behind those of the ethics of the individual, and is not sufficiently addressed by existing guidelines'

(Bhutta 2002, page 116)

Much research published on ethical issues in developing countries is based on clinical trials and the relevant ethical framework developed for them (Emanuel *et al.* 2004). Due to the complexity of conducting any kind of research, a single ethical principle is rarely absolute (Bhutto 2002). In order to work in the developing countries research must consider more than the broad seven principles suggested by Emanuel *et al.* (2004).The seven principles are: collaborative partnership (between researcher and researched), social value (adding value to the society), scientific validity, fair selection of study population, favourable risk benefit ratio (assess the potential risk-benefit of the research), independent review (transparency), informed consent and respect for the participants (Emanuel *et.al.* 2004). However as noted by the Nuffield Council (2002) for doing clinical research in developing countries, concepts of respect for family and community are

equally as important, or more important than, concepts of individual autonomy and rights.

In conducting ethically sound research in Nepal, gaining informed consent was more than filling in forms. It was more about building trusted and respected relationships for open and honest communication and it was time consuming. This was possible as the researcher is native and spoke the local languages with a wider knowledge and respect for the different cultures and traditions practiced in Nepal. Having knowledge around cultural and traditional aspects of the research participants and being sensitive towards them had an influence on the quality of data generated. In consequence whilst formal ethical consent was obtained, this was continually reaffirmed through the contacts with participants.

Furthermore, the researcher believed and believes that good research involves being sensitive and managing to balance the aspiration goals of the research. In other words, being open about what is in it for everyone. There is always a risk that the researcher might raise false expectations. This is quite easily done while conducting research in resource poor settings and especially on health service issues. Failing to be realistic and honest may result in a breakdown of trust and undo established relationships. Trust has more value than any signed contract and "trust" forms the foundation on which the community stands. Therefore it is morally responsible (Downie and Calman 1994) for the researcher to manage expectations by acknowledging them during the field research. The importance of these issues was highlighted under the researcher in context Chapter.

Ethical considerations in this respect are all about understanding the research oneself and the research participants fully. While doing so, the process does not negate the principles of ethics within the university context. Ethical codes apply to the in-depth literature review, justification for using a sound, appropriate methodology and the transparent, sensitive analytical approach to the data collected. Research in developing countries, where many urgent health needs are waiting to be addressed, must be seen, if only in small ways, to be contributing to the improved well-being of the people.

6.10 Conclusion

This chapter described and analysed the premises, processes, challenges and impact through the use of PAR in the context of telemedicine research in Nepal. The chapter makes claims as to why PAR is the appropriate methodology; however the research process is not without drawbacks. In other word a "mess" (Cook 2007). Some of these drawbacks were challenges around multiple data collection methods, the fluctuating position as "insider and outsider" and managing dynamic and circular nature of emerging themes and challenges around taking collaborative actions. The chapter has highlighted the messiness of the process (Cook 2007) in the context of the role of researcher and the process. With this acknowledgment of the strength and weakness of the process, the next three chapters present the findings related to the research topics under the phases *Developing, Maturing and Early sustaining phase.*

In chapter 7: the developing phase of the findings from survey and interview will be presented and ends with formulation of the action plan. The Maturing chapter will be presented with the actions taken to implement telemedicine in rural Nepal and further presented with overarching themes that emerged from during maturing phase The Early sustaining Phase of the findings will be presented with case example which to demonstrate impact of action taken during maturing phase.

7 The Developing Phase

This chapter the developing phase of the research aims to present findings from the preliminary survey result and in-depth semi-structured interviews.

The first part of the chapter presents, a small scale questionnaire survey (12 participants took part) exploring “knowledge, attitudes and practice” of Telemedicine amongst health workers and their basic understanding of the role of ICT in health care delivery.

The second phase of this findings chapter are based on a semi-structured interview focusing on two main topics: a) General (Being Health Professionals) and b) More specific (on the use of telemedicine and their experience and perception on telemedicine systems in Nepal) and the findings are presented accordingly: a) Being a health professional and b) Using telemedicine in health care setting.

The chapter ends with a discussion of the developing phase and formulation of the action plan for the Maturing Phase this developmental project.

7.1 Results of the preliminary survey

The survey results showed, 4 out of 12 health workers had consulted doctors using a landline telephone and 2 had used their private mobile phone after giving primary care treatment to the patients. Six had never used any form of communication to consult with doctors or senior health professionals.

The majority of respondents who had engaged in a tele-consultation with a doctor found the advice given over the phone very helpful, strongly agreeing that patients were satisfied with the tele-consultation. However the majority never asked for consent or even informed the patients about the telephone consultation with the doctor.

	SD	D	NA/DA	A	SA
Effective treatment advice for the patients' condition			1	2	3
Using telemedicine was too expensive		2	2	1	1
Phone signal was very poor and unreliable	1	3	1		1
Felt easy and confident to tell people that I am using TM				4	2
Advice on management and treatment of patients was adequate				3	3
Access to the doctors at the hospital was easy		3		3	
Patient were happy and felt good with the consultation			1	1	4

Index: Strongly Disagree (SD), Disagree (D), Neither Agree, Nor Disagree (NA/ ND) Agree (A) and Strongly Agree (SA)

Table: 7.1 Usefulness of telemedicine

Factors	Not at All	Little	Not sure	Some	Strong
a) Recommendation from a friend or colleague				5	3
b) Published evidence of effectiveness		1		3	4
C) Recommended by the Hospital				3	4
D) Media (TV, Radio, Newspaper /Magazine)				6	2
E) Easy Access to experts				4	4
F) Availability of training and Equipment				1	7
G) Oneself (due to circumstances)	1			4	3
h) Cost			5	2	1

Table 7.2 Influential factors in the use of telemedicine:

In terms of their knowledge of different modes of communication, everyone responded with some form of knowledge about telephone and radio communication (wireless radio) and internet. Email and video conferencing got mixed responses from no knowledge at all to one high level of knowledge.

Regarding their beliefs on the effectiveness of telemedicine in different illnesses, 100% responded with some to very beneficial and the majority believed that this is the best way of delivering health care in remote Nepal. Despite their strong belief in effectiveness, cost and life saving benefits of telemedicine in remote Nepal, the majority responded that telemedicine should be followed by physical examination from doctors and should be included as part of delivering health care in the remote areas. All the respondents reported strongly that health care professionals should be trained to use the telemedicine system and rural health care workers are the best candidates to consult with doctors. Many health workers answered that they would be happy to undertake tele-consultation

for their loved ones as well. Furthermore, everyone showed an interest in taking part in the next phase and hence were drawn in to participating actively with the research.

This small scale survey result (with the sample size of 12) shows the knowledge, attitude and practice of telemedicine amongst remote health care workers. These findings highlighted that it was the wish of existing health post staff to improve their current patients' care practises and there was a realization that telemedicine or the use of technology may facilitate this. Furthermore, village health workers were enthusiastic to get involved; their interest and willingness to support was overwhelming and most were keen to take part in the interview and the next part of the project. The findings from the survey, listening and being with the health workers in their location led to developing the next phase of data collection which was through interview.

7.2 Interview findings

The semi-structured interview questions were focused on two main topics: a) General (regarding Being Health Professionals) and b) More specific (on the use of telemedicine and their experience and perception on telemedicine systems in Nepal) (Appendix 6). The rationale behind two distinctive categories is described below under two sub headings and the findings are presented accordingly: a) Being a health professional and b) Using telemedicine in health care setting.

a) Being a health professional

The rationale was to understand the factors which made people become health workers, why they chose to work for this organization and in a remote setting: their journey in securing the job, their expectations and challenges in their existing practice and so on. The questions also helped to understand how the workers perceived new ideas (such as telemedicine) in their daily practices.

In Nepal, there is also an "internal brain drain" as health professionals often choose to work in the private sector, in the urban based health institutions rather than in the community Hospitals like Dhulikhel and its outreach clinics. As shown in the literature review (Fraser and McGrath, 2000, WHO 2006, MOH 2006) health workers in rural areas (who serve most of the population) are isolated from specialist support and up-to-date information and training and furthermore the majority of health centres are constrained

by poor buildings, lack of infrastructure such as electricity and telephone, and working with limited medical resources and support. Therefore it was very important find out why and how they adjusted to all these frustrations and distractions and what motivated them to work in rural health centres.

b) Using telemedicine in their practice:

Due to recent developments in telecommunication in Nepal and the growing trend to use it as a means of communication in the health field, the questions were directly related to Telemedicine and the use of technology to assist any form of communication by the health professionals in their practice. It was important to know how much the research participants already knew about the topic in which they are going to be involved. The second part of the semi-structured interview therefore focused on knowledge and attitudes towards the telemedicine system.

7.2.1 Being a Health worker: Choosing the hospital

Everyone had a different reason for being a health worker and joining the particular institution. These reasons varied from personal to professional ambitions. However, one of the most common reasons expressed for being a health worker amongst the participants was the opportunity to serve the remote and rural community.

"…many years ago I took one of my family members to …….. hospital in Kathmandu. The experience I had with the service that staff provided during that time. I was hurt by the way they treated us, so decided to do something to serve my own people in the village and then went to study CMA in Baktapur"

CHW 1

Another participant dreamt of being a nurse from a very early age however unfortunately she became ill just before the board exam and this affected her result:

"I always wanted to become a staff nurse however, I became ill just before SLC (School leaving certificate 10th grade) exam and I hadn't recovered fully during the exam. However the result was not what I expected – though I passed but still not enough to enrol in the nursing course. But I wanted to do be in health sector and got enrolled in the ANM (.....) course and there is a scheme that I could go and do staff nurse course after working for three years as ANM." CHW2

Despite all the challenges they had to face, the majority of health workers were happy with their job.

"*… I am very happy to work and serve my own people in the village and even my family are very happy too"*

CHW1

Another participant who came from the Southern part of Nepal, who had never seen mountains felt proud to have this opportunity.

"*…I am very happy and never knew the situation of the mountains. I used to come by bus to Kathmandu and stayed in Kathmandu but never had a chance to experience what it is like to be in the mountains and now while working at X (Place), I completely understand why people used to mention that we have got to help the people in the mountains where health is a huge problem. I came to experience and see for myself and am very happy too that I could share the pain of poor people in the mountains"*

CHW 3

He (CHW3) went on to give an example that he had experienced himself, regarding the geographical barrier:

"…it's very challenging to work in the remote areas from every aspect, such as transportation. Let me tell you the current situation. It takes for 6-7 hours to journey one way and in some situations you have to spent nights on the road as well. In others you have to make the journey on foot for 4-5 hours too in the rainy season when there are no vehicles. I experienced how difficult and hard lives in the villages are"

Despite these challenges and obstacles, he (CHW 3) is willing to work in an even remoter part of Nepal if needed as his next quote testifies.

..."And the talk you gave us certainly has encouraged us to move forward and in the future, I am happy to work ever harder and even happy to go to even more remote places than X (place), I am ready to go. I am happy!"

The opportunity to serve the most needy communities was expressed by the doctors who were based in Dhulikhel Hospital. The majority of the hospital staff (Doctors) who were

interviewed have been working in the hospital for 5 years. None of the doctors who were interviewed were native to Dhulikhel hospital or the remote areas of Nepal. They were from Kathmandu, Baktapur, Janakpur (big cities) in the south and Syangja in the west of Nepal. One of the Doctors was brought up and trained in India for her first degree and completed her Post Graduate studies in Nepal. Every doctor had a different reason for joining Dhulikhel Hospital. However, out of the 7 doctors interviewed during this phase, 3 gave the vision of the hospital (serving the community) as one of the attractions to join the hospital.

"… the main attraction for me to work for the Dhulikhel Hospital is its community programme. My passion is in getting involved in community programmes and one of the criteria for applying for the job at Dhulikhel Hospital was that all the staff must be involved with the community programme and that was the main attraction"

Dr A

Another participant gave a similar reason:

"…I like the working style and due to its community oriented vision in providing health care services for community which is also one of the motivational aspects and indeed a very good leadership of Dr Z and dynamic place to work and learn. Due to all these reason, I joined and couldn't leave the job at this hospital"

Dr B

A doctor who shared her passion to work under the very dynamic leadership and community centred hospital said:

"… *I met Dr Z and saw the hospital, and my interest has always been working with the community hospital and with community in the field but by then I couldn't join immediately as I was pregnant but later joined the hospital while I was doing my PG*

Dr C

The government health workers shared similar reasons for becoming a health professional – to serve the people in the rural and remote areas of Nepal.

7.2.2 Mode of getting a Job

Getting a job in this health sector is not difficult as there is a lack of health professionals willing to serve in the remote areas for all sorts of reasons. Out of 4 outreach workers 2 of them mentioned how they were recruited.

Personal Recommendation

Recruitment is one of the hardest tasks for Human Resources in health as the majority of health professionals look for work in urban centres with access to facilities that enable their own personal and professional growth. It is normal practice to seek recommendations for jobs and to target requests at professionals to go and work in health centres in the remote areas of Nepal. Recommendations are highly valued as they tend to hold very strong forms of trust and respect in Nepal. One of the health assistants left his job in Delhi and decided to take a new challenge where he had never been before and where he was not native.

"…While working at Jeevan Mala Hospital in Delhi, my cousin brother Dr … used to teach at KUMS, and he informed me about the job and told me that I was able to do that job so asked me to come over and apply… so I came"

CHW3

Another participant had a similar story:

"{giggled}… for me it wasn't too difficult and even before the result was out (CMA) I was at the hospital for training to go and work in Y. I was recommended by X… who is from the same village and we are relatives too".

CHW1

Recommendations were widely accepted amongst hospital doctors too in securing jobs. Two doctors gave a recommendation or request from the administrator (Dhulikhel Hospital) as a reason for joining the hospital.

"… it's long story, I want to make it short. I was an applicant of Nepal medical college and you know Dr……. invited me here (at Dhulikhel Hospital) and he took the interview and I came here…"

Dr D

Another doctor shared his reason for joining the hospital which is similar to Dr D.

"… basically I was invited by Dr….. and I was involved mostly in research work with my previous work and I was looking for clinical exposure too so I came here."

Getting a job and choosing particular areas to work for the government health workers was not an option, jobs were allocated by the government.

Most doctors who were posted in the Primary Health Care Centres were recent graduates and were part of a government bond (they studied with a government scholarship on condition that they serve in remote health centres; they were then also eligible for Post Graduate courses). In consequence the doctors posted in the health centres by the government are juniors with limited experience and only stay for 1- 2 years.

"Yes mine is governmental post for a year, have mentioned that maximum for 2 years ….. One year remote and another year is an urban posting as part of government bond"

GHW1

However this is slightly different for another government health worker who has to move around as the government allocates her. This generated uncertainty in terms of job security.

"I was in my previous health centre in Kathmandu for a year and then government posted me here and I have been here just for 2 months and I know they will send me some other place again in six months time.

GHW 2

7.2.3 Challenges

Despite their deep interests in serving remote and rural communities and the ease of securing their job either through recommendation or targeted recruitment process, health professionals who were serving in the remote areas were faced with several professional and personal challenges.

All the health workers agreed that there are huge professional barriers to overcome. The health workers were asked specific questions on the professional challenges they face. Most of the professional challenges that they faced were around support from the hospital, the local community and their own security.

7.2.3.1 Support from the hospital to the outreach health clinics and primary health care centres

In the early phase of the research, everyone expressed that they were happy with hospital support, although it was sometimes slow in recognising the needs of the health workers. One of the participants expressed his contentment over the moral support he was getting from the hospital.

"Yes, whenever I run into trouble, so far the hospital has been very supportive and sympathises during hard times and the love you all have given Dr Z, Dr A and yourself (the researcher) has been a source of energy to me to be there. So it has been very good"

CHW3

Another participant wished that the hospital could run some clinical training for him to update and upgrade his knowledge and skills.

"I am a bit lacking in confidence in clinical skills and wish if I could go to hospital and take training and learn. I wish to upgrade and update on the knowledge and skills I gained and learned during my course of study. I would love to have training on Orthopaedics and Dental care so that I can provide quality care for the people here in the villages"

CHW1

Being part of the hospital and working as hospital staff in the remote areas, one of the participants commented that the hospital is not doing enough to acknowledge the hard work of the staff in the remote areas.

"Hospital has got to do a lot for the outreach staff. For example just to tell you that, when I first joined the centre my salary was Rs… and now I earn Rs …. per month. It was a huge struggle for us to get our salary increased from one level to another level with the hospital administration"

Furthermore, outreach staff were not treated equally and not accepted as part of the hospital family by those working in the hospital

"It really hurts when someone tells you that you are not part of the hospital staff. I had to face that when I went to hospital taking a patient to the hospital from the senior staff…"

CHW 2

7.2.3.2 Support from the community to the outreach health clinics and primary health care centres

Beside the technical support from the hospital, one of the biggest challenges for any health professional is whether he or she will be accepted and welcomed in the local communities where they are serving. This is due to the ethnic diversity within Nepal. For those who are local to the village this has never been an issue; however the majority of participants in this research were recruited by the hospital to go and serve in other communities. The majority felt supported, as in Nepal health professionals are always respected in rural communities.

"There are and always will be few problems with the villagers but it's not a major issue and so far we have been coping well. We had a couple of cases such as dealing with drunken patient parties and people who come here after argument with their husbands and so on…"

CHW2

She (CHW2) further shared a problem which arose due to a misunderstanding between visiting health professionals and the community.

"…the problem arises after the hospital vehicle refused to take patients with them. However some of the staff bought potatoes from the local farm and took them back in the vehicle. The villagers were furious to see the situation and angry patient parties vandalized the sign board and further came up to the health centre and threatened us with legal action and to lock the health centre and so on. I was very nervous. Dai (Nepali word for older brother or term used to call anyone man or colleague older than you) and I told them to go ahead and lock the health centre if you don't need us we are going to stay outside. They said they needed us but not the staff from Dhulikhel Hospital. Next day Dai went to the hospital and I was left alone. More community people came to the health

centre saying – why did the hospital do this? - giving priority to their potatoes rather than patients. So I had to deal alone with this huge crowd of people. As you know there are always some supportive and positive people in the community. I explained to them that the patient's condition wasn't serious and did not need hospital referral and they were convinced with my explanation and those elders went to explain the situation the riots and the situation returned to normal. These things do happen now and then and I was happy to handle the situation, however, when hospital vehicle came back for another visit, villagers stopped the vehicle and again we had to go and resolve the situation."

Despite all these challenges, she (CHW2) is very positive and loves serving the communities. She went on to say:

"These kinds of challenges do arise when you work with the communities. But I am very happy in the community and I am so interested in working in the community. Due to my interest in serving communities, I managed to convince my family to let me work in the community."

7.2.3.3 Security issues raised by the village health workers

One of the biggest challenges for the hospital staff in the working in the remote areas is feeling vulnerable due to lack of security provision for the staff in the outreach centres. This situation was worst during the political turmoil in the country (Refer to Nepal in Context chapter 3). Due to the reputation of Dhulikhel Hospital and its staff, hospital and outreach centres weren't affected as badly as others. However one of the supporting staff shared his story about being tortured by the army.

"It was the early evening, I went to visit the field to check if the irrigation channel was clear or not in the paddy field. It was completely unfortunate that later that evening the Bomb went off near the paddy field. Then the army came and arrested me and took me to their station. Without further enquiry they started beating me and started asking questions. They poured cold water on me and kicked me all over me. It was next day only when everyone from the health centre came and villagers came and they released me".

Despite being tortured by the army during the conflict time, the participant still works in the same health centre.

A health worker shared his fear while treating both wounded army personnel and the Maoists.

"It was so difficult a situation at the time when you become an agent suspicious from the both groups and army used to come and ask questions and check the people who we were treating."

CHW 4

Once the conflict was over in 2006 / 07 the health workers said they felt more secure working in the community. However they accepted that there will be always some problems and misunderstandings while working with diverse groups of people – drunken people, people not wanting to pay the fee and so on.

7.2.3.4 Lack of (basic) Infrastructure at the outreach health clinic and primary health care centre

In rural Nepal, many health workers face a lack of basic infrastructure such as buildings, basic medical equipment and communication. Compared to government health care centres, Dhulikhel Hospital outreach centres are better equipped with buildings and medical equipment and other basic infrastructure to practise their skills and knowledge effectively.

Two out of three outreach centres which were selected for the research sites have their own buildings and the remaining one uses one room building in the local secondary school. This building was further deprived because of lack of electricity in the early phase of the research. In contrast, it has the greatest patient flow per day amongst the outreach centres of the Dhulikhel Hospital.

"…even though we don't have electricity at the health centre, though every household over here has electricity in their home. I have done several deliveries and treated patients under kerosene lamps. I really wish the hospital would talk to the community and at least we can have electricity in the centre which will make it much easier to provide services to the patients who come in the evenings."

CHW3

The other two research sites have purpose-built buildings for health centres with separate rooms for patient examination, a delivery room and a separate room to perform

minor surgery procedures. One of the buildings is electrified with solar electricity and another has electricity with a back-up generator. Furthermore these two also have rooms to accommodate the health workers.

7.2.3.5 Communication facilities at the outreach health clinics and primary health care centres

The communication infrastructure was poor during the early phase of the research because of a lack of access to a phone service; and where available, the network signal was never better than poor. However every Health Worker had their own private mobile phone despite this poor signal. The one health centre without its own building was further challenged with a lack of telephone in the centre whereas 10 public call centres (telephone booths) were available in the village by 2007.

"…during an emergency, I go and wake up the local shopkeeper to use the phone to call the doctors. I have done this several times and sometimes the shopkeeper and their family are quite reluctant to wake up so it's very odd… I have used my mobile (phone) several times but I have to come out of the health centre to get a signal and when I am talking with doctors I am worried that something might happen to the patients."

CHW 3

7.2.3.6 Required Medical facilities at the outreach health clinics and primary health care centres:

Beside major infrastructure challenges, outreach workers lack access to facilities, which could rule-out or confirm some clinical issues, such as basic laboratory tests and x-ray.

"Several patients come here with agriculture related injuries such as falls, cuts and fractures. These are very common cases here in this area. If we had access to an x-ray machine here at least we could confirm whether it's fractured or not. It is very difficult to work in this confusion ourselves, sometimes we send a patient to hospital with doubt about a fracture and he / she returns to the village with the report saying nothing there and sometimes it is the other way round. It's frustrating. This would be some kind of income generation too if we were able to run this properly here as none of the government health centres have such facilities either."

CHW4

The same thing was claimed by the health worker in another outreach centre:

"That's the case Sir, once the construction (building) work started is completed and with an installation of X-ray and with the help of this telemedicine care, I see huge benefit... On the one hand, the cost of transportation is huge, patients had to go through difficulties and hurdles and then 2-3 people need to accompany a patient which is again economically very costly in loss of time and the patient has to leave the house un manned... all these problems could be solved with installation of X-ray, lab and with the telemedicine, the staff in such remote areas will be able to offer specialist care through consultation and in addition to these, email and internet service will be very beneficial. By providing such services there, I can guarantee and proudly say that there will be a minimum of 50 patients visiting per day."

CHW3

Another health worker mentioned there is a very expensive and useful machine in the centre but no one is trained to use it.

"We do have portable ultrasound but none of us is trained to use to it. So it's only used during the doctors' visit day. But I think X-ray would have been more useful here."

CHW 1

7.2.3.7 Personal challenges:

Personal challenges are probably more important than professional challenges while working in the remote areas. These are some of the strongest reasons that health workers are not willing to work in the remote areas. In this early phase of interview, apart from one health worker, working in his own village, others expressed their concern about personal challenges one way or another. One of the health workers was faced with an important language barrier.

"It was very challenging due to language problem when I first arrived here from India. There were lots of words I didn't know, for example "jam jamauchha, katkati khanchha", which is said differently there (his home town in southern Nepal). With the help of 2 or 3 local people especially, Arjun Dai, Raju Dai and Krishna Dai (Nepali word for older brother or term used to call anyone man or colleague older than you) who stayed with me for 2 to 3 months and later gradually I improved in language as well, (so) had to overcome those challenges." CHW3

7.2.3.8 Family support and acceptance

This is one of the biggest challenges for many health workers not willing to work in the remote areas. As mentioned earlier, out of four health workers, only one was working in his own village. When you are looking for a job, it's not only a job for the health worker but also for the family members. For example, what is the spouse going to do and where are the children going to go to school? Here are the research participants' views on their family challenges:

One our participants shared his own personal satisfaction of having family near him or being with family:

"I am married and have two children. I am happy that I got to serve my own village being with my family and my family are happy that I have this job in the village too."

CHW1

CHW3 brought his wife with him in this remote part of Nepal and how they are utilising the services available in the village.

"Sir, I got married in 2052 (Nepali date – 1996 -1997). I was only 15 years old and my wife was 11 or 12 years old."

He explained this was due to family pressure. They now have two daughters. He is happy that his wife is now back in the school and the youngest daughter goes to the same school.

"My wife, she has enrolled in class eight and she has exams these days."

However when he (CHW3) spoke about the dilemma he faced when he decided to bring his family with him:

"Regarding children, I was in a dilemma when I brought my wife and children over here… I left my eldest who is eight and she goes to a Boarding school in the village (Private English medium school) is with mom (Health worker's own mother) so mom won't feel lonely."

Besides leaving his eldest daughter, he was well settled in his work, his wife went back to school after a long gap and he himself managed time to enrol for the part-time study in the local college and was studying for a Bachelor in Arts (BA) in Education and Health education as a major.

One of the health workers simply told me that he has been working away from home for the last 7 years and his wife and son are in the village with his own mom and dad.

"I go to village sometimes once a month or mostly this (visit) will be once in two or three months. It's very difficult to arrange holiday when you are in this field. However I do talk with them over the phone."

CHW 4

7.2.3.9 Family support and being a woman health worker:

The family support is even more crucially required for a woman who is willing to serve where the majority of her colleagues are male. However, this has been more culturally accepted recently especially for those working in the health field. Here is the personal account of a female health worker:

"… my parents visited the health centre and my uncle visited too and they all are convinced that I am happy here and they have seen themselves what I used to tell them that the health centre where I work is near by the road. I live within the health centre. On the first floor and check the patients on the ground floor… furthermore, I am the only daughter in my family so everyone worries about me. Even after their visit, they kept on saying leave the job immediately and move to the job near the city or at least work near Dhulikhel Hospital."

CHW2

The family were worried both in terms of societal acceptance of their daughter working with male colleagues and assurance from the institution for her safety.

"… dai (Nepali word for older brother or term used to call anyone man or colleague older than you) went to speak with my uncle and my parents that the institution we are working with is very supportive and furthermore he told them he will take care of me and not to worry about me until he is here in the centre as well. I have been putting "Bhai Tika" (symbolising the celebration of the respect and the bond between brothers and sisters) on my co-worker in the health centre and he is now my guardian and my parents know about that so they finally agreed for me to work in the centre."

CHW2

7.2.3.10 Difficulty in career progression of the village health workers:

An opportunity for further studies for professional development besides their skill based training from the hospital was raised by 3 out of 4 outreach staff who were working in the remote areas of Nepal. Access to further training and academic qualifications almost comes to an end or is put on-hold when health workers are working in the remote areas. However, almost all agreed they are happy to take their own initiative if there were any such kind of facilities available. Due to availability of an opportunity, one health worker took the advantage by enrolling himself in the local campus as a part-time student.

"… Personal Challenges, I want to move forward and develop working with Dhulikhel Hospital. Currently I am doing my 3rd year in Education at the Local campus, I wish to pursue further education in the areas such as MPH and that would be great if someone lifted me up to such position. This is what I wish."

CHW3

The difficulty in career progression was even harder for the woman health worker whose family are asking her continuously to leave the village.

"…my uncle was worried about my further studies and he knew that I don't have any career prospects working in the village. He asked me to leave the job as I have only done up to intermediate level of studies. As you know I always wanted to be a staff Nurse and managed to secure 75% in ANM exam. So I went back to talk with Dr …. (Head of the Community department) and Dr …. (Director of the Hospital) explaining the situation that I had to leave the … centre and Dr … told me that he is happy to talk with my family and if you had to leave that he was happy to take me to Dhulikhel Hospital as well..."

CHW2

One of the health workers was contemplating pursuing self-study course where he only needed to attend the exams.

"I am planning to do further studies now as you know for last seven years working here, I don't have any qualification to take with me. This is bit sad isn't it?

CHW4

"I have huge desire to learn more and more. If the hospital is not able to provide any facilities, I am happy to go and learn myself too"

CHW1

7.2.4 Government health workers

The government health centres are worse off in terms of infrastructure, be it health centre buildings or medical infrastructure, to provide the basic services which they are trained to provide in the community.

"We used to be in one of the school buildings and now we moved to the building that was left behind by the Action Aid. Beside lack of our own purpose built-building for the health centre, we don't have desks, chairs and other required furniture at this health centre."

GHW 3

7.2.4.1 Frustration due to lack of medical services:

All the participants expressed their frustration due to lack of availability of basic drugs and bandages that they required even to provide simple First Aid at the government health centres. Basic medical equipment for doctors to provide the services for which they were trained was lacking:

"…doctors are trained not only to prescribe paracetamol, in order to send doctors in the PHCs, there should be facilities of X-ray, Lab and USG … only then doctors will go there. This is the main problem."

GHW1

These problems are echoed by other government health workers too.

"… this is really frustrating when you have to send the patient away without the proper and basic medicine they are entitled to get from the health centre."

GHW2

The GHW3 further added that lack of medicine is not only the problem of the village health centres as she had to face the same situation whilst working for the health centre in Kathmandu.

"…even worst than here (in the village health centre) with lack of medicine and other resources and so we simply do what we can and refer to NMC (Nepal Medical College)."

GHW3

This leads to a decrease in trust and respect for village health workers from patients and community and in many cases they have to face angry patients and are verbally-abused. Hence they are more vulnerable and less secure than their counterparts at Dhulikhel Hospital outreach centres. One patient was reported to have said:

"If there is no medicine why are you staying here and why don't you get required medicine?"

GHW2

Many health workers were sad as that they had to face up to the same kind of abuse day-in and day-out. However, health workers have other stories to tell:

"About 4-5 times a year, we go to receive medicines from the district medicine store but usually we have to return without any medicines. Therefore we usually request for the required medicines when we go to submit our operational report which we need to submit every month. Store in-charge is hardly at the medicine despatching centre. We simply go there and request for medicine, if there are some medicines in stock we bring them, otherwise we return with empty hands."

GHW2

The government health workers further went on telling some horrific stories:

"…Even drugs banned in Nepal are still in use and available. Such is the situation here. Nepal Drug Administration published a list of the banned medicines those were brands such as ….. Syrups and many more. You can go and check in the hospital chemists, you still find these banned medicines and find doctors prescribing them – It's amazing!"

GHW1

Many of those banned medicines were sent to the government health centres by the government central drug store.

"Yes they (government) send some banned medicine – such is the situation here. This time they have supplied us with …"

GHW1

This problem creates a huge dilemma for health workers who have the smallest voice when challenging administration and policy but have to put up with all the blame and assaults from the patients.

"We get blame from patients if we went ahead and treat patients with low quality of medicine or simply avoid treatment that might do more harm. If the patient died with such low quality medicines, we have to face prison sentences too. Irony is such medicines are distributed to us by the government. I've never understood why they send expired medicine here just for us to throw it away."

GHW2

The participant went on to saying:

"Once the patient arrives here and pays Rs 5 for ticket (registration), he or she shouldn't worry about anything. But the reality is we have to confess in front them, we don't have any medicine here, can you go and get this medicine, even don't have bandage to cover up wounds, even no single eye drops and ear drops for minor infection to give to patient. It is very sad and frustrating for us when we are not able to perform and provide basic services for the patient. It goes further when the patient asks what is Rs 5 for?"

GHW2

7.2.4.2 Unmotivated health workers:

The government health workers are blamed for not being motivated and for being lazy. These were what health professionals had to say:

"Government health workers are blamed for not being willing to work: It is not true. We are willing to work and use our knowledge and skill within our capacity and what we have trained for. Now, how are you going to work with all these challenges?"

GHW2

The willingness to work is further echoed by the medical doctors too.

"First and foremost is the (need for) investment in infrastructure development to attract doctors in the government (health) sector. It's not only just to show the face of doctors in the villages, Doctors will definitely go if the infrastructure is developed. Why not?"

GHW1

7.2.4.3 Lack of support and supervision for the village health workers

Beside all the above challenges, all the participants express having to go through professional isolation.

"Being in a remote village, you simply cannot say that there won't be a variety of cases. I have to handle alone even very complicated cases. It's very difficult. No facilities for consultation, so I had to deal with my own, whatever and however I want to, with my own experience and knowledge. If the cases are beyond my knowledge and experience, I run off to my room which is just near-by and will go through the book and continue with the job."

GHW1

This lack of support is not only in clinical practice but also in many other administrative areas. District level authorities and government ministers simply turn their deaf ears.

"We have to submit our monthly report and need to go to the district headquarters, take us 5 hours. If the head of the department is not there, sometimes it takes 2-3 days to submit the report."

GHW4

7.2.4.4 Lack further referral of patients from the government health centres

This is often very difficult for the government health workers:

" Our referral system is according government guidelines. We are supposed to refer from sub health post to health post and then from there to DHC and then to district hospitals. We do know what reality is like in these different levels so we usually refer them straight to nearest health centres and refer them with counselling to the hospital in Kathmandu."

GHW4

7.2.4.5 Absent or irrelevant training

Continued training is one of the crucial components in human resources and it's most crucial in the health sectors. Many participants complain about not having access to the relevant training to equip them to deal with the cases in particular situations.

"There is training in the government scheme but without any needs assessment. For example, here, lots of post-mortem cases need to be dealt here, but I never took any form of post-mortem training beside my own study period. There is a government training

package for this. We have formally made requests due to high load of such cases here, at the district level up to regional level, made request several times, but the training hasn't been provided yet."

GHW1

Health workers have a need to upgrade and update their skills as this quote testifies:

"We do have people working here for more than 30 years. Their training has never been updated. You can simply imagine CMA courses done more than 30 years ago. Even disease patterns have changed or they might not have varieties of diseases we are getting now. So for those who completed the training then and now, will there be consistency?"

GHW2

Everyone expressed their willingness to take training to upgrade their skills and update their knowledge. However due to corruption in the system, people serving in the remote areas never get a place or the opportunity to go for the training.

"We have seen the training curriculum for ANM and CMA but those courses were never conducted and implemented. It is usually decided at Ministry level and we do know that we are always priority list but never get the chance to attend one. I have heard that most of those training placements were filled by their own people."

GHW3

The above mentioned issues are the consequence of complete failure of the health system infrastructure in Nepal and mainly in rural areas. Beside their professional challenges, they shared their personal challenges of being health workers in the remote areas.

" If you want to stay near your family, either leave the job to stay with your parents, in order to bring old parents and family over here you simply cannot afford with your Nepal government salary. It's very difficult when they get sick and you are not able to be there on time. It's really frustrating."

GHW4

"There is definitely personal isolation and those like us who are recruited by government are very recent and young graduates. This is certainly a great challenge for young doctors like myself."

GHW1

7.2.5 Use of Telemedicine amongst Outreach Health workers

All the participants from Dhulikhel Outreach centres reported that they have used phones (mobile) to consult with doctors after giving primary or emergency care treatment to the patients. Two of the health centres had even tried to use the radio system between the hospital and the outreach centres previously but due to constant technical failure, both centres stopped using them. However all health workers said they had never heard about telemedicine before this research.

Despite there being mixed responses in both cost and quality of phone signals (mentioned above in challenges), everyone was willing to use such modes of communication, both phone and email in seeking help from experts, though almost half said it was very difficult to have access to doctors (survey result). Those who had access to doctors found that advice given over the phone was very helpful; strongly agreeing that patients were satisfied with the tele-consultation on the patients' behalf.

"I have used CDMA phone for consultation but with great difficulty, signal is very poor here and advice given was not clear either – so sometime its bit more confusing."

CHW1

"In many cases we even went to the local telephone booth to consult with doctors if needed and if we are not sure about something. It would be far better if we can have CDMA fixed phone in the centre. There are only certain places here you can get a signal at the health centre."

CHW4

7.2.6 Use of telemedicine by Government Health workers

The findings show that access is one of the strongest influencing factors in using telemedicine. The access and development of a system of consultation; who to consult; for what; and when emerged in the interviews and also in the survey (Government health workers found it difficult to have access to doctors). This is illustrated by one health worker who said:

"Will definitely do the consultation when there is opportunity, but here we don't have such facilities and whom should we consult? Occasionally, we consult with the people whom we

know personally other than that nothing as we don't have such facilities here. Relatively we do quite well here as I get phone calls from Bahunipati and Dhubachaur saying "Doctor we have got such case what should we do?" I give advice and supports which are possible so at the local level its working."

GHW1

Like the outreach staff of Dhulikhel Hospital, the government health workers shared the same line of opinion such as improved signal for phone and access, they all said that telemedicine could be very useful, not only for the patients but also for village health workers.

"…importance is that the right treatment is given for right kind of diseases… with other facilities and even with telemedicine – improved signal and network coverage, it will be very good here…"

GHW2

Health worker GHW3 believes that the benefit patients get from telemedicine ultimately benefits the health workers too.

"If the patients get benefit out of this, we will get benefit too. If we can get this opportunity to use telemedicine when we are bit confused and consult seniors by sending signs and symptoms and a history, patients get treated and benefit, ultimately we get benefit too. So I think it's very good."

GHW3

7.2.7 Use of telemedicine amongst doctors

Out of the seven doctors, 2 participants Dr A and Dr E had a wider knowledge of telemedicine. Dr E recalled that he had to study Telepathology during his own MD studies and the latest books in pathology have also got chapters on telemedicine. The remaining doctors only heard of it during the researcher's presentation on telemedicine.

" I have never been involved in discussion but heard about the telemedicine from you only. Because of your presentation, I came to know many things about telemedicine…"

Dr B

But Dr B agrees that she has used some form of communication technology in consulting the patients.

"Yea, especially telephone not emails. From outreach – almost all the outreach (centres)."

Dr B

However, almost everyone had given advice or consulted over the telephone and sought help from experts from abroad when required, though they were not aware of the term telemedicine.

"*...there is always some kind telemedicine practice going on with everyone here either through understanding or without knowing it – telemedicine practices do exist."*

Dr E

Dr E's statement is further supported by Dr F when asked about using telemedicine:

" I have seen your lecture there once, not before that. But directly or indirectly we were involved with telemedicine – like that. We had to consult our senior through emails, you know and my juniors through email and through phone being on call- some sort of telemedicine. So many ways it's related to telemedicine. Isn't it?

Dr D

Dr D shares a similar kind of experience:

"Not yet, but I have taken part, participate on discussion and taken lecture on telemedicine not specifically on teledermatology."

For one of the participants it was part of his job as he was in charge of the department looking after the outreach centres.

"… being co-ordinator for the outreach community programme, I do get calls quite often when they (the outreach staff) get into problems in managing cases and dealing with those cases."

Dr A

7.2.8 Importance of knowing the person who you are consulting with: Trust

The importance of knowing the outreach staff in person; meeting face-to-face and also understanding their working system was given high priority by all the doctors who were interviewed. Here are some of the examples of what doctors said:

" (Giving advice over the phone)… with the Dhulikhel Hospital staff of outreach centres, I feel comfortable as I know the staff very well and their competency and the level of their understanding which gives me freedom and able to make guess what they mean. I feel relatively comfortable with my own staff."

Dr A

The sense of "my own staff" feeling comfortable in giving advice and "having full understanding of outreach staff competencies" is due to Dr A being in-charge of all the community programmes and having recruited almost all the staff in the outreach centres. However this was not the case for other doctors in the hospital and they strongly expressed the importance of knowing their colleagues:

"It is very (very) important, if I don't know who the person I am consulting with is, I am very much reluctant to say to refer the patient. That's my personal view. First one is recognition, who is a dermatologist? How is he treating?, Is he treating properly? Identification, introduction of person referring to and with..."

Dr D

Same kind of sentiment was shared by another doctor, Dr E:

"Yes. That's a very important question even with myself. If I am taking slides to show someone, [I am going to show to] whom you are going to trust – that person whom I trust, not everyone. Therefore trust is very important while consulting. Due to that I raised the issue, how much training do outreach people need and with whom are they going to consult? - Should be trust from the both sides – who is consulting with whom and who is giving advice to whom. When an outreach staff rings us we should get image of him, understand his limitation and what he has done and due to his limitation he cannot do this and that – we should be able to understand that side – if there is another HA it would be difficult, so trust should be in both ends."

Another participant, Dr B, mentioned that she feels bad about not having much time to get to know staff when she visits the outreach centres:

"…feel bad about and don't know much about them (outreach staff). We simply go and treat patients and come (back) – we do counsel them – I like to take feedback from our outreach staff who are there. My wish is to give them training (in) rotational basis. We have to ask them what kind of patients come there (in outreach centres), paediatric cases, surgery – I do know some outreach paediatrics cases are more, some there are more Gynae and Obs…"

The health workers expressed almost similar views to the doctors, it is important to know the Doctor in person before they consult them.

"I know Dr... Personally very well so I always ring her and she is very good in giving advice whenever I need it."

CHW2

Another health worker went even further, he made a call to the doctor who visited the health centre on several occasions but now he doesn't work in the hospital.

"I know Dr… doesn't work for Dhulikhel Hospital but I know him very well and he always been very supportive and told us to contact if we need any help so, I contact him most of the time."

CHW1

7.2.9 Their own practice of telemedicine amongst Doctors

Almost all doctors have expressed that they have been involved in some form of tele-consultation in their practice – either in giving advice to patients or junior doctors when they were on call. However, only 3 out of 7 Dhulikhel Hospital doctors have been in communication with outreach health workers.

Tele-consultation between outreach remote health workers and doctors:

Consultations took place between health workers and doctors about cases who presented in the health centres. These findings are the doctors' account of dealing with these tele-consultations over the phone. Questions were asked about the clarity of communication: voice (signal of telephone), language barriers and frequency of calls to and from which outreach centre.

Dr A, mentioned that he has taken around 30 cases (he didn't remember the exact number) but he had encountered problems:

"Most of the time it is big problem…due to poor (remote) location of our centres, signals are very poor". He further acknowledges complaints made by the staff in the outreach centre: *"(outreach) staff did complain about difficulties of making calls. Calls used to get disconnected and the voice was not clear but even during that time some how we did manage*."

Dr A

Dr B states that the clarity of voice depends on where the calls are coming from. In her experiences, out of 9 outreach centres she receives calls from 7. Some places have very good signals and others are poor. She further expressed her concern about the lack of availability of resources where some outreach centres do not have their own telephone:

"… for example of X (place) it has more disturbance. We have to repeat many times. Also the staff at the X place told us that because the phone does not belong to the hospital (outreach) and they have to go to nearby shop and it is difficult (usually) at night they (outreach staff) need to wake up the people (telephone owner)."

Dr B

One of the participants, Dr C, used to get calls when he was a medical officer but once he became a consultant, he didn't get any calls and he was not given any responsibility toward receiving calls from the outreach centre and anything to do with outreach.

" I used get calls when I was a medical officer but not anymore once I became qualified with MD. Furthermore I am not responsible for any outreach activities and that could be the reason as well. So I didn't have to do (tele-consultation), I hope other doctors are involved with the process. I am not directly involved yet."

Dr C

Asked if he was willing to receive any calls and give advice and Dr C replied:

"If the request comes, I have to and I will do."

7.2.10 Training for Telemedicine:

All the doctors and outreach staff supported the telemedicine system and were willing to use it in the future and to continue to use it to deliver health care in the remote areas. They suggested that staff should be fully trained (both outreach and hospital staff) on telemedicine and clear guidelines for the telemedicine system should be developed which answer questions such as how, who and when to use the system with a clear outline of the limitations of telemedicine. All the doctors gave further importance to providing training for Village health workers in their related areas of expertise. However one of the doctors highlighted the importance of running telemedicine training together (Doctors and health workers together) in order to build up understanding that telemedicine is team work.

"… and we can take some skill training together at the same time (with outreach workers), so that we can create a team work. Teledermatology or any medical practice is all about team work. We simply cannot work today alone. So I think in terms of teledermatology we should take same training by the dermatologist and the outreach staff. So they can interact with each other and create friendly environment and they, outreach staff also feel free to call and come anytime (at the centre). It is not that you should give them training differently and dermatologists should take training differently. No, they should take training in same setting so that they can interact with each other."

Dr D

Almost everyone supported the telemedicine system but made a few crucial points to consider before implementing it.

"*It is a very good concept but I am only concerned around infrastructure, logistics, resources and economics. If these are thought through carefully, it will be very good. In case of our own situation, at our outreach centres it will be more useful for patients to admit and treat."*

Dr C

"(In) Countries like ours telemedicine of course has huge prospects but we should plan and develop it in a very systematic way. It is important to understand the existing health system and its positive and negative attributes. This will give a clear understanding of where we can introduce the technical part and things necessary needed to develop. You are doing this very well."

Dr A

Similar sentiments were shared by the village health workers too. The health workers made a list of key elements in order to implement successful telemedicine in the government settings. These included electricity, telephone, computer and training on to how to use them effectively. However the quote from the one of the health workers (GHW3) sums up their needs:

"First we need patients, health workers, then telephone or internet whatever is available for our interests. I think that should be fine."

GHW3

The health worker (GHW 3) also went on to say that the telemedicine should be user friendly.

"*Telemedicine should be easy to use for us and able to consult doctors and follow their advice for treatment of patients and telemedicine should be supported with training and skills*."

7.3 Discussion of Findings from the Developing Phase of the research

In this *developing* phase of the research, the findings from both the survey and the interview highlighted some key issues. The survey results show there is a strong wish to improve existing health care practice by health workers and also realisation that telemedicine or technology may do this. The wish and enthusiasm to take part in further development in this project led to exploring their personal and professional challenges through in depth interviews and listening and being with participants.

The interview findings highlighted both the personal and professional issues of being a health professional in Nepal and the challenges of delivering basic health care in remote areas. Despite all the challenges there is a common theme emerging that the health professionals are "willing to serve" if proper training and support mechanisms are in place. Figure 7.1 shows there are common challenges in being a health professional in the remote areas though others are specific to the government and Dhulikhel Hospital.

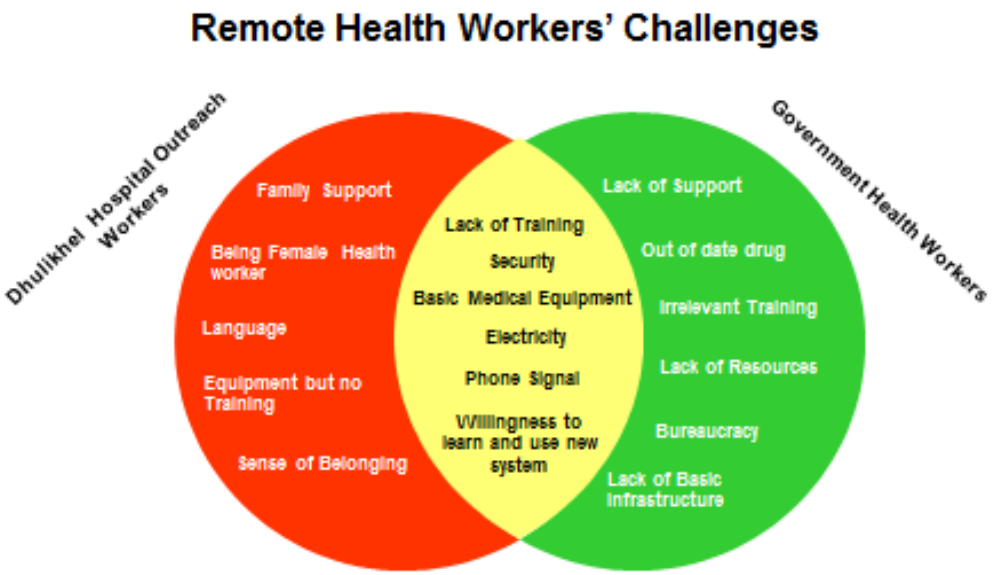


Figure 7.1: Professional and Personal Challenges of Being Village Health Workers

Security was the main concern of all the village health workers; relatives may not be able to understand the situation of the patient and they get violent towards health workers. Failure to deliver what is promised and misuse of resources can mean that the front line health care provider has to face up to confrontation from the general public. However

the situation for the government health workers is more severe than the Dhulikhel Hospital health workers.

Some of the issues described below are from the *developing phase* findings and suggestions made by the health workers.

- **Phone and connectivity:** Health Workers shared what would be the best option for communication with them and which network works in their location from their own experience. This certainly helped the researcher and the Hospital to take action to devise the solution which is described later.

- **Electricity:** Nepal was going through a national crisis on electricity supply; worst hit were the remote areas of Nepal. The daily power cuts varied from a minimum of 4 hours up to 18 hours a day and in many cases several remote areas were left without electricity for several days.

- **Access:** The access to doctors for consultation by a reliable means of communication is a basic element of the telemedicine project. The survey findings showed that access is one the strongest influencing factors in using telemedicine. The importance of this "who what and when" emerged in the interviews and also in the survey (Government health workers found it difficult to have access to any doctors) which will be addressed in the next phase of the research through consultation with all the stakeholders.

- **Knowledge and Skills:** Thirst for learning to update their knowledge and skills was widely expressed during the interviews (both clinical and support training such as computer skills). Moreover they were frustrated at not getting such knowledge and skills on time with the consequent negative effects on patient care. Both groups of health workers (government and Dhulikhel) expressed their willingness to undertake training customized to their needs to deliver relevant health care in their locality.

- **Telemedicine training:** Developing skills (training) on telemedicine was found to be one of the most important factors and was also mentioned by the doctors

during their interviews. Everyone agreed and suggested that staff should be fully trained (both outreach and hospital staff) on telemedicine. Clear guidelines of the telemedicine system which answered questions such as how, who and when is should be used, with a clear outline of the limitations of telemedicine should be developed.

- **Family support:** It is not unusual for men in Nepal to go away from home in search of work, sometimes working in remote settings with a lack of professional challenge; but the family plays an important role in making the decision either to work away from home or in such a remote situation. Many participants expressed their guilt and sadness at not being able to be with family especially those who have children at home with their spouse and elderly parents. Family support is even more crucial for women health workers working day and night with men in the Health Centres. It is difficult to establish a social acceptance of an unmarried young woman working in the health centres. However the case of CHW3 demonstrates that whilst on the one hand society and its culture is a barrier for the women to work in such situations, on the other hand within the same society and culture there is a solution; the simple gesture of *Tika* symbolizing the bonding of "brother and sisterhood relationship" within the society.

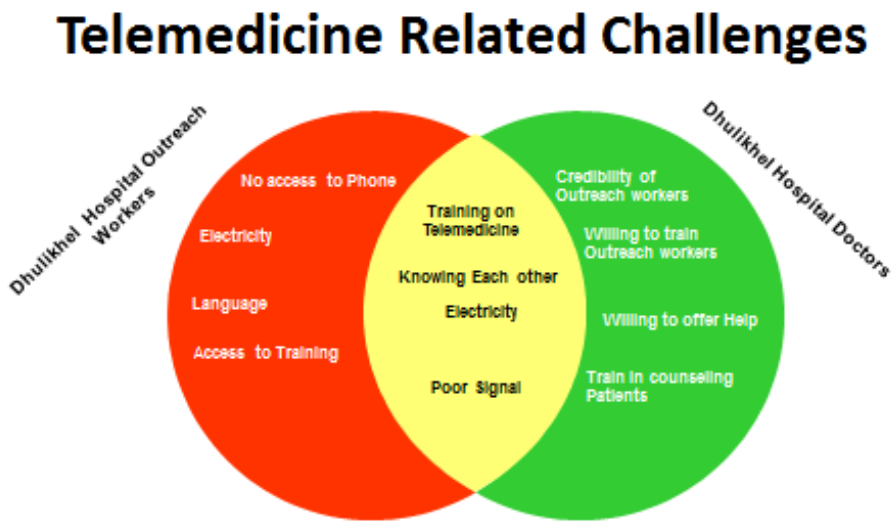


Figure 7.2: Challenges in implementing Telemedicine between Village Health Workers and Doctors

7.4 Formulating the plan for action

The formulation of actions from the *developing phase* can be divided mainly into two categories: Telemedicine related and non-telemedicine related:

Telemedicine	**Non Telemedicine**
Telephone	Security
Training	Family Support
Electricity	
Access to Doctors	
Listening	Listening

Table: 7.3 Formulating the plan for action

As shown in the table above, the participants expressed telephone, training, electricity and access to doctors as basic components required to implement telemedicine and the other issues they raised were security and support (family and professional support) which are summarized below.

Telephone: Both the availability of a telephone and the quality of a signal for mobile phones were very poor or non-existent in the outreach centres. Lack of phone service or poor signal of the existing network in the vicinity of the outreach centres made telemedicine a far-fetched dream.

Training: Training was another crucial component for the telemedicine: either training about telemedicine equipment and implementation or training on particular cases and what health workers can deal with themselves in the health centre in addition to what and when they should seek help (or use a telemedicine system).

Electricity: Electricity or energy is one the major problems faced by the health care service providers in Nepal. Phone calls may not be possible as the majority of telephone signals are powered by electricity.

Access to doctors: The outreach workers did have some understanding that they could phone hospital doctors if they needed help. However due to lack of information on who is who in the hospital and never having met many doctors face-to-face, they were quite reluctant to use the access they do have to the doctors. Furthermore, the situation was as serious amongst the doctors in the hospital who did not have any knowledge of the competencies of the village heath workers and had not worked with them. This made it difficult for doctors to give any kind of advice over the phone.

Safety: There were two concerns: first violence from patients and patient parties and second, politically motivated violence from the public. With the political settlement in Nepal the latter is no longer an issue. In one instance of the former there was a problem with how the hospital staff had behaved and the researcher was able to bring this to the hospital's attention in the hope of preventing a recurrence.

Support: There are inevitable family strains when a family member serves people in a remote and isolated area of the country. This was an even greater issue for female health workers. The researcher had little power to amend this but was able to counsel some individuals and speak to their families.

The chapter has highlighted the areas which are either directly related to telemedicine or not. In this phase of the research it was important that such issues were identified and analysed in depth in order to understand the genuine need for the formulation of action. The actions identified above will be explained in depth in the next Chapter.

7.5 Conclusion

This chapter has identified the issues which are important to a range of stakeholders when a modest telemedicine system is proposed in rural Nepal. It has found problems in how the health system works which would have a bearing on how a telemedicine system might operate; for example if the conventional system of face-to-face medicine is not working well it would be unrealistic to think that telemedicine could improve it. Also there may be easier ways to improve patient care by making small improvements to conventional care rather than introducing a whole new system. The actions identified will be developed in the next Chapter the *Maturing Phase.*

8 The Maturing Phase: Implementation of the action plan

8.1 Introduction

This chapter *Maturing Phase* forms part of the ongoing process from the *developing phase* of the Participatory Action Research project and is particularly focused on what were the issues that needed to be addressed to implement Telemedicine in rural Nepal. Telemedicine related actions, identified in the *Developing Phase* provide the focus. These are installation and use of telephones, the electricity shortages in the hospital, training, purchasing and installing equipment in the health centres including computers and digital cameras, and improving access to doctors by building up effective communication between outreach health workers and hospital doctors. This chapter explores these actions and their outcomes. The actions are presented as they were taken.

8.2 Phones

The action, according to the wishes of participants, was to have telephone lines installed for the telemedicine project. This was undertaken by the researcher. Finding the best kind of telephone system, in terms of connectivity and cost was essential to the project.

Acquiring and testing new and different service providers was done quite easily as many of the outreach workers already used mobiles with different network providers. Some had very good reception in the area and others poor. In many cases they had to go out of the building to find a signal. The researcher required to know if there were any phones, either public or private, in the surrounding areas, whether they were effective and accessible.

Place	Mobile GSM and Mero Mobile	Voice CDMA Mobile and fixed set phone	Satellite phone Voice and Data
Bahunipati (DH)	✔ (Mero – very weak signal)	✔ Mobile (only outside of the health centre) Fixed Phone – very good signal inside	✔ Satellite phone was tested – it was difficult to set up and very expensive – 40, GBP per day.
Bolde Phediche		✔ Mobile (only outside of the health centre) Fixed Phone – very good signal inside	
Kartike Deurali	✔ (GSM very weak signal)	✔ Mobile (only outside of the health centre) Fixed Phone – very good signal inside	

Table 8.1 Outcome of health workers and researcher tests of signal strength and connection for all the three kind Phones.

Once different telephones and mobile network providers had been explored, the researcher acquired all the equipment to test (Table 8.1) including a CDMA fixed set phone. A CDMA fixed set phone (which is like a landline phone but uses wireless technology) was recommended by all the participants as they have used them themselves from the local telephone booth which was installed in the local shops.

8.2.1 Partnership with Nepal Telecom

Nepal Telecom is the state owned communication service provider of Nepal. Nepal telecom is the biggest and most experienced provider in the field of telecommunication and also has the widest coverage across Nepal. The researcher anticipated Nepal Telecom to be an ideal partner within the project.

Nepal Telecom and the researcher signed a Memorandum of Understanding (MoU) for technical assistance for the next three years and they gave Rs 40,000 Nepalese Rupees (around £380) towards communication equipment for four pilot sites.

With this generous donation four fixed CDMA phones, three mobile phones, three patch antennas were bought. Three phones and three patch antennae were installed successfully at the outreach centres (Bahunipati Health Centre, Kartike Deurali Health Centre and Bolde Phediche Health Care Centre – Figure 8.1); one fixed phone set was installed in the Accident and Emergency Department in the hospital (24 hours). The phone at the AE Department of the Hospital is the first point of contact for the Outreach staff.

Figure: 8.1 CDMA Fixed Phone and Patch antenna

Because there was no or very limited signals at any of the locations of the health centres, signals were boosted by a patch antenna (Figure 8.1) for fixed CDMA phones after thorough consultation with the provider Nepal Telecom. With these, phone signals were boosted up by 20 times and had a very clear and undisturbed voice call with internet access of 150Kbps (Kilobytes per second). Nepal Telecom provided further assistance with these high quality antennae charging only the deposit of Rs 2000 per antenna.

The CDMA Engineer from Nepal Telecom gave a presentation on CDMA in the hospital for doctors and its coverage, including how best to use it for telemedicine.

8.2.2 Wider use of the telephone

Once the telephones were installed in the health centres, emergency department and mobile phones were provided for consultants, the number of phone calls increased substantially as evidenced by the increased in the telephone bills, however exact quantification of the increased in tele-consultation was difficult to establish as phones were also used for administrative calls.

Lack of guidelines on using the phone

Once the phones were installed, no official guidelines were introduced apart from a fixed monthly credit to each phone allocated by the hospital.

Misuse and underuse of the phone

At one outreach centre there was overuse of the phone by intern doctors as reported by a health worker:

"That was maximum misuse. We are only two and they [intern doctors] are always 3- 4 in number, when we are busy with patients downstairs –they go up (to the room where phone is located) and use the phone. That's the one case and when we had doctors for a month or two, they used it a lot too. Rs 500 top up hardly lasted more than 10 – 15 days. They are always on phone and claim that they are doctors and sent by hospital – it's very difficult for us to tell them not to..."

CDMA Mobile phones for doctors

Mobile phones given to consultants were not used as anticipated. The researcher had a meeting with doctors; they already had a mobile for on-call as well as a personal mobile phone and with another mobile phone for telemedicine they had too many mobile phones.

Later it was decided that outreach health centres were welcome to call the on-call duty phone and some doctors agreed to pass on their own mobile phone numbers for consultation.

8.2.3 Other telemedicine-related equipment

Equipment discussed here is directly related to telemedicine such as computers and digital cameras. At one site we couldn't install a computer due to a lack of basic infrastructure – no dedicated building and no electricity.

Overcoming computer phobia with training

The health workers' skill with computers to start with was limited, ranging from not knowing how to switch the computer on, to limited use for entertainment. Following the installation of the computers in the centres and with the introductory training, the following comments were made during the follow up interview:

"I do use it now but I feel that I need [more] guidance, (I use) computer much more than before. I used to be afraid to use computer even just to touch and I had no knowledge of how to switch On and Off. But after you (the researcher) invited us for teledermatology (training) I gained a bit of knowledge and even myself... I started touching (using) more computer since then."

CHW 1

Another outreach worker (CHW2) talked about how his use of the computer had improved following the training:

"Once computers were installed we only used for them watching movies but after the training I started using them a lot more for making reports and using excel for making lists and expense sheet for hospital monthly report."

Computer Breakdown and maintenance

One of the major problems of the computers was frequent breakdown. The researcher consulted computer dealers and service providers; it was evident that the frequent fluctuation in power supply and adverse environment (pollution) does have a part to play in computer breakdown. Beside hardware failure, many computers were affected by viruses because they did not have proper anti-virus software installed. The use of corrupted CDs and memory sticks either for work or to use the computer for entertainment (watching movies) also caused crashes.

After any breakdown of the computer, the outreach workers usually had to bring the machine down to the hospital and leave it at the community department to be fixed by IT

technicians in the hospital. However most complained about the time it took (sometimes more than two months) to get any information regarding the damaged computer.

"Here (Dhulikhel Hospital) it took around 1- 2 months, Once I brought it here, it was here for one to two months in the community (department) room and nothing seemed to happen so I took it to the computer institute (private) myself.. got fixed in just one day that's it…"

CHW 1

The health worker (CHW1) further recommends the hospital should use external services to maintain the computers:

"For computer, it's better to have link with outsider (provider) rather than with the hospital. Not only computer, any equipment needing to be fixed it's better to have external service provider. In the hospital its lengthy process, from this department to that department, asks one person to another – it took so much time."

Digital Camera for use of telemedicine cases

Digital Cameras were distributed to three outreach centres for staff to learn how to use before the training and to bring them to the training. However one outreach worker came without a camera, which he reported missing after it was lent to the hospital community department staff during their visit to the outreach centre.

8.3 Electricity

Electricity was one of the greatest challenges for everyone and especially for those advocating and researching telemedicine systems. Electricity is a vital source of energy to operate the communication system. This posed a big dilemma for the researcher with not only 16 to 18 hours of power failure in the outreach centres but also in the hospital where energy needed to be saved for life-saving operations rather than to power computer and communication services for teleconsultation. The worst hit places with the electricity crisis were the remote areas of the country.

As part of the action during this phase, consultations with the suppliers took place (*developing phase)*, looking to secure a non-disrupted power supply for the hospital and also for the Health centres. However one of the outreach centres was fully operated by

solar power (24/7) and one had a generator back up (when needed). The third didn't have any electricity supply even though the rest of the village was electrified.

Options were explored as to how best to maintain the electricity supply to the hospital and health centres. Hospital technicians, alternative energy (solar) providers and generator suppliers, both in Nepal and in the UK were consulted to find what the best option was to overcome such huge power shortages. This involved many hours of discussions on power saving in the hospital and also produced many quotations on how to solve the problem. The outcome was to have a dedicated feed from the national supply and which was guaranteed to be uninterruptable. The process of installing the direct electricity feed was under discussion with the Nepal Electricity Board and the hospital during the research period.

8.4 Training and its challenges

The importance of training and updated knowledge on the latest developments in different methods of treatment and care of patients was expressed by the outreach health workers during the *developing phase* (data collection). During this phase many hours were spent shadowing their work, listening to their stories and understanding their concerns about working in the outreach centres.

In terms of delivering training, the researcher had several meetings with the person in-charge of the Community Programme Department of Dhulikhel Hospital and also with the doctors from the specific departments who had expressed their willingness to run training for outreach staff during research interviews. Once all the stakeholders had been involved, the planning of the training started.

8.4.1 Planning of the training

The planning took a longer time than anticipated: issues which had to be resolved included coordinating with the community health programme department in the hospital for the time, accommodation and refreshment during their training period; availability of the doctors and the department for the training; consultation with outreach workers to find the best time of the year for their training (so that their absence did not have much effect on patient care). After long consultations with both the outreach workers and the hospital staff, the training was fixed in the hospital at end of 2008 (winter period) as the

patient flow is lower in the winter and the centre can spare one or two staff for the training purposes. This was four months after the end of the *developing phase* of this research. Furthermore, the agenda for the 5 days training was designed to attempt to address all the issues raised by the health workers.

In the first phase of the training, dermatology, basic introduction to computers and using digital cameras for telemedicine purposes were included.

8.4.2 Dermatology Training

The general training on dermatology was held in the hospital premises and focused on a general introduction to the department and doctors conducted short interactive workshops and lectures on different skin diseases; the cases which can be dealt with in the outreach centres and cases that require telemedicine consultation.

Figure 8.2 Outreach workers interacting with a patient during the training.

Furthermore during their stay in the department, outreach staff were directly involved in diagnosis, and taking pictures for further consultation with doctors. During this period doctors observed and supervised health workers developing their skills in taking an effective history of skin diseases and counselling patients (Figure 8.2).

Figure: 8.3 Training participants taking part in group discussion on a dermatological case

This further gave doctors an understanding of the outreach workers' level of knowledge of certain diseases and competence in dealing with patients.

8.4.3 Primary Eye care training

Three outreach workers along with 10 other outreach staff attended two days primary eye care training conducted by the eye department of the hospital.

Training related to Telemedicine

Three health workers attended the training related to telemedicine – one from each 3 health centres. They had either very limited knowledge on using computers or none at all. One of the staff from the computer and maintenance department volunteered to teach health workers basic computer skills: use of Microsoft Word, and Excel, browsing the internet and sending emails with an attachment

Training in the use of digital cameras was conducted together with health workers and departmental staff of Dermatology. All the health workers took a picture of skin abrasions or other skin disorders before the training and discussed with doctors and among themselves whether the pictures were interpretable. Then the researcher conducted training, according to the Swinfen Charitable Trust Handbook (2005), in taking clinical pictures. The training was fun and as well, the doctors were able to make a diagnosis on the spot.

Training feedback

After a five day training in the hospital, the researcher asked for feedback from the outreach workers. They all responded saying how useful it was to be able to know the departmental staff better during the training period.

"We used to attend training for the whole day and then return to our outreach centres but this time we got more time to interact with doctors and other departmental staff better"

Participant 1

Figure: 8.4 Researcher taking feedback from the participants after the training

All the participants expressed the importance of knowing about hospital departments. Outreach staff were not officially updated on departmental developments in the hospital and their services. Due to that, they usually referred the patient to the new services without having a full understanding of such developments: For example one of the staff highlighted frustration having to refer patients to such new services without having a proper information and induction the service to the health workers.

"We heard that there was laser machine installed for surgical dermatological cases such as to remove marks, [moles and tattoo] and so on without leaving any marks after the treatment. We are equally excited and proud to have such advanced technology in the hospital, however we never had much information about such technology and its uses in detail but we did refer patients for such service without having a proper knowledge of such service. This is rather frustrating."

Participant 2

The participants highlighted the following points;

The opportunity to learn more about the dermatological cases, this was expressed by all the participants. This provided an update of their existing knowledge of skin diseases and also an opportunity to learn about new developments and more on the diseases and methods of treatment.

"*I didn't have much knowledge of derma… but I did get opportunity to learn new and more on skin diseases and their treatment.*"

Participant 3

Better understanding of Doctors' daily routine

Being unable to understand the working pattern of the hospital was a fear for many of the health workers who were worried about interrupting doctors when they needed to do a consultation. This fear was lessened due to the training in the department where spending time with hospital staff enabled outreach health workers to understand the overall schedule of doctors and their daily routines. Health assistants who were assisting consultants in the hospital were thought to be the right channel for the consultants to be contacted by the outreach workers (a gate keeper role).

Health workers further believed that the training session with dermatology laid a very stable platform to start a teledermatology service and certainly boosted their confidence in dealing with cases and asking for help where and when needed. The only concern raised was of the concurrent availability of the patients, the doctors and electricity to have an effective consultation.

8.4.4 Training for Doctors: Language challenges

Medical doctors expressed their concerns about professional writing in English either be it research papers or report writing. Therefore a one day workshop for doctors on professional writing was organized and found to be very useful. This was conducted by the trainer from the British Council who was highly qualified and experienced and also very expensive. Ten doctors (mostly consultants) participated in the workshop and reported it very useful and said that they learnt some very important tips and methods on professional writing. The group work and group editing of the individual work were appreciated by many who openly participated in the discussion. The trainer further sent a list of useful websites for improving professional writing in the health sector. The

participants expressed the need for such workshops in the future. The workshop was funded 20% by the doctors' individual contribution and rest by the hospital.

The feedback was very positive with all participants feeling more confident in giving presentations in front of their peers. The doctors asked for this to be repeated in the future.

8.5 Outreach Conference

The first ever outreach conference was held towards the end of the end of the *Maturing phase.* During and after the *Developing phase*, the outreach workers expressed their concern around lack of effective communication, support mechanisms, induction and relationship gaps between hospital and outreach centres. Health workers shared their experiences of practising healthcare in the villages without having proper support in place. Furthermore there were big issues around a sense of belonging (outreach health workers felt that they were not considered as part of the hospital staff). This was compounded by a lack of knowledge on the part of administration staff in the hospital and further exhilarated due to the challenges outreach centre staff faced in getting something get done within the hospital effectively (on time) after a day long and difficult journey from the outreaches.

Besides the three designated research locations, the researcher visited other outreach centres of Dhulikhel Hospital too; their willingness to participate and enthusiasm for learning new systems of delivery of care was similar to the participants. These other outreach centres also expressed some genuine concerns which were almost identical to those which were voiced by the health workers from the research sites. Staff from these other centres also participated in the conference together with staff from the three research sites and the conference outcomes are discussed below.

The conference was proposed by the researcher at the end of 2008 or early 2009 but it didn't take place until December 2009, near to the completion of the *Maturing phase*. Organizing the outreach conference took longer than anticipated due to difficulties in co-ordinating attendance for everyone from all the outreach centres, in spite of their enthusiasm. Further delays were due to late responding to requests and collaboration

from the Community Department in the hospital. Finally requests both from the outreach participants and the researcher highlighting importance of the conference, but the department of the hospital organized the outreach conference with a very short notice for the outreach workers to attend.

The Outreach conference was designed in such a way that it would accommodate all the issues raised in the Developing and Maturing phase the project. It took place over three consecutive days: the first day consisted of introductions – to each other, to the outreach programme and to the hospital – and all the outreach centres were asked to give an oral presentation about their centre, using Power-point if they chose. Furthermore the Community Department gave a presentation on outreach work, and on who is who in their department; the second day was about telemedicine, mostly presented by the researcher; the third was a series of department presentations and workshops.

8.5.1 Specific outcomes for immediate action from outreach conference

Two specific issues were raised by the conference. The first was around identity and visibly being part of the hospital. They required proof of identification that they were part of the hospital such as ID card or dress code either within the hospital or while dealing with communities. Dr Z and the researcher took action immediately and all the outreach staff were given their ID card the day after they raised the issue and Dr Z assured them that there will be a uniform for the outreach workers too.

The second issue came from all the participants and concerned the referral system for the patients from the outreach centre to the hospital. Many complained that when the patients arrived at the hospital following referral from the outreach centre, they were treated as a new patient rather than being treated as referral patients.

8.5.2 Conference feedback

The researcher asked everyone who attended the conference to fill in a very simple one-page feedback form on the following topics - overall conference experience, training, telemedicine workshop and suggestions for future sessions. Here are some feedback comments from the feedback forms from the participants.

The overall impression was extremely positive and the themes generated are set out below.

Getting to know each other better

"Getting to know each other" was one of the highlights of the conference which was overwhelmingly expressed by everyone. The conference provided an opportunity to find out about other outreach centres and meet their staff, as well as learning more about the different departments of the hospital and meeting their staff.

"The conference gave us an opportunity to meet and be introduced to all the friends from different outreach centres."

Participant 1

"We got an opportunity to know more about the hospital and the staff of different departments."

Participant 2

Discovery of a collective voice

Almost all expressed that they had an opportunity to voice their issues collectively and seek a way out for those challenges.

"We all, the friends from outreach centres had the opportunity to raise our challenges collectively and got assurance in addressing those challenges in near future."

Participant 4

Participant 2 further added in the feedback:

"We got an opportunity to say (express) our challenges, discussed to the way to solve them."

8.5.3 Support from senior management

The engagement of senior hospital management in the conference was important to the attendees who were reassured that their opinions and concerns mattered and were being taken notice of.

"Dr Z (senior management) assured us that he will fully co-operate with and support outreach staff and will introduce separate arrangement for the patients referred from the outreach centres in the hospital."

Participant 3

8.5.4 Workshops and training

They all expressed that they had really enjoyed the training sessions

"Trainings are very important for our practice as we can apply in the outreach centres what we have learnt here in the hospital. After training we can handle the basic situations ourselves, no need for referral (things that we used to refer)."

Participant 1

"Learnt more and different ways of providing treatment to the patients in the villages … and the training has increased my self-confidence."

Participant 5

Everyone enjoyed the telemedicine workshop conducted by the researcher

"I really enjoyed the training specifically on Telemedicine as I got chance to learn and understand importance of telemedicine in delivering health care for any remote areas of Nepal. With help of telemedicine, Nepali people who are living in remote villages can have access to international standard health services and get treatment without leaving the village."

Participant 5

"…presentation and training on telemedicine was very informative and had a great opportunity to learn more on telemedicine."

Participant 6

8.5.5 Recommendation for the future in organising Outreach conference

Everyone wanted to have more conferences like this. These are some comments from the feedback form.

"Date and time should be fixed early and allocate enough time for all the outreach centres to prepare for the conference."

Participant 1

Participants highlighted that every outreach staff should get chance to attend such conference as in this conference there were one representative from each outreach centres.

"Participation for the conference should be on a rotational basis rather than focusing on one person such as outreach in- charges."

Participant 2

The participants further raised the importance of having different departments of the hospital related to the outreach centres should be invited in the conference too

"All the responsible department and staff should be invited at the conference. For example, issues around administration should be raised in the presence of the administrative staff and need assurance that those issues will be solved and look for solutions in time"

Participants 3

One of the participants was eager to see action resulting from the notes taken on the issues and also to find out who is doing what to address these actions.

"Those raised in the conference should be implemented rather than only been documented in paper."

Participant 6

They all expressed that Conference had been very fruitful with some actions and one of the participants suggested and everyone agreed too on the following statement:

"This could be the first outreach conference ever but in coming days it would be better to have one (conference) every three months."

Participant 2

The following quote from a participant sums up the conference:

"The training has been enjoyable, because we got a chance to meet with all the outreach staff (friends), (have) introduction to many hospital staff and opportunity to learn many new things and indeed got the opportunity to put forward personal challenges and wishes too."

Participant 4

Figure 8.6 Conference participants with the researcher

8.6 Access to doctors

Access to doctors for consultations both through a reliable means of communication and personal knowledge are the basic elements of the telemedicine project; this came up in both the survey and the interviews in the Developing phase of the project. Access was improved firstly by setting up phone and communication links between outreach health centres and the hospital and secondly by providing an opportunity through the conference and during training for all stakeholders to meet.

Training sessions and the outreach conference were great platforms for increasing access potential between doctors and health workers. The training and conference gave the outreach workers an opportunity to introduce themselves to the doctors. The training also added value for the doctor; it enabled them to understand better the limitations and strengths of individual health workers.

8.7 Listening and being with health workers

The researcher spent many hours listening and observing daily health professional activities in the health centres and in the hospital. The purpose of this was to become recognized by the people and familiar with the local community before any specific request for participation was sought. Similarly a period of 'getting to know you' took place in the hospital settings, village health centres and villages. The researcher further kept notes after each visit in order to understand the "genuine need" for telemedicine in delivering health in remote Nepal.

The listening and observation processes continued from the early phase of the research until the end of the field work. They gave further understanding to both personal and professional aspects of the health professionals' lives. The researcher's presence at the hospital and outreach centres and asking questions on different issues according to their daily activities enabled the researcher and health workers to build trust and mutual respect. They started to open up with hopes, fears, challenges and expectations from personal and professional aspects.

Being present, brought into the open some previously unmentioned problems with the hospital internal management system. Some of the issues raised by the doctors and health workers were:

- The need for an induction session

- The availability of one stop information regarding the hospital (good web portal)
- The availability of facilities for staff including work email or working space
- The need for job descriptions
- The need for an organizational chart and identify who is who
- The need for a continuing professional development scheme
- That there is a lack of clarity of support mechanisms

There were no facilities in place for inductions and updated information for returning, rotational or new staff in the hospital. This was a major problem for health workers recruited for the outreach centres. This further pushed outreach workers into personal and professional isolation.

Access to information was further challenged by the lack of basic information systems on the hospital and its services. The system included an out of date website, lack of organizational email for staff, and no organizational chart including who is who. Only two information sources were in place: brochures (English language) and the Annual Report. The information void increased the gap between outreach centres and the hospital staff.

8.8 Discussion

The actions formulated from the *Developing phase* of the participatory action research led to this chapter on implementation of the actions – the *Maturing phase*. The work was challenging, and took up a huge amount of time and energy of all the stakeholders including the researcher's over 12 months. Furthermore the interlinked nature of issues raised from both telemedicine and non-telemedicine aspects made the necessary actions increasingly complex. The actions implemented broadly fall into three main themes: access, communication, and empowerment: these are linked together by two positive reinforcement cycles (see Figure 8.7 below).

In the clockwise cycle, better access leads to better communication which empowers the health worker and leads to more access. In the anti-clockwise cycle communication leads to access which increases empowerment and leads to more communication. These are equally relevant to non-telemedicine activities as well as telemedicine ones.

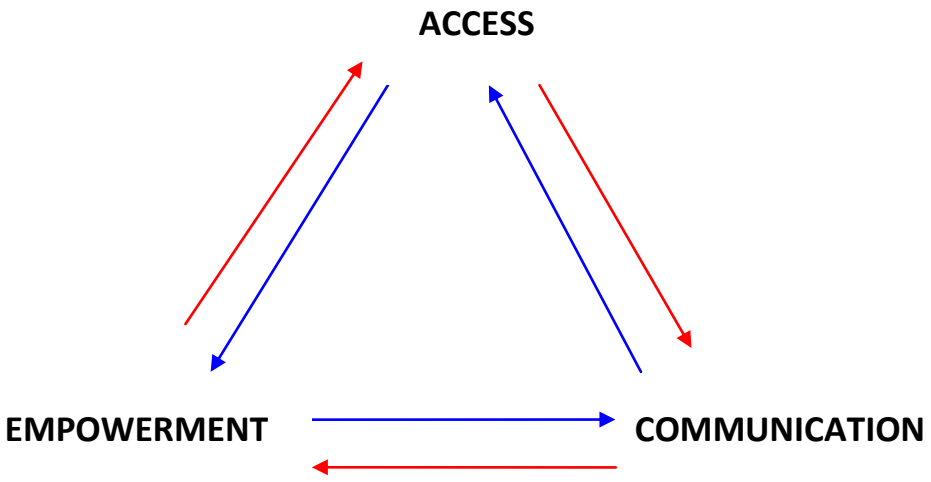


Figure 8.7: Two way flow of connecting themes

8.8.1 Access

Access has been one of the key emerging themes in this research. The access encompasses two main categories: 1) Access to people and 2) Access to technology.

Access to people: *"to see and to be seen"*

The access to people has been the integral part of the whole research in building new relationships between service users, service providers and the researcher. These include the whole range of people- directly involved with telemedicine *(patient, village health workers and Doctors –and in a broader sense, villagers, Health centres and Hospital)* and other outside agencies *(Nepal Telecom, IT professionals, electricity suppliers)* who are equally important for the tangible output of telemedicine. However, this discussion will focus on how the actions implemented have increased accessibility for different stakeholders when introducing a telemedicine service. For example, the key position of the telephones is considered first.

The Telephone

The CDMA phone service of Nepal Telecom was found to be very effective in terms of coverage, affordability (cost), data service (internet service) and most importantly user friendliness.

Furthermore, the partnership with Nepal Telecom was crucial in understanding the service better. The researcher spent many hours with CDMA engineers, CDMA service planning and implementing team and others who gave a better understanding of the phone and its wider possibilities in strengthening rural communications in Nepal.

The CDMA telephones were sought for the hospital and in the outreach centres and were particularly successful. The installation of CDMA telephone certainly proved that telemedicine was feasible.

Computer

Computers which were installed at the outreach centres highlighted two main technical problems – frequent crashes (this could be due uncertain fluctuation in electric supply) and inadequate repair. Both of these are solvable. Furthermore, training needs in using the computer were highlighted during developing phase of the research project.

The training conducted during the research periods was well received by both doctors and health workers. This demonstrated the importance of needs assessment involving both trainee and trainers beforehand. Future customized training for specific outreach centre staff would be even more beneficial because of the diverse nature of the user groups and geographical situation of each outreach centre.

Training created a strong platform for knowing each other and building relationships at a professional and personal level. It gave the health workers the needed confidence in their existing knowledge and the doctors understanding of the competency level of the health workers.

Joint training: The joint training on how to use a digital camera and take clinically acceptable photos for diagnosis increased mutual trust and respect as well as digital camera use.

Outreach Conference

The first outreach conference was found to be highly effective as it gave a platform for outreach workers to have a collective voice and identity. Activities such as a tour of the hospital, helped to bridge the gap between the hospital and the outreach centre staff. The conference further highlighted that the problems of three pilot study sites were similar to the other outreach centres.

So the installation of the phone, training and outreach conference are all interlinked and made a huge contribution towards increasing access. The above actions further validate the next two themes: communication and empowerment.

8.8.2 Communication

Effective communication, verbal and, non-verbal, plays a vital role in participatory action research, through effective listening to hopes, fear and challenges. Effective communications is an art and can sow the seeds of mutual trust and respect. Therefore, being with health professionals and villagers has been a major part of this research: with a great deal of explaining about the project and listening to genuine concerns.

By listening, the researcher obtained an opportunity to observe and experience some other issues but critical which were not raised during the surveys and interviews. The issues raised impact directly or indirectly on the acceptance of new initiatives like telemedicine and its sustainability. For example, the needs to develop clear job description for the health workers and doctors were raised and discussed in several staff meetings during the Developing and Maturing phases of this research. These issues now have been taken up by the hospital administration.

Often the researcher simply listened to frustrations and hopes and the participants started accepting the researcher as a colleague rather than an external researcher.

Effective listening also led to many of the actions mentioned earlier such as training, service information and recommendations to the hospital regarding their channels of communication. Therefore an effective communication led to actions (voice been heard) which led to making the organization more accessible for the outreach staff and the wider community. The two clear actions that resulted were the development of an interactive

website and the production of the hospital documentary in Nepali language with English subtitle which was broadcasted on the national television.

Website: A new interactive website with several features and up-to-date information on hospital was launched in 2009 and is updated regularly (www.dhulikhelhospital.org) by hospital staff. Information was gathered through the Annual Report and crosschecked with respective departments if any changes or updates that were required before uploading in the website.

Recommendations were made to the hospital authorities for having work email addresses available to all the staff.

Television Documentary about the hospital

Making of the documentary involved participation of staff and users of the hospital and gave further insight into the hospital and its services. Filming of the documentary "*Dhulikhel Hosptal: a journey so far…"* (http://www.youtube.com/watch?v=tkV9s7P7kyA) with help from professional producers and crew (volunteers) gave another opportunity to learn and interact with all stakeholders including outreach staff and the patients. The main purpose behind the documentary project was to celebrate and promote the hospital and its philosophy of community-based health care to the wider population in Nepal. Furthermore the project was enthusiastically supported by the hospital staff who participated in its production. It was previewed at the hospital morning conference before being broadcast on the national television at prime viewing time in the evening. The video was later shown several times in the hospital for staff and visiting dignitaries and was also distributed to all the outreach centres.

8.8.3 Empowerment

When the health workers took the opportunities to express their fears, hopes and challenges they were able to concentrate on trying to find solutions together with the researcher. Working together makes a good combination for identifying the "genuine need" and setting a platform for "new initiatives". Effective communications and having access to the resources made developments possible. These activities also gave perhaps a sense of belonging and a feeling part of the team and voice to discuss the challenges and hopes for their professional development and the growth of the organization. Being involved in decision making and witnessing change enhances empowerment.

9 The Early Sustaining Phase

9.1 Introduction

Early indications of the sustainability of the telemedicine approach developed through the actions reported in the *Maturing phases* of this research project. The impacts of actions taken are presented as case examples below. The chapter concludes with consideration of the views of the partners whose enthusiasm and dedication was vital to the implementation and continuation of telemedicine.

Telephone consultations regarding difficult cases and asking for second opinions already existed in the hospital before the telemedicine system was launched. Though, many participants didn't hear about the term **telemedicine** before the arrival of the researcher in the hospital. They used the telephone and any other means of communication for consultations. However the system was disorganised and lacking in clear structure, thus relying on chance that appropriate contact was made. Those consultations were more about helping out those in need (on a voluntary basis) rather than as part of service delivery for the patients or on behalf of the hospital. Telephone medicine as "telephone consultation" is not new in Nepal. Once the basic telephone was introduced as a part of the services in the hospital for research purposes, the consultation between outreach centres and the hospital increased rapidly. Some fascinating lifesaving cases were managed through telemedicine. Whilst some situations benefited greatly from the approach, others did not. This chapter presents an account of a number of cases handled via telephone and email between Doctors and health workers at the outreach centres during the research period. Elements of access, communication and empowerment are interwoven throughout the accounts.

The case examples presented below are divided into two categories:

- Telemedicine cases dealt in the outreach centres
- Telemedicine cases referred to the hospital after primary management

9.2 Telemedicine Cases dealt within the outreach centres

Many cases presented in the outreach centres. They ranged from life threatening situations to chronic long term illness. These illnesses present the biggest challenges for outreach workers. In common with all primary level emergency settings, staff do not know what they are going to be faced with day or night. Some of the cases encountered during the research period were: Gynaecological and Obstetric cases; abortions, falls and cut injuries: ilium proliferation and Scrotum proliferation; appendicitis; jaundice; malaria; meningitis; animal attacks: snake bike, monkey bites, leopard attacks and wasp stings and paediatric cases. Amongst these cases many were dealt with in the health centres after consultation with the doctors and many had to be referred after primary management of the case to the hospital. In some life threatening cases, health workers even accompanied the patients to the hospital. Some first-hand accounts shared by the health workers and doctors who dealt with the cases using telephone and internet are presented below. The case examples enable the readers to gain insight into the contextual realities for health workers, patients and their family as they experience serious health problems. These cases are categorized according to the value of telemedicine in different medical disciplines:

The value of telemedicine in obstetrics cases

a) Hand Prolapse and

b) Retained Placenta

The value of telemedicine in Trauma cases

- Cut injuries
- Fall Injuries

9.2.1 The value of telemedicine in obstetrics: Case examples

Case example 1: Hand prolapse (breech)

A complicated delivery case was brought in to the Kartike Deurali Health Centre around 7 am one morning. A mother presented with a prolapsed hand of her baby that was known to have died earlier at home. The patient was from a neighbouring village about 3 hours walking distance from the health centre. There were several complications which would happen if action was not taken quickly such as sepsis if the dead baby was not separated from the mother. Due to these complications the health worker decided to ring Dr A in the hospital for a second opinion before taking any further action. The doctor suggested that the health worker separate the baby from the mother as soon as possible otherwise the woman might lose her life too.

Health Worker's account:

"While consulting with Dr B, first I explained to her all the signs and symptoms and she told me the case was beyond my capacity and might not be able to be dealt with in the centre with my capacity and resources so asked me to refer to the hospital as case might get worse if try to handle there (outreach centre). We were in a dilemma, as the patient doesn't have money to pay for the basic service we provide in the centre, sending her to the hospital was simply beyond their economical reach. I did my best counselling the patient's family and the community that we had lost the baby and if we cannot refer the patient to the hospital we might lose mother too. Once I told them the reality of the situation, they told me "Sir we trust you, please try to save this patient here. We believe that she will be saved here". I rang Dr B again and explained the situation and Dr B told me what to do over the phone. I started following her instructions and did up to where I was confident and when I was bit confused and faced with difficulties, I rang Dr B again in the middle of the primary management which was done already such as opening IV lines but there was a of bit difficulty while turning the baby for delivery, so I ask a helper to assist me. We managed to take baby out successfully and there wasn't much bleeding so it was successful. Once the baby was removed successfully, I rang Dr B to let her know the outcome. However Dr B rang me quite often to find out how I was dealing with the situation and kept telling me to remain calm and follow the procedure as advised."

"Dr B mentioned that the dead baby needed to be separated and I did as she suggested. We managed to take baby out and administered IV fluid around 15-16 pints with DSM (Dextros Saline) and later Metharzineoxytocin and other antibiotics. The patient came to a stable condition around 4pm. So it was almost a whole day dealing with the patient. During that time there had been only one bus that runs between the village and the city and the patient's economic condition was very poor. However with help of Dr B we managed to save the patient at the centre and discharge the patient next day."

The health worker found the doctor very encouraging and supportive.

"… Yes, she was amazing during that time, her encouragement, advice and support was simply amazing. When I first saw the patient and severity of bleeding, I was shocked myself and very worried if the patient going to survive or not. But Dr B kept telling me all the way not to worry and remain calm, assured me that she will remain on the phone and provides advice I needed. She further advised me to counsel the patient's family members regarding the situation and what they are doing. We did as she advised, so it was a great success and very good outcome indeed."

However, a dead baby is still a significant loss for the family. This tragedy could potentially have been prevented with early intervention which could have resulted in a more successful outcome for mother and baby.

Case example 2: Retained Placenta

A 20 year old mother presented with ruptured membranes and severe bleeding at home. This is the case of a health worker working against all the odds while handling a delivery at home in a very isolated and poor community in Thulo Parsel near Bolde Phediche Health Centre.

Health worker:

"We thought it was twins and membranes had ruptured and we were faced with difficulty. We consulted over the phone and did as suggested and it was successful. [It was] very good. You know it's difficult to handle once membrane has ruptured. These kinds of cases come with bleeding, retained placentas – I was very happy to handle the case of retained placenta successfully."

"...this particular case, even in the previous year the (baby) was dead, and they came to call me and I went down. When I arrived there I found that baby was not separated, they

didn't separate as the villagers had been saying that baby will die if separated, and there were huge crowd of villagers and people from the Tole (Neighbourhood) and I checked the condition and saw severe bleeding had occurred and separated the baby. Regarding separating baby (from placenta), the crowd was divided... half of the people were there saying baby should be separated and half saying shouldn't be. If baby is separated then mother would die too as cord went inside... then I explained to the crowd that we have equipment to handle such cases and please don't express and keep this kind of misconception, I remind them..."

"I explain everything to them in Tamang (local language) and we separated the baby and then I moved on to check mother's situation. I gave IV fluid, and when I arrived there (she) was unconscious, maximum bleeding gone through, soils were brought in from outside and thrown to cover the blood. Bleeding was continuing and the patient was lying there unconscious, I administrate her with 6 – 7 fluids (Saline water through IV), and inject her with 2 Haematoxylin and then used cinto. And after 5- 10 minutes waiting patient came out of unconsciousness, start responding to her vision, she went completely blind before, nothing was visible completely blacked out – patient told us those things had happened to her and requested us " Please save me." And... placenta, retained placenta was out successfully. Ever since that day, people from the area said that this person was dead but saved, even last year she went through same circumstances. Anyway it went very well. For me that was the happiest moment."

"For this case I rang Dr Y (a medical doctor) and he told me to follow his instruction, and if it doesn't work do consultation with hospital. Dr told me that he would make call if necessary too (with senior consultants). But consultation with the hospital was not required at the time."

"For me that was the happiest moment, and I am very very happy with that case. In Thulo Parsel there were 2-3 deaths due to retained placenta."

This is again a similar case where the health worker was able to save the mother but not the baby. However, with better care during pregnancy and delivery the baby might have also have been saved.

9.2.2 The value of telemedicine in Trauma cases

Agricultural related accidents are very common in Nepal. The majority of Nepalese living in the remote areas are farm workers. Occupational injuries are frequent. The following two cases (Cases 3 and 4) show the type of problem the health workers have to deal with injured patients beyond their normal practices. These two cases also highlight the use and value of telemedicine in trauma events.

Case example 3: Cut Injuries

A middle aged man presented with a deep cut in the wrist however the cut had already been exposed for 12 hours or more before he arrived in the health centre. In this situation health workers are trained not to apply any stitches to deep cuts exposed for 12 hours or more. However the patient insisted the health worker stitched his wound against their normal practice:

Health Worker's account

"… Patient was pushing me to suture the cut but I told patient that I am not going to suture the cut which is more than 10 -12 hours old and finally I agreed to put stitches in only after consulting with the doctor. The patient told me to ring the doctor…"

The health worker rang senior outreach health workers working with the hospital emergency department rather than with the doctors in this occasion.

Health worker:

"… I know that we shouldn't put stitches to any wound which are more than 12 hours old. So I rang emergency department and spoke with X Dai (older brother) and he asked me how big the cut was. I told him that it was a big cut. It was quite a nasty cut in his wrist, so X Dai told me to clean the wound properly and put stitches and also suggested me to administer ampicillin injection. I did as he suggested."

The health worker suggested that if there were no such support mechanism she would have simply followed what she was trained to do.

"… I would simply have followed what I leant and know – never have done it (suturing of the cut which was older than 12 hours). So it has been of great support and if I didn't ask during that time, patient simply had to leave without doing anything."

The health worker was able to save patient from the danger of developing a serious sepsis if left longer without treating the wound and further went on adding direct cost of saving for the patient that time of year.

"Many patients come in the evening time and we don't have frequent bus services – only two buses a day. So if you need to hire the bus it will cost around 12000 to 13000 Rupees (£120 -130) and the situation is usually worse in summer (rainy) as it's difficult to drive and even the Ambulances do not come even when requested."

CHW 4

Case example 4: Fall Injuries

Falls from trees and other tree related injuries are the most common cause of trauma in many parts of rural Nepal. These accidents happen due to the nature of occupations where people need to climb trees to pick fruit, collect fodder and bedding for livestock and collect firewood for energy. The following is the account of a health worker who tells how he dealt with such a case.

A 40 years old man who fell from a tree was presented with punctured scrotum and exposing both testes when the health worker visited a patient's home. The health worker had to make a home visit in this case as the patient was unable walk or be carried (in traditional method on someone's back) up the hill to Kartike Deurali Health centre.

Health Worker's account:

"… I tried my best to convince them to bring the patient to the centre as such a huge open wound would be very difficult to handle in the house due to lack of hygiene and being unable to sterilize the equipment, however, they insisted on me going to the house. So I packed simple first aid equipment but once I reached the house, I saw the wound; it was in a critical situation. I counselled them to take the patient to hospital but it was around 8 in the evening, no vehicle was available and it was raining quite heavily. There wasn't any possibility of taking patient to hospital, so we were in quite a difficult situation. On the other hand if the wound is not stitched up within six hours then there were some other chances of complication such as infection and further bleeding could occur. If stitched up, then might have to cut again and re-do it when the patient gets to hospital as well. So rang from the mobile phone for consultation – I rang Dr S and explained the patient's

situation, and he told me to refer the patient immediately to the hospital. Then I explain to Dr S the current situation with transportation and everything. Dr S further advised me to counsel and inform patient that we won't be responsible if anything goes wrong as this kind of wound should not be dealt within the house environment and I told the patient's family that I will do my best but if something goes wrong we won't bear any responsibility. Patient's family agreed to go ahead with the treatment and whatever possible in that situation."

"…looking at the situation, I realized that I need someone to assist me – as it was quite difficult to do cleaning, stitching scrotum with both testes exposed. I ask if there is anyone there who can support me. I brought in another person who has completed CMA. So he agreed to support me. I cleaned up the wound thoroughly and insert testes into scrotum and put 33 stitches. So everything went really well though I couldn't provide the best sterilized dressing and treatment like in the hospital but did my best with the materials available to me at the time. Then after a day of rest, the patient was referred to the hospital for further investigation at Dhulikhel [hospital].''

"The patient's report of ultrasound of the testes showed everything was normal without any infection or foreign bodies. Furthermore the doctor also gave assurance both to me and the patient that medicine I prescribed was correct- and the patient was sent home."

The Health worker estimated that the real saving for the poor farmer if the patient needed to rush to hospital is around Nepali Rupees (Rs) 30,000 (£300).

"We saved a quite a lot for him too: let's say Rs 12000 for hiring bus and hospital charges and medicine and everything could have cost him around Rs 25000 to 30000 max. He received treatment with basic charge for medicine and gauzes used for stitching at home and had to pay for ultrasound once he visited the hospital in a local bus the fare which is Rs 200 (less than £2)."

As in every other case, once health workers consult with expert they usually report about something new or changing in their practice. The following quotes testifies the learning outcome

"I used to clean the wound with maximum of one litre normal saline water (NS) but Doctor S suggested I wash with at least 5-6 bottles of NS due to the nature of injuries – fall injuries with open wound should be cleaned thoroughly as any minute foreign bodies

remained in the wound would cause infection and could do more harm. So I followed as he suggested and stitched up and bandaged with sterilise gauzes. It was a great success."

9.3 Telemedicine cases referred to the hospital after primary management

A referred case to the hospital after primary management at the health centre

Case example 5: Miscarriage

A 24 year old woman who came alone to the health centre presented with an abortion (miscarriage) at 3 months of pregnancy. She was bleeding severely. The miscarriage was later found to be due to a heavy workload at home. She was the one who looked after all the work while her father in-law was sick and was in the hospital in Kathmandu.

Health Worker's account:

"Once she arrived in the health centre I investigated and diagnosed that there was great chance of abortion due to heavy bleeding and (cervix) was already dilated. So it was best to refer her to the hospital as soon as possible. I was confused too whether to send her back home or to the hospital for treatment. So I rang Dr B looking at the situation and she suggested me to set up IV line and sent her to the hospital as soon as possible. We opened vein as suggested and as it's a long way to the hospital, we rang her home and informed her family that the situation of the patient is quite serious and want one family member to come over to the centre as patient needs to be taken to the hospital."

"Once her family member arrived we arranged a police van and negotiated the price and brought her to the hospital and the patient was saved from further complication. I joined with the patient and her family members in the police van, and checking fluid level, giving injections and managed to get her to the hospital safely on time. She got the treatment and it was successful and she was very pleased and happy and so were we."

The health worker further shares his experience once the patients returned back to the village. The patient frequently visits the health centre to say hello and brings vegetables she grows in their field as a gift for him.

Case example 6: Snake bite

Snake bite is a common event in many rural areas, however many snakes found in Nepal are not considered poisonous – especially those found in the rural mountain areas of Nepal. Due to the lack of medical facilities in the vicinity and due to religious value of snake (incarnation of God) many faith healers play a major role in the treatment of snakebite. This kind of practices further delays seeking medical advice and treatment which could be one of the main causes of death. In this case of snake bite the health worker was not sure what to do apart from referral after consulting with the doctor at the hospital.

Health worker's account:

"The man was bitten by a snake while he was working in barley field. There was blood at the site of the bite. I didn't know what to do; what to give to the patient. So I rang emergency department and spoke with Dr X and he told me that we cannot handle the situation apart from giving Tetanus injection and refer to Teku Hospital (Tropical medical hospital) so I did as I was told."

One challenge with referral is that the health worker is never able to track down whether patients went to the referred hospital or not.

"… I think he went I am not sure. He did tell me that he will go to village to get help in extracting venom out with help from some shamans. I am not sure regarding that."

Case example 7: The wasp sting case study

A 26 year-old mother of two was stung by wasps and hornets while cutting grass in the afternoon. She was attacked and chased by a swarm of wasps for more than 5 minutes until she fell. Villagers rescued her and called in her family. With the help of everyone she was carried home and given local remedies - "Karkalo ko Pani" (yogurt and herbal leaves) and "Nilotutho" (a solution of copper sulphate). However, she deteriorated rapidly so the family and friends rushed her the 5 km down to the Bahunipati Health Centre. This is an outreach centre of Dhulikhel Hosital which is 45 km away, but takes 3-4 hours travel in a four-wheel-drive vehicle over a narrow and very bumpy road. After a two hour journey through rugged terrain they arrived in the health centre at about 18:00.

The following account is from interviews with the participants in the incident: the patient, her husband, the village health worker and the doctor.

Health worker's account:

"When she was brought in she kept slipping in and out of consciousness. Her pulse was 150 beats per minute, temperature was 38.2^{o} C and BP was 150/100 mm Hg. Once I found out that she had been stung by 16 wasps and one Bacchiun (hornet), I was very nervous about handling the case. But there was no other option as it was hard to get transportation to hospital at that time of day: the hospital was at least 3 hours away and her bad situation meant she might not survive the journey to hospital. I asked my assistant to act quickly and assist me in taking out any stings, setting up an intravenous saline drip (1 litre) and administering other intravenous medication (furosemide 20mg, pheniramine 45mg and hydrocortisone 100mg). Calamine lotion was applied to calm her down. I asked the patient's husband to remain calm and told him that I need to consult a doctor for help. I managed to get hold of Dr A and he told me what to do and at the same time asked me to stay calm and follow his advice step by step. I told him what I had done and what the vital signs were."

"*I followed his advice although I had already administered many of the drugs he suggested and after 2 hours the patient showed signs of recovery when she passed urine. I kept her under observation for the whole night and she was discharged the next morning. I am very happy that we managed to handle such a case through telephone consultation, although I was very nervous and frightened. I think I maintained professionalism and did what was best. The patient's family was very cooperative and supportive too."*

Stings by bees, wasps and hornets are common in Nepal, especially for farmers living in the mountains. Although there are no official records about the number of people who are killed by stings in Nepal there are accounts in many villages of people who have been severely stung and have lost their lives. This case was published in the Journal of Telemedicine and Telecare (Appendix 10).

9.4 Teledermatology

National health statistics of Nepal show that skin diseases are amongst the highest diseases prevalent in Nepal. This is due to poverty and other factors which were discussed in Chapter 3 section. The distribution of the skin diseases varies in Nepal according to the country's geographical regions: Himalayas, Hilly areas and Terai and the prevalence of dermatological diseases are different in different regions of the country (WHO 2009). For example: Himalaya region: sun allergy or in medical term photodermatosis, related to sun light, dry skin and some infected disorders like scabies, pediclosis due to lack of water, then with dry skins, unhygienic skin, part and secondary bacterial infection occurs; Terai region: fungal infection due to high humidity and sweating. Furthermore, most of the sexually transmitting disorders manifest as skins disorder too.

Teledermatology is the best example of the store-and-forward telemedicine system as the majority of the skin disease are not life threatening. Before installation of a computer and training on how to use telemedicine system, the researcher took pictures of patients' conditions with a digital camera and took it to the hospital and showed it to the dermatologist. Once the diagnosis was made from the picture, the doctor rang the health worker explained the details of such diseases and ways to treat. One case was of Tuberculosis, second was Scabies and a third one was Cracked Foot. These pictures were taken before introducing computers and training for health workers on how to use the camera to take best pictures for use in teleconsultation.

Despite the challenges of intermittent electricity one of the health centres took part in teledermatology and it proved to be very successful. This health centre was not part of the research site. The cases presented below are evidence of how teledermatology could be very useful in the context of Nepal. The extracts from are from their email correspondences, between the junior doctor in the health centre and the dermatologist in the hospital.

Case example 8: Hand Eczema

"Respected Doctor……

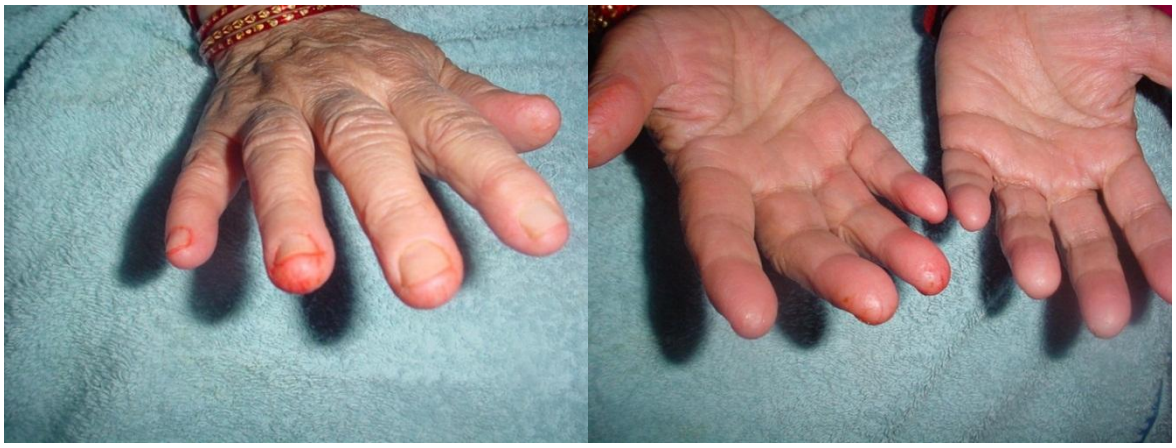
The patient is 80 year old female, a known case of dyslipidemia, hypertension under various medications like antihypertensive med, aspirin, atorvastatin etc. she complains of

multiple skin lesion in finger tips since about a year. They get aggravated on touching water or soap. it is not itchy but is painful. Sometimes it is associated with bloody discharge. There are no associated systemic symptoms.

On examination, all the finger tips skin is thin, with a lot of breakage marks. The colour is reddish with some discharge (reddish) present. It is also tender but there is no systemic sign.

She says she has already used a lot of ointments like antibiotic/ antifungal medications, steroids as well as Vaseline.

I would like to request you for your help regarding this case"



Response

"Dear Dr….

I went through your history, your findings and photographs. It appears like Wear and tear dermatitis. It is a kind of hand eczema. Commonly seen in elderly female with dry skin. It exacerbates with use of plenty of water and soap.

*Treatment: * Clobetasol (Deplene) Cream- L/A BD for 2wks.*

** Petroleum Jelly(Vaseline) OR Emolene Ceam - L/A*

Day time.

** tab Cetrizine 10mg 1 HS for 2weeks.*

Comments:

Look for extensor aspect of Hand

Ask for Raynaud phenomena to Rule out Pitted scar

I am coming this Friday for the [health] camp. I'll come by 9 am and leave at 1pm.

kindly manage accordingly.

Thanks"

Feedback:

"The patient who is diagnosed as a case of Xerotic dermatitis and who has been under treatment given by you has improved a great deal. After about 6 days now almost all of the lesions have disappeared, she can use her fingers well and even hold spoon without any discomfort. She wished to tell a lot of thanks to you. I have sent some of the photographs."

This was the one of the 10 cases that was dealt with successfully between the particular health centre and hospital. These consultations were possible due to some crucial factors. The health centre was located just outside of Kathmandu (30 minutes drive from Centre of Kathmandu) the relationship between the doctor and the consultant had built up since the doctor had studied at the hospital. They had known each other from lecturer and student relationships which had certainly broken any communication barrier. Another crucial point was that the doctor in the health centre had adequate knowledge and skill of

computers and the English language. The rapport was further built during the Dermatologist's fortnightly visits to the health centre.

The above case is evidence of how useful telemedicine can be where doctors are willing to use it and where a good relationship between user and providers has been built up.

9.5 Hospital Doctor's account of dealing with cases

Many doctors have their own experiences in dealing with cases from the outreach centres. This section describes doctors' own personal and professional account of giving advice using telemedicine. The following are different doctors' reflection on cases ranging from obstetric emergencies to other serious medical situation.

This case was shared by an obstetrician during the research period. This first-hand account of an obstetrician (who is known as Dr B) highlighted the challenges and uncertainty filled with anxiety during teleconsultation. The case further demonstrates the important of right instructions over the phone and team work (transportation – driver, interns and village health worker) in saving mother and baby's life successfully. The patient presented in this case example was from Katike Deurali which takes around 5-6 hours drive (4 wheel drive) to the hospital and road is not accessible during rainy season.

"It was very interesting, last time, a case from Kartike Deurali, even if we take the bus it takes 6-7 hours. I got a call in the evening around 6pm, someone came with prolonged labour and I asked them to take the detailed history. So again I put the phone down and after taking history and examination he called me back again. So he told me this much observation (situation of the patient) and that she has not been resuscitated or had anything done, I asked him to open the vein as cervix was fully dilated and baby was about to come and first to give 5% dextrose and then wait for sometime once it is over put up a syntocin drip. They did the same. After 2 hours, patient has delivered good size baby and baby is fine. But after delivery they cannot take out the placenta and the bleeding continued. I told to stop the 5% dextrose and start on the drip. First of all resuscitate the patient and they did so and try to see whether placenta was separated and see this this this (check lists) if possible try to remove placenta by hand. There were no calls for an hour. They call me after an hour and told me that resuscitation is done, catheter is in and [reported me the] output [is this much] and we have done this and this and we have given

this much amount of fluid, vital (signs) are almost stable but still we cannot take out the placenta. I ask them whether there was active bleeding and there was not. So I told them to continue with what they are doing and we will send ambulance from hospital. Then, it was almost 11pm and it's difficult for them to get vehicles from that place, so we sent the ambulance with intern doctors. They went there and patient was already in a stable condition and placenta was separated. Because the people who are working there were scared because labour was prolonged, bleeding was present there and they couldn't take out the placenta but though the placenta was already separated. When the interns went there, they call me and told me that they have seen the patient and told me about the patient condition and I advised them further management. Due to high loss of blood from the patient, they took the baby and mother with them and arrived here (hospital) around 8 am in the morning."

Dr B

This is a doctor's (Dr A) account of dealing with wasps' sting case. The case highlights further complications if not dealt with properly on time and transporting to the hospital is not an option, and the importance of doctor's knowledge on drugs available in the remote areas while dealing with emergency cases. This is a successful case study showing how teleconsultation can save someone's life in a given situation.

"I was at the meeting of the Rotary club and it was about 20:00 in the evening when I was called from the Bahunipati health centre. The patient had multiple wasp stings on different parts of the body and we have seen cases like these many times in the hospital. One of the most dangerous consequences of this is anaphylaxis and patients can die within a short time. If the patient survives they may go into acute renal failure or shock. It is essential to do first level management in these cases. The patient must be given high doses of steroids and drugs like adrenaline (epinephrine) should be on hand, as they are life saving if anaphylaxis develops. To avoid acute renal failure the patient is usually given forced diuresis with intravenous fluids. These are some simple, but life saving steps.

The staff did not know what to do, so both staff and patient were panicked. I knew that we had the necessary drugs in the outreach centre. I advised the health worker and told him what he should look for (the signs for anaphylaxis and shock) and how to deal with them and when to refer. I was quite confident he would understand what I told him. I am

glad that he managed it very well. I feel really good about this case because the patient could easily have lost her life if we had attempted to bring her to hospital."

Dr A

These are few case examples demonstrating the success of telemedicine which relies on effective communications (specific instructions), knowledge and understanding of the situation by the health worker dealing with the patient and effective team work between doctors, medical interns, village health workers and drivers (transportation).

9.6 Patient's accounts:

The following patient's account highlights the trauma she went through during the incident and emotional account of how telemedicine not only saved a woman but also a mother and a wife.

Wasps bite Patient's account:

"I remember up to five or six wasps which stung me in my head and I crushed them as they got into my hair. I felt a burning sensation in head and my vision faded away and became blurred. Despite the burning sensation and blurred vision I started running away from the field towards the nearest village. But the swarm of wasps kept chasing me until I reached the nearest house after running for 5-6 min. The situation was not improving – I felt an increased burning sensation, felt dizzy and my voice seemed to be fading away. I was not able to talk or swallow food. I was semi-conscious and asked to them to call for my father and my husband."

"When I heard someone telling me not to worry, we have arranged an ambulance; I really thought I am going to die. I started missing my family and especially my children and worried about them. If they aren't able to treat me at the health centre, which means it is very serious and I am going to die. I am very grateful and I am in debt to all of you. I really wish I had something to give but I have got nothing special to offer. You have given me my wonderful family back so I thank you for that. I now have my life again and my children have got their mother."

The lady was accompanied by her husband during the interview and the following is an account of the husband during the course of treatment. In this account, he shares his fear and uncertainty and appreciation for health workers' efforts and telemedicine in saving his wife's life.

Husband's account:

"The village health worker was a bit nervous and frightened to see the situation of the patient. His advice to his assistant was very clear and to the point, and things moved carefully but fast. My friends who helped me to carry her and the other people who were watching the drama were nervous and afraid too. It was not one or two wasps: it was 16 wasps and one Bachhiun. I was losing hope there. The health worker did everything he could to the best of his knowledge and skills, and with the help of a doctor at the other end of the phone. He and his assistant did everything very smoothly – injecting medication, administering saline through a vein and basically everything was done very professionally. The health worker kept talking to the doctor about the patient, and I followed him everywhere as I was very nervous and afraid of losing my wife. I kept on telling him that there was no point in keeping her at the health centre if he could not treat her, and that we needed to rush her to hospital as soon as possible.

The health worker talked every 8-10 min with the doctor and observed her progress, administered the treatment and gave me advice and counselling. I really appreciated his hard work and the way he handled my wife's case. If he had not been there at the time, we wouldn't have her here now. It [telemedicine] is a very good thing for our country and for people like us living in rural areas. It could also be used for snake bites too, which are quite common here, and might be life-saving."

9.7 Doctors' perceptions on Telemedicine after consultation

One of the purposes of this study was to determine the doctors' perceptions and their acceptance of a new intervention to their practice. The researcher found that acceptability of such interventions had an effect on the uptake of such services in the hospital. Here are some of the doctors' perceptions on the importance of telemedicine and how they want to use the telemedicine in their practice.

Dermatology

The Dermatologist, who took part of this research and supported the research in providing training to village health workers shared his aspiration of telemedicine or teledermatolgoy in Nepal.

"…conditions can be treated, if you send photographs and make a diagnosis. So in the future, teledermatology in Nepal will be one of the best [telemedicine] services for the remote areas. People who are living apart from cities and urban areas, there are no doctors (where is there no dermatologist). But there are some limitations in teledermatology. If we need some procedures like skin surgery (procedure) always ask patient in the centres, tertiary centres. But most of the dertmatolgical cases in Nepal can be treated by medicines."

Dr D

Gynaecology

The Gynaecologist who took part in the telemedicine research and who has given consultations over the phone for outreach workers supports the use of telemedicine which can help to fulfil the vision of the hospital and how the future use of telemedicine enable her to deal with many cases in her discipline.

"Definitely we will use (telemedicine), and especially at the community hospital like ours. This is of great value."

"About telemedicine, like you have shown, I am dreaming we will see the patient in television, or computer to find out if jaundice is there, oedema there, pulses are there, pedicardio is there, and like we keep on talking like we are doing, chatting- I am just dreaming when this will happen in our hospital."

Dr B

General Medicine Doctor

A general medicine Doctor who participated in the research believes that there is a wider prospect for telemedicine in Nepal but implementation requires wider understanding of the health care system challenges too.

"In countries like ours, Telemedicine of course has a huge prospect but we should plan and develop it in a systematic way. It is important to understand both positive and negative

aspects of the existing health system. This will give clear understanding of where we can introduce the technical part and things necessary we need to develop. You are doing this very well."

Dr A

Another Medical doctor (consultant) supports the concept of telemedicine however highlights the challenges which need to be addressed:

"It is a very good concept but I am concerned about infrastructure, logistics, resources and economics. If these are thought through carefully, it will be very good. In case of our own situation, at our outreach centres it will be more useful for patient to admit and treat. I think there will certainly be expenses involved including maintenance and how to run (the project). If all these things are taken into consideration and thought through it will be very beneficial. It certainly is the best way and beneficial to give advice from hospital to outreach centres and from expert level to non-expert staff."

Dr G

Ophthalmology

In cases of teleophthalmology (Eye Care) in Nepal, an Ophthalmologist believes that a telemedicine system will work in the field of ophthalmology and she drew on her previous experience of accepting calls from primary care centres for a second opinion:

"...Yes, yes, at least in ophthalmology field. Because most of the primary care centre ... where ophthalmic assistant are kept there under rotation every 3 months ...What they used to do is that they used to see the patient and refer those they cannot manage. If that kind of patient, if they send photos and pictures through telemedicine to tertiary hospital, then patient doesn't have to come. So in that case it is good option specially for poor – patients who are far off and in a country like Nepal need this kind of advanced technology and medicine. And transports are not good and not safe also. That's perfect option for this…"

Dr E

Paediatrician

Nepal is one of the countries with a very high infant and child mortality (see Chapter 4 Nepal in Context). Due to lack of access to health care services and more importantly

access to paediatricians many children lose their lives every year. The researcher asked a paediatrician his view on the scope of tele-paediatricians in Nepal.

"... my aim is always around all those children who cannot be transported, ... 70 percent things can be done provided person slightly more competent with availability of minimal facilities –equipments and drugs things should be there,... and 70 -80 percent cases can be dealt in the community."

The Doctor further went on adding that in order to deal with the 70 -80 percent of paediatric cases in the community he requires the following facilities and condition to prevail:

"I need to trust some people to some level, so that I can reproduce a setting similar to the hospital (in the outreach centres) given the opportunity. Yes ...couple of oxygen cylinder, couple of small pulse oximeter which need 10 thousand to 20 thousand rupees and antibiotics ...nowadays readily available. And he, (health worker) should understand my principle, ways of my treatment with this level of understanding same thing can be done in Baluwa and same thing can be done in Kartike Deurali no difference..."

Dr H

Pathologist

One of the major reasons for transferring patients to the tertiary centres in Nepal is due to a lack of basic pathology laboratory resources in the remote settings. Many health professionals working in the remote areas showed their frustration not having basic laboratory facilities to treat patients (see Chapter 6 Findings). The researcher interviewed the pathologist in the hospital to understand his view on telemedicine and the possible scope for the telepathology. The pathologist who took part in this research had taken a module on telemedicine and telepathology during his specialization study. Here is his perception on developing telemedicine:

"...there are some very important factors that we need to consider – first and foremost, the effective communication system – there should be easy access to phone with tower (signal booster) and another one is email – that could be possible isn't it? Let's put that under No 1, and in Number 2, there should be clear cut guideline, who is going to use that telemedicine... and who is consulting with whom. For example, most of the people in outreach centres are Health Assistant level (level of qualification Chapter 6: Research

Participants). After examining at their level, they are going to go for further consultation to medical officers and consultants. So, in order to maintain optimum use of the system, there should be couple of things in place. For example, HA is consulting with other HA in the hospital and if they (outreach centre) do not have HA, other staff will be asking some other people in the hospital. To overcome confusion who should contact whom and how – there should be a clear guideline for the outreach staff. And those who work at outreach centres should know when to use telemedicine or telephone and email communication. They should be knowledgeable otherwise they might not consult appropriately or not consult when needed. In this matter all the staff should be fully trained. These two key things – access and training."

Dr C

On the question of whether he is willing to give any advice to the outreach centre where the basic pathological lab is available and call him when they need help, he went on to mention the differences in pathology and histopathology and the importance of understanding challenges what can and cannot be done by the health workers in the outreach centres.

"So far I have been talking telepathology regarding histopathology… histopathology and I think it might not be just yet possible between outreach and here because we need a pathologist in the outreach and staff at the outreach like CMA, Lab technician cannot handle the work with their qualification. In the outreach centres, apart from histopathology, other pathology like microbiology, biochemical tests and haematological tests can be carried out (by outreach staff). These tests they conduct for example, blood smear – if the total counts shows higher, inquiring about the differences in blood cell morphology, in those kinds of inquiries we can help. But histopathology is only between pathologists. Not between technician and pathologists. We can help technicians and HA with haematology, microbiology, clinical pathology and biochemistry which is possible."

Dr C

This section shows the views of the different professionals from different disciplines on telemedicine. The chapter further highlights that the interviewed health professionals are willing to use telemedicine, however with some caution, but almost all think that telemedicine will be very beneficial in a country like Nepal.

9.8 Health workers' perception on telemedicine

In keeping with the participatory, partnership philosophy, the researcher explored the health workers' perception on telemedicine too. Here are some of the views of remote health workers involved in the introduction of telemedicine in their local health centres.

One of the health workers expressed the benefit and importance of telemedicine but raised a very important issue on who should pay for the consultation fee (mainly telephone).

"Telemedicine is very good for the villages, in remote areas like Bolde... Telemedicine system would be very good and of great benefit for the local patients and for health workers like ourselves. It is also very useful and very good because (we) experience handling particular cases [through telemedicine] from which we get a chance to learn and for me, I am just wondering who is going to cover the financial matter either the hospital, or paying by patients' family, for that I think I need to be clear..."

CHW 1

The benefits were further supported by a female health worker:

"It will definitely benefit the patients as there are several treatments we simply cannot provide. So with the help of telemedicine we will be able to provide the services there. This means that they don't have to travel to and from the hospital either."

CHW3

Some health workers raised their expectation for the future development of telemedicine where use of pictures comes into practice:

"Yes, I hope one day I would be able to send pictures regarding cases so that doctors can look at them during their free time and send back their suggestions and opinions. That would be really helpful for us and for the patient. Hope this will be soon implemented."

CHW 4

One of the health workers further added that the telemedicine system would not only work for clinical purposes but will also increase their effectiveness as health workers in remote villages. For example telemedicine support towards better way of identifying and managing resources.

"I think this will be very effective – in terms of bringing efficiency at work, cost effective, I'm sure this will be very effective in delivering services. I do have confidence that I can use the related technology if needed – such as using computer for consultation."

CHW2

The health workers also gave an account of the patients' satisfaction and their own satisfaction. In all the cases elaborated above, both the health workers and doctors mentioned that patients were happy and satisfied with the teleconsultations for treatment. However the patients and health workers' satisfaction go beyond the individual, it helps to build rapport within the community they are serving. This is a huge boost for their social status and social acceptance too. Here is an account from a health worker on what it meant for him to be able to perform his skills in saving lives in the remote areas.

"…they [patient's family] were very happy. It was very challenging personally too as this happened just after two months after I started my job there. This has certainly given me an opportunity to win over people's trust and respect by handling such a critical situation. People start understanding my skills and since then patient flow started increase too. That was a great personal and professional benefit for me and also perception and image of the hospital improved (outreach centres are widely known as Dhulikhel Hospital's outreach centre). Professionally I learnt a new skill and with their support, I had a very good place within a community too."

CHW 4

After saving lives and performing their duty with the help of telemedicine services, health workers expressed their satisfaction in saving villager's lives and also boosting their social acceptance. This development is crucial for health workers moving from outside into a local community to be able to deliver services in remote areas.

Both service provider (Hospital staff) and users (Outreach staff, patients and carers) reported that they are very positive about the outcomes and satisfied with the telemedicine system so far. They have, however started to raise questions relating to the further use of ICT. For example health workers would like to send pictures and other health reports through emails. They are keen to learn about the next phase of this project.

"Outcome was very fruitful and very good. The staff at the outreach centre received very good remarks from the villagers." Dr C

The following quote from a health worker highlights very strong sense of empowerment:

"Every time I do consultation with doctors, I feel more supported and confident in providing services and at the same time I learn about the cases I consulted so in the future I might not need to consult with such case again. It has been very useful for myself and for the patients."

CHW 3

9.9 Conclusion

This chapter on telemedicine demonstrates the wide nature of cases health workers had to deal with using existing communication system in the remote settings: teleconsultation ranging from viral and bacterial disease, wild animal attacks to fall injuries. Furthermore, having knowledge in dealing with diseases alone is not adequate for the health workers. In many cases health workers had to become advocates for the patients' real circumstances: ranging from the economic situation of the patients to family circumstances along with infrastructure challenges. Therefore health workers are not only delivering curative care but they are an integral part of the community in advocating on behalf of the community on their real challenges and needs.

The experience of using telemedicine and perception of telemedicine show that the attitude towards telemedicine from the Hospital Doctors, Health Posts staff and patients are extremely positive. There is an overwhelming wish to improve the lot of their patients and realization that telemedicine may do this. Staff did not express any concern that patients might worry about the process of tele-consultation. However, everyone agreed the importance of training, having systematic access and reliable communication systems, and importance for doctors in having knowledge of village health care workers and in building trust. These very important factors for introducing effective telemedicine are highlighted in this chapter.

The chapter further highlights that there is both an enthusiasm to practice Telemedicine by phone and email and a desire to develop a telecommunication infrastructure which can support those in mountainous areas. The next chapter brings together the key emerging findings from the 3 project phases. The strong interwoven elements of access, communication and empowerment find expression within the Unlocking, Unblocking and Validation themes.

10 DISCUSSION

10.1 Introduction:

Rural health care in Nepal is in crisis with some formidable challenges to delivering health services. These challenges are highlighted in the chapter 'Context of Nepal' and later developed by first-hand accounts in the *Developing and Maturing* stages of this research. Despite these challenges, the researcher found that the participants (doctors, village health workers and local villagers) are enthusiastic to get involved in all aspects of this work; their interest and willingness to support was very encouraging. This commitment demonstrates that the participants were clearly aware of current health care challenges for the country and were keen to find better methods to deliver health care to complement the existing systems in remote rural Nepal.

The aim of this study was to explore, using Participatory Action Research methodology, the acceptance, understandings, applicability and efficacy in rural Nepal of the use of telemedicine to support healthcare services (i.e. through village health workers). The research had the objectives of:

- Building partnerships with all the stakeholders
- Exploring the current health care delivery in the villages;
- Exploring the resource feasibility, the available and appropriate technology, and the sustainability of the telemedicine system; and
- Finally evaluating the impact of Telemedicine on major stakeholders using the PAR approach.

The research also highlighted the importance of the interdependency in relationships between the researcher and the researched in introducing possible changes to existing health care practice in this resource-poor setting. The role played by the researcher in this unfolding and developmental project, enabled a deeper level of understanding of the issues surrounding health care delivery in Nepal. In this journey, the researcher and the researched travelled complex inter-locking pathways which gave rise to the Unlocking, Unblocking and Validation concepts (Chapter Five: 5.3 Contextual use of PAR). This chapter uses these concepts to address the objectives of the project.

10.2 Unlocking, unblocking and validation of the researcher and the research topic

The early experience of the researcher growing up in Nepal unlocked in him the realisation that there was a problem with health care in Nepal and that there must be a better solution (see The researcher in context Chapter 5). This revelation was developed further in formal public health studies at Northumbria University.

The literature review chapter has identified (unlocked) the potential of telemedicine to improve health in the developing world (Edworthy 2001, WHO 2009) but more importantly has highlighted that there are a few examples of telemedicine which have proven feasible and useful in developing countries (Wootton and Bonnardot 2010). Amongst these few empirical studies from developing countries, debate around the quality of the studies, appropriate use of methodologies and approaches, effectiveness, publication bias and short-comings in telemedicine were Unlocked in the literature review Chapter.

Above all, the "user" (patients, health workers and doctors) and other stakeholders' involvement in the research were not always stated explicitly. This lack of engagement with the participants may have contributed towards failure of telemedicine projects beyond the pilot project stage in developing countries. Therefore, this project was based at the outset on participants and a number of activities facilitated the Unlocking, Unblocking and validation of the researcher's own journey. These activities included visits of various supervisors and organizing a national level conference on telemedicine.

The visits of the researcher's various supervisors to Nepal to speak at meetings in the hospital and meet some outreach staff unquestionably unlocked the idea of telemedicine in the minds of many of the staff particularly in the hospital. It also helped to unblock misconceptions which the doctors may have held about the potential of telemedicine. The encounters also validated the researcher's role as part of a serious academic research project with the potential of helping the local community.

The conference on Telemedicine in Nepal unlocked and unblocked the understanding of the potential of telemedicine in improving health in a wider Nepalese context. Whilst the conference demonstrated a wide range of superficial engagement with telemedicine,

none of it had been formally researched. This emphasised the need for the research reported in this thesis.

The discussion further explores the analytical concepts of Unlocking, Unblocking and Validation in the Developing, the Maturing and the early sustaining phases of this project which is illustrated in Figure 10.1. For each phase, there is a dominating concept and the PAR approach is central to these phases and analytical concepts.

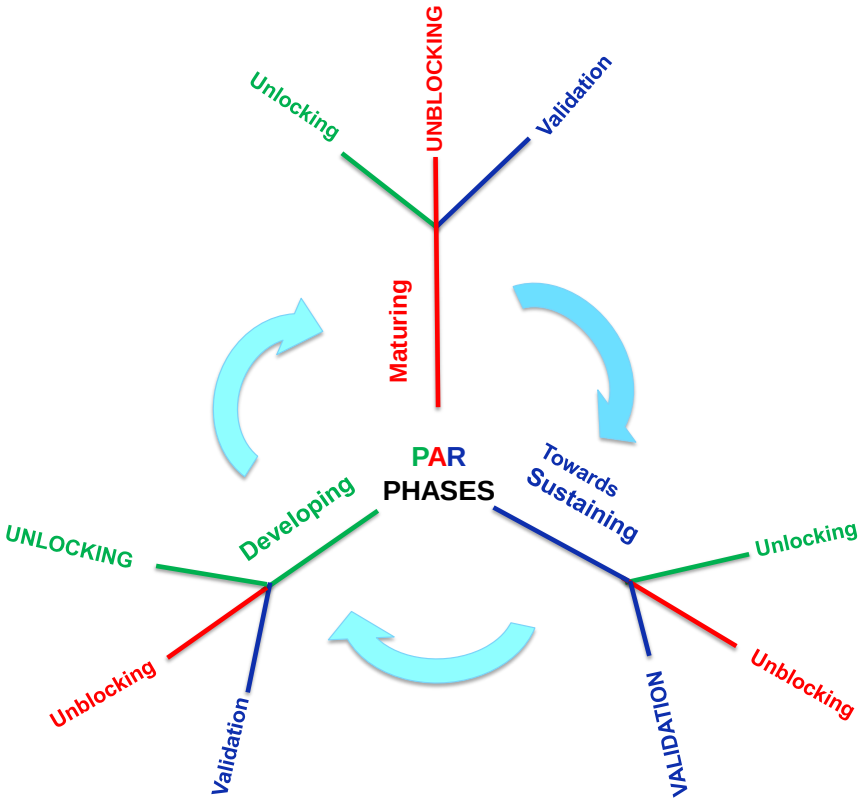


Figure 10.1: Analytical concept of Unlocking, Unblocking and Validation in PAR Phases (dominant concepts are show in capitals against each phase)

10.3 Unlocking, Unblocking and Validation in the Developing phase

The developing phase involved the survey, interviews, listening and being with the research participants as the major methods of unlocking and also identified the blocks to further development. This phase showed that there was a great enthusiasm for improving health care and a willingness to engage in telemedicine amongst all the

participants. It identified many blocks; some of these were related to the development of telemedicine but others were not. It was felt that these non-telemedicine blocks, either be they personal or organizational (Wootton 1999), were important for two reasons; they indirectly affected the ability of the system to deliver and sustain telemedicine in the future, and also potentially prevented serious engagement with the research and the researcher (as highlighted in the Chapter Four- the researcher in context).

Some of the identified blocks were quite simply impossible to address. For example the government health workers were in an impossible situation. They experienced many problems and the solutions to which were beyond their capacity and control. Their personal accounts through both survey and interviews validated the miserable picture of the government health care system which is known to be inefficient and poorly resourced (Justice 1989; Palman 2004; DoH 2003, WHO 2005).The crisis in the government health system further influenced the researcher's decisions to involve Dhulikhel Hospital and its outreach centres and not the government health centres as the bases for this research.

The developing phase also highlighted some important telemedicine and non-telemedicine blocks which were amenable to intervention. For example training started to address the professional development needs of the participants. Although some blocks were intractable, for example the unique problems of women working away from home; others could be *Unblocked* by the researcher and the respective stakeholders. The Unblocking process is further discussed in the maturing phase of this research.

10.4 Unlocking, Unblocking and Validation in Maturing Phase

The Developing phase identified a number of blocks which set the agenda for the researcher and the research participants to initiate actions to remove them. These actions were undertaken in consultation with other (respective) stakeholders where and when needed for example Nepal Telecom to secure telephone resources and it was often the research participants (village health workers and the hospital) who were responsible for their execution. Unblocking required a great deal of time and was an on-going process. Time was not under the control of the researcher or in many cases the research participants (for example planning for the training) and it usually took a longer period to negotiate (Gibon 2002) than anticipated and g*et al.*l key members to agree and take actions.

This phase required dealing with both telemedicine and non- telemedicine blocks. The non-telemedicine blocks were given similar importance to the telemedicine blocks. Without addressing these non-telemedicine blocks, any interventions would likely be sub-optimal. For example, the non-telemedicine people related blocks of "being valued", "belonging" and building up "trust" between hospital and outreach centre staff were unblocked through organising joint training and the outreach conference. The concerns and reluctance expressed on both sides in engaging in telemedicine without knowing and trusting each other where acknowledged and addressed (Chapter 7). The conference and the joint training were successful with positive feedback from all participants and provided further Validation for the approach.

Dealing with telemedicine related blocks was also time consuming. Improving the phone coverage required high level discussion and decision-making with Nepal Telecom resulting in the signing of a Memorandum of Understanding (MoU) to secure and install phones and antennas in the outreach centres and in the hospital. However, the exercise was successful with good signal and availability of phones (Findings Chapter 7 and 8).

Unblocking the electricity problem also took a lot of time in evaluating alternative solutions to electricity provision for the hospital (Solar power and oil generators were explored). Ultimately, none of these resolved the situation in the short term although the preferred solution (an independent supply to the hospital) should resolve it in the medium and long term.

Although the importance of non-technological blocks has been stressed, appropriate and efficient technology remained central and crucial. Computers were installed for the first time in the outreach centres to facilitate telemedicine, but this gave rise to unanticipated problems such as computer (CPU) failure probably due to variable power supply compounded by severe delays in maintenance. Similarly new problems were encountered with the misuse of the outreach centres' telephones by visiting doctors (interns) and these behaviours too required Unblocking. These were unanticipated and Unblocked through recommendations to the hospital management (an on-going process).

The above paragraphs (Maturing phase) highlight the significance of understanding complex human and technological aspects of telemedicine. Social and organizational aspects of telemedicine, as highlighted in the literature review, demonstrate a need for a pragmatic approach to ICT and other technological feasibility (electricity) (Scott 2007).

The importance of "trusted" relationships and being "valued" within an organization (Whitten, Holtz and Nguyen 2010) and creating a platform for staff voices and concerns (a conference and support system) are all key aspects of telemedicine. Ensuring that all these elements are understood, dealt with or having systems in place to deal with them (Unblocking) are part of the normalization process (May *et al.* 2007). In this research context, Unblocking could be understood as a stage in the normalization process as outlined by May *et al.* (2007) and Murray *et al.* (2010, 2011).

The Maturing phase was not just about unblocking; it unlocked further unanticipated issues such as staff behaviour (misuse of phone) and timely technical support.

10.5 Unlocking, Unblocking and Validation in the Early sustaining phase:

The purpose of the research was ultimately to develop sustainable and successful telemedicine system of care between the outreach centres and Dhulikhel hospital and Chapter 8 (the maturing phase) showed how the improved systems led to an increase in tele-consultation.

The existence of the case examples gave important and tangible evidence to validate this participative approach to implementing telemedicine. The case examples showed that the telemedicine system could be lifesaving. The health workers' accounts in the case examples demonstrated the use of a typical kind of medical triage system (intuitively) before consultations. A second triage process by the hospital doctor produced three main types of outcome:

a) Cases in which the outreach health workers dealt with everything locally after consultation: For example cases such as wasps' stings, retained placenta, deep cut and hand-prolapse.

b) Cases in which outreach health workers carried out primary care management and then transferred to the hospital: For example cases such as ruptured scrotum and miscarriage.

c) Cases where patients are transferred straight to hospital: Cases such as snake bite, leopard attack, and small intestine perforation come into this category. These cases needed emergency and specialist care beyond the capacity of the outreach health workers, but they frequently escorted patients and families to the hospital

demonstrating the engagement with care of the hospital from the time of initial consultation.

There was however a fourth outcome where the health worker or hospital doctor recommended an action but the patient was unable to comply with it, usually mainly due to financial constraint or poverty (World Bank 2009).This is well demonstrated in the case of the ruptured scrotum. This situation has two unique features: first telemedicine provided the only possibility of a good outcome and second both doctor and health worker needed to make clear to the patient and family that this was not the preferred or best option from a medical point of view. In this kind of exceptional case, in a given circumstance, it would be unethical not to treat the patient through the use of telemedicine if it is available (Wootton 1999)

The teledermatology cases presented were neither emergency nor life-threatening but required a diagnosis so that appropriate treatment could be started. For most a face-to-face consultation with a dermatologist was not a viable or necessary option.

In other non-emergency situations there was an alternative, namely that the patient could come and see a doctor at the next medical visit to the outreach centre. In emergency situations this did not apply and telemedicine was then the quickest way of obtaining medical advice.

In short, the analytical concepts of Unlocking Unblocking and Validation in the PAR phases, *Developing, Maturing phases and Early Sustaining* of telemedicine indicate clear benefit in some, if not all circumstances. The Early Sustaining Phase highlighted the evidence of the effectiveness of telemedicine with lifesaving examples in rural Nepal. Furthermore, the PAR approach to the telemedicine project requires a multi-disciplinary and multi- layered approach and should not be viewed in isolation (Wootton 1999). This is further explored in the next section 10.6, Conceptual model of telemedicine.

10.6 Conceptual model of telemedicine

The research findings and the researcher's own experience demonstrated that the participants; doctors, village health workers and local villagers were enthusiastic to get involved, were interested to see further development and willing to support telemedicine in not only the three centres chosen for this research but also the other outreach centres. The comparison of responses before and after the introduction of telemedicine from both doctors and health workers showed a marked increase in enthusiasm for the approach with no respondents being less enthusiastic (Refer to the Chapters, 7, 8 and 9). These findings are similar to those of Whitten and Allen (1999) who highlight that telemedicine thrives largely due to the enthusiasms and commitment of individuals. This is a further Validation of the developmental process which had been on-going for three years.

Three years is perhaps not long enough to judge true sustainability and hence the use of the title "early sustaining" based on the initial evidence from this study. Nevertheless the cases that have been described and the evidence presented of increasing enthusiasm (Whitten and Allen, 1999) and acceptance or normalisation (Murray *et.al.* 2010, 2011) of telemedicine have provided a good indication of sustainability and validation for this research and its inclusive methodology.

For the successful introduction of telemedicine with tangible outputs, an in depth understanding of the existing health care system of the country is required. Telemedicine does not operate in a vacuum and must be integrated within a complicated health care delivery system (Whitten and Adams 2002; Whitten 2006). The challenges and strongly expressed 'genuine need' for the service improvement must be understood in all the domains (patients, practitioners, organisation and the public). The actual status of ICT infrastructure (Scot 2007) in the country and its application will be further discussed below in Figure 10.2. These are drawn together in a Conceptual model of telemedicine based on the evidence presented in the previous chapters.

10.7 A conceptual model

Here the researcher uses four layers of activity to characterize telemedicine. The four layers are: the people layer at the centre, the organizational layer, the infrastructure layer and finally the telemedicine layer.

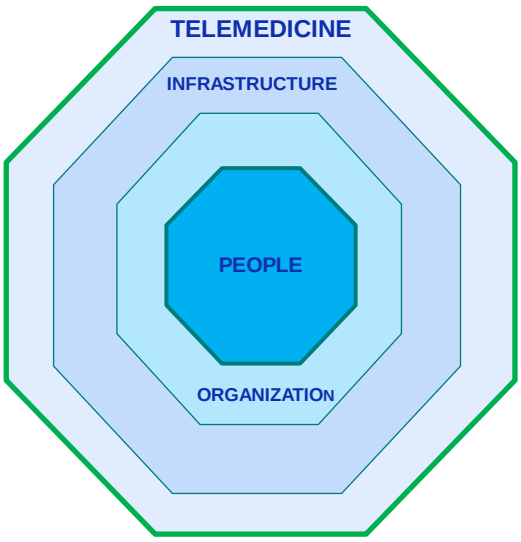


Figure 10.2: A Conceptual Model of telemedicine

10.7.1 People Layer

People are the centre of the development of telemedicine. The people layer in Figure 10.2 represents the genuine needs of users: Health Workers, Doctors and Patients. Genuine needs of service users and the interests of the service provider are paramount otherwise telemedicine simply would not work despite the latest availability of advanced and robust technologies.

Due to the nature of the health care systems developed in Nepal where patients are only the passive recipients of the services, the majority do not know what their medical needs are. This is due to several factors such lack of access and poverty (World Bank 2009) and highlighted in the Nepal in Context Chapter 4. Furthermore health care services are always seen as being provided either by government or other providers (private or

charitable organizations). It was evident through both formal (interviews for case studies) and informal communications with the villagers that they were more concerned about having health care facilities in or near their villages rather than the ability to judge the level and quality of care they are getting from the centres. Furthermore, their trust and respect for health care workers of the outreach centres grew through the reputation of the Dhulikhel Hospital and experience of their performance and the recommendation of others (word of mouth).

The level of participation of patients and the villagers in the research changed as the research progressed due to the scarce availability of health services at the village level. As the research developed, it became clear that the major issues that needed to be Unlocked and Unblocked were within the service providers (outreach centres and the hospital) rather than service users (Chapter 7 and 8). Therefore the level of the villagers' participation decreased as the project highlighted that for telemedicine to be successful, non-technological issues of telemedicine needed to be resolved. In addition, all the patients who were treated or referred to hospital after tele-consulation reported high patient's satisfaction as was highlighted in the Early Sustaining phase of this research (Chapter 9).

There was a further question of how ethical it was to raise demand and expectation without having prior knowledge of the villagers' own need and the capacity of the service providers (Dhulikhel Hospital and Outreach centres).

However, the researcher acknowledges that villagers can be empowered through the opportunity to exercise their choices and take effective actions. For example, the character of diseases and treatment (health information) would be the best understood by an individual if communicated within the appropriate cultural context (Thiede 2005). This further plays a key role in increasing health service access in the sense that it develops health knowledge.

The Village Health Workers are the key people in delivering primary health services in remote rural Nepal. Furthermore, health workers in rural areas (who serve most of the population) are isolated from specialist support and up-to-date information (Fraser and McGrath, 2000). That professional isolation was an issue was highlighted in Chapter 3 and in the Developing and the Maturing phases (Chapter 7 and 8) of the project. In interviews, concerns were raised around the lack of support mechanisms needed for

teleconsultation, poor lines of communication, a lack of sense of belonging and being deserted by the senior management. These concerns and frustrations were expressed most strongly by government health care workers (Justice 1989; Palman 2004; DoH 2003).

Despite the challenges faced by village health workers, they remain the critical bridge between villagers and the hospital. Evidence suggests that village health workers often extend their roles in their communities beyond solely the provision of health service (Ivernes, Farmer and Hanaford 2002, West, Farmer and Whyte, 2004). They are advocates for the patients regarding their circumstances such as family and financial difficulties when referring them to the hospital. This finding further resonates with Whitten and Allen's work highlighting the importance of committed individuals and their contribution to the wider communities or an enterprise (Whitten and Allen 1996). In spite of the strong relationships between the health workers and the villagers, they were often reluctant to refer patients without knowing where the patients would end up.

Once the telephone was introduced and telephone consultations were carried out from the outreach centres on behalf of patients, village health workers expressed their experience of increased trust and respect from the villagers they were serving. It appears that involving the patient (i.e in presence of) and family members in the telemedicine offered a sense of inclusion, which was not experienced previously (Case example 9).

In relation to the people layer, doctors were another key set in the process of delivery of care through telemedicine. The success or failure of the system lay in the knowledge, attitudes and practice of the doctors. Like village health workers, doctors shared enthusiasm and expressed their support for the telemedicine service, which enabled them to serve the rural and remote people – though they were based in the well-equipped hospital, often a day's journey from their patients. They further identified the importance of having knowledge of the competencies of the village heath workers before giving any kind of advice.

The concerns of the doctors were more about their personal or professional growth. They were interested in their credibility and recognition at national and international levels. They also faced the difficult choice of either staying at Dhulikhel Hospital or moving to the private sector.

At Dhulikhel Hospital the job satisfaction was higher but the remuneration low. The hospital's philosophy underpinned the community-based health service provider

(Dhulikhel Hospital 2010), where a participatory ideology was central to the care system. This was understood by the health professionals employed as part of their everyday practices. In other words, the philosophy became normalized (Murray et.al. 2011) and the hospital commitment to outreach work is the reason for many doctors joining the institution.

At private hospitals or even moving abroad (http://www.ndauk.org.uk/) doctors were providing care to the higher end of the socioeconomic scale with a high salary (Rowe *et. al.* 2005). Therefore retaining health professionals is a major challenge for the community hospitals like Dhulikhel and its outreach centres which are located in remote and rural areas (Bangidwala, Fonn, Okoye and Tollman 2010).

Besides the three key players considered, villagers (patients), village health workers and doctors, there are other important players in telemedicine. For example, telecommunication services providers, technology and technical service providers (Scot 2007) and the institution's own administrative staff (Whitten, Holtz and Nguyen 2010; Whitten and Adam 2002). A range of stakeholders were identified who should be involved and be clear about their remit and level of participation. Their support and partnership can be brought in to tackle particular issues.

10.7.2 Organizational Layer

The organizational layer plays an equal role in either the success or failure of telemedicine. Taking on any new innovative initiative like telemedicine, should involve a shared common vision: serving the rural and remote communities (Dhulikhel Hospital 2010). The vision should be followed with shared decision-making which leads to greater understanding and commitment to the philosophy of the hospital (Ansari and Philips 2001). Commitment is significant in partnership (Ansari and Philips 2001). In the case of this research, organizational vision played a crucial role in selecting the partnerships. Despite having a great vision, on many occasions failure to address micro-level management issues (non-telemedicine related), had a huge impact on the success, or not, of the new system as part of the normal care pathway. The micro-level management issues highlighted in Chapter 8 were: sense of belonging, identity, working environment,

lines of communication, clear job description, appraisal and appreciation and including continuous professional development. They required urgent attention and needed to be dealt with at the same level as the major issues (Willis-Shttuck, Bidwill, Thomas, Wyness, Blaauw and Diltopo 2008; Ansari and Philips 2001). Therefore a supportive and responsive management team with proper lines of communication (who is who and for what) are equally important in relaying the vision and values of the hospital.

In any progressive organization adequate communication that is direct, accurate, timely and relevant is vital in taking new initiatives such as telemedicine where multiple stakeholders and inter-professional working are involved (Ansari and Philips 2001). This further means needing to know who to communicate with, when and for what. However, in regards to telemedicine it represents a wider meaning of communication. For example effective communication in telemedicine requires an understanding of medical language and the ability to translate into lay people's language and vice versa (63 different languages are spoken in Nepal – Chapter 4, Nepal in context).

Before introducing telemedicine, another key component which needs to be addressed in the organization layer, is the Infrastructure. The infrastructure comprises the telecommunication system, electricity supply, computer manufacturers and retailers. The technologies now exist to fulfil most telemedicine requirements; however this infrastructure and equipment must be user-friendly (Wootton 1998, Scott 2007). These structures support the basic components of telemedicine transmission and provide the capability to process information. Furthermore in terms of telemedicine, buildings (health centres) and access via road to the health centres plays a vital role in the success and failure of telemedicine (Chapter 4, the Nepal in context). Therefore it is important to emphasise the need for an effective real world intervention such as telemedicine to be implemented widely for long term impact and not treated in isolation (Whitten and Adam 2002; Murray *et al.* 2010, 2011).

With respect to medical infrastructure, all other medical equipment (diagnostic equipment) comes under the broader perspective of infrastructure as well. Therefore telemedicine's infrastructure components are quite costly (Johnston et.al. 2004) and continuously changing. It needs to be implemented in partnership with other key

stakeholders with the view for longer term and wider use such as the telephone. Furthermore, the telemedicine system in the primary care centre must be used for multiple purposes (Wootton 1998). For example, used for continuing medical education, administrative work or even for personal use – staying in touch with family and for recreation (watching movies or documentaries on the computer – CHW 2 in the Maturing Phase).

10.7.3 The telemedicine Layer

This layer represents the real action of telemedicine such as teleconsultation between patients, health workers and the hospital staff (doctors) with the help of information and communication technology (Craig, 1999; Perednia and Allen 1995). It includes case referral, case management with advice and support received from the doctors in the hospital (Wootton 1998).

This layer is not limited to telemedicine services: instead it operates across different services within the organization either for administrative purposes or educational use (health promotion and protection and education). The system builds on all the above mentioned layers: the people, the organization and the infrastructure. All these components MUST be taken into consideration while implementing a telemedicine system for tangible outcomes to be achieved. Therefore telemedicine is a system rather than a single component in a chain of care. At a deeper level, the overarching themes developed from this PAR project: access, communication and empowerment need to be included and are discussed in the following section.

The following quote summarises the telemedicine layer and where it stands in the health care delivery system:

"First we need patients, health worker, then telephone or internet whatever is available that requires our interests and willingness. I think that should be fine".

CWH3

10.8 Overarching themes

Beside the PAR Phases (Figure 10.1) and the Conceptual model of telemedicine (Figure 10.2), there are three cross cutting themes emerging which enable telemedicine to function effectively. They are Access, Communication and Empowerment. These are linked together by two positive reinforcement cycles (see Figure 10.3). These themes further validate that telemedicine is primarily about people rather than technology (Wootton 1998; Whitten and Allen 1996) and were considered in depth in findings chapters 8 and 9.

In the clockwise cycle, better access leads to better communication which empowers the health worker and leads to more access. In the anti-clockwise cycle communication leads to access which increases empowerment and leads to more communication. These are equally relevant to non-telemedicine activities as well as telemedicine.

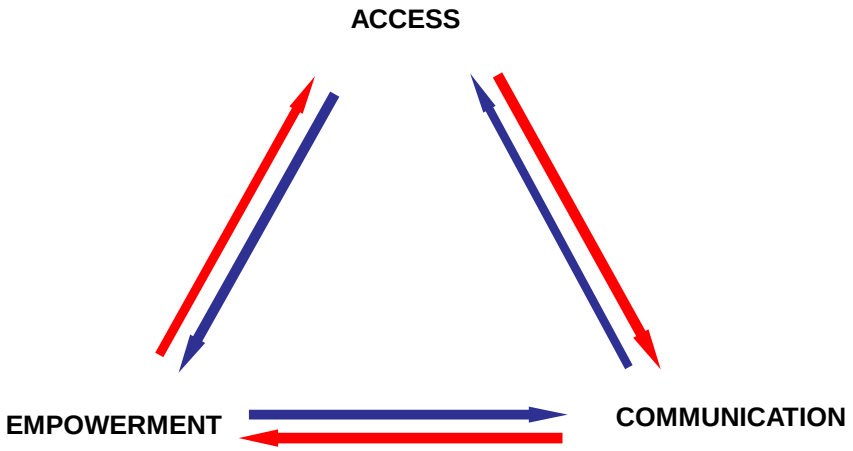


Figure 10.3. Cross cutting themes

10.8.1 Access

Throughout the world the importance of “equitable access” and “improved access” to health care is well documented: for example, Alma Ata (1978) “HFA (2000)”, MDG (2015) (WHO, UNDP). Access to basic health care services has been advocated as a fundamental human right by all the international declarations. Furthermore, ‘access’ to health care has mostly been addressed under access to health care services for patients, however, the improved access to support, even in the resource poor setting, is equally important to improve equitable access to healthcare. Hence, what is meant by ‘access’ often remains unclear. Whatever definition of access to health care is used, it needs to be transferable across cultural, economic and geographic settings.

Rural areas are deficient in professional medical personnel, physical health care facilities, and the ability to afford the financial costs of illness. "Access" may also mean that services are available whenever and wherever the patient needs them and that the point of entry to the system is well-defined by Bodenheimer 1970 and Freeborn and Greenlick 1973 in Aday and Andersen (1974).

In the context of this research, “access” is based on three dimensions:

Availability: In the case of patients, the physical existence of a health care centre, its geographical location, the availability of transportation, staff availability in the remote health centres as well as organisational factors such as opening hours (for example government health centres only open from 10 am to 2pm).

Affordability: The level of fees charged to patients influences both access and whether or not health care offers financial protection against the cost burdens of ill-health. Empirical evidence demonstrates that these costs can influence poor households’ poverty levels and, hence affect their ability to purchase other household needs to maintain a basic living standard (McIntyre *et al.*. 2006; Russell 2004, 2005; van Doorslaer *et al.*. 2006; Wagstaff 2002). For developing countries like Nepal, the crushing force of poverty is the leading obstacle in the drive to improve access to health care for rural remote people.

Empirical evidence demonstrates that availability and affordability commonly influence whether and which population groups use health care, as well as when groups seek care in an illness episode, with implications for illness severity and treatment effectiveness (Dahlgren and Whitehead 2007; Dixon *et al.*. 2003; Hausmann-Muela *et al.*. 2003; Palmer 2007; Shaikh and Hatcher 2004).

Acceptability: Social and cultural acceptability or normalization (described by Murray *et. al.* 2010) influences the opportunities for effective diagnosis and treatment, patient adherence with advice or treatment, and self-reported health status (Gilson 2007a; Wallerstein 2006). Therefore as highlighted earlier in the chapter without understanding the "genuine" need and "customised" care pattern required to meet the need, it is impossible to implement any health care service and furthermore even if it is, uptake may be very limited.

A quotation from Avedis Donabedian (2006 p. 111) aptly summarizes many of the concerns expressed here with respect to the conceptualization and measurement of access:

"The proof of access is use of service, not simply the presence of a facility. Access can, accordingly, be measured by the level of use in relation to "need." One should recognize, however, that clients and professionals evaluate "need" differently. Further, one must distinguish two components in use of service: "initiation" and "continuation." This is because different factors influence each, though any one factor may influence both. It is hardly necessary to emphasize that barriers to access are not only financial but also psychological, informational, social, organizational, spatial, temporal, geographical and so on."

There is some irony that telemedicine whilst mitigating access issues in many instances actually exposes the inequality to levels which those in power may find unacceptable. Support for poor remote communities may diminish. Also telemedicine can and does play a role in saving lives. However as with case study number 1, a mother's life was saved by village health worker and telemedicine intervention but her baby died. Telemedicine

further exposed the fact that midwifery care in remote communities is sadly lacking (MOH 2006; WHO 2006, Bangdiwala, Fonn Okyoye and Tollman 2010). Despite increasing access to services, that is bringing specialist expertise to the patients and managing scarce health resources, the telemedicine system cannot solve the problem of health worker shortages (Wootton 1998, 2007).

10.8.2 Communication

Effective communication (both ways) of information plays a vital role in building the needed relationships. It is an art and can sow the seeds of mutual trust and respect. Trust as Theide (2005) states is an important ingredient in information effectiveness. Therefore, being with health professionals and villagers has been a major part of this research: with a great deal of explaining about the project and listening to genuine concerns. This opportunity enabled both researcher and the researched to exercise choice and take effective action in the project.

Blanchard (2007) stresses that in high performing organizations, the information needed to make informed decisions is readily available to people and is openly communicated – sharing information and facilitating open communication builds trust and encourages people to act like owners of the organizations. The more readily available information is, the more effective solid decision making aligned with the organization's goals and values is. Open communication and effective lines of communication are the lifeblood of the organization (Ansari and Philips 2001).

However, in a global sense, health workers who are serving the most vulnerable people in the world in developing countries are starved of the information that is the lifeblood of effective health care (Kale 1994). Lack of effective communication within and between doctors and health workers in a timely manner and which is readily available, leads to increased suffering and likelihood of death of the patients. Therefore, adequate communication that is direct, accurate, timely and relevant (Ansari and Philips 2001) is a major factor in success of telemedicine systems.

Providing access to reliable health information and access to experts when needed for health workers in developing countries is potentially the single most cost effective and achievable strategy for sustainable improvement in health care (BMJ 1997 Editorial). The

British Medical Journal (Editorial team 1997) further claims that it is cost effective because the amounts of money required are negligible compared with those invested in health services. Achievable, due to the availability of the health information on the internet (either for free or for subscription); the rapid and advanced development of ICT presents new opportunities to complement the conventional methods of dissemination. All it needs is the will and commitment to make it happen. It is sustainable because information access is the sine qua non for the professional development of all health workers and the most vital asset of any health care system. Therefore, it is crucial to have access to information so that staff can plan and make decisions in an effective way and through open communication do their job effectively. The communication system further needs to be supported by an effective line of communication within the organization and requires a reliable technological infrastructure (Scott 2007). These technological improvements in communication are the key to employee empowerment (Malone 1997). Furthermore, the effective use (or miss-use) of technology is the key component of high (or low) performance

10.8.3 Empowerment

Empowerment is a process of unleashing the power in people – their knowledge, experience and motivation – and focusing their power to achieve positive outcomes for the organization (Blanchard 2007). In other words, "unlocking an individual's potential". To unleash or unlock is only possible when the health workers are given the opportunity to express their fears, hopes and challenges, they were able to concentrate on trying to find solutions with each other and with the researcher. Brandon (2005) quotes Wolff (1985, p.153) who stresses that empowerment is not something that is done 'to' people: *"empowerment is the mechanism by which people, organizations and communities gain mastery over their own lives ...the aim should be to enhance the possibilities for people to control their own lives"* (Wolff (1985, p.153) in Brandon 2005).

In this project, PAR methodology played a critical role in unleashing the potential in health workers which was a perfect combination for identifying the "genuine need" and setting a platform for "new initiatives". The process restored confidence for the participants in which they could face problems which were identified. Therefore, PAR emphasised 'real' participation and 'worthy' action (McTaggart 1997). The activities in the PAR phases also gave them a sense of belonging, a collective identity and a voice to

discuss the challenges and hopes for their professional development and the growth of the organization.

Thomas and Velthouse (1985) conceptualized empowerment as relating to the very basics of human existence. These basics are:

- The environment (Working environment –example infrastructure)
- The tasks (Clear Job Description)
- The behaviour of the leader (Support and guidance)
- The individual's interpretive styles (Willingness and their attitude towards work)
- The impact and meaningfulness of the task (Satisfaction)

These ideas clearly resonate with the findings from the research which are highlighted in the chapters 7, 8 and 9.

Spreitzer (1996) found that employees who are empowered have low ambiguity about their role in the organization. Empowered employees feel that their organization provides them with needed support and recognition; that they have greater access to information and resources than in traditional organizations and that their work climate is participatory.

A literature review carried out by Willis-Shattuk *et al.* (2008) in context of motivation and retention of health workers in developing countries reported that recognition or appreciation either from managers, colleagues or the community was one of the most important motivating factors for the health worker. Therefore recognition or appreciation that ultimately empowers staff should be integrated into an organization's culture in a progressive manner and must address the needs of each unique entity. Foster- Fishman (1995) found that unless the culture of the organisation is appropriate, employee empowerment efforts are doomed to failure. For example the organizational culture between government health worker and those supported by the hospital was highlighted in the Chapter 8: the Maturing Phase of this project. Employee empowerment emerges when the people and the systems are willing to make changes. The willingness is determined by looking at issues of control and power, trust and inclusion, and risk taking currently exemplified in the organization.

Empowering is the key to treating people right (valuing people) and motivating them to treat service users right is the role of the leaders or supervisors. Having champions resonates with the findings from the case study of two telemedicine projects by Whitten

and Adam (2003) who reported that success was largely due to strong leadership. As highlighted in an earlier chapter (Chapter 7: the Developing Phase), many participants in this research project stated that their reasons for joining the hospital were due to its vision and leadership. Therefore the setting of an example by the leader is crucially important and good leaders create an environment where individuals are able to make that choice and take action. That is empowering. In high performing organizations, leadership practices support collaboration and involvement, and leadership is assumed at every level of the organization. Dhulikhel Hospital's philosophy "taking service to people" embraced many of these collaborative ideas.

Empowerment is multi-dimensional, it involves the way leaders lead, how individuals react, how peers interact, and how work related processes are structured. Furthermore, empowerment in real terms rather than bestowed as a gift, means power devolves to those who have the capacity to take hold of it. The specific needs of the research participants are: around their sense of belonging within the organisation (Chapter 8); reducing their professional isolation (Fraser and McGrath, 2000); ensuring their learning needs are supported; developing the perceived worth and value of their work in context and hence retaining and developing in place this essential element of the health care workforce who take healthcare to the rural population.

Therefore this project shows that for the successful introduction of telemedicine with tangible outputs requires in depth understanding of the existing health care system of the country and its challenges, strongly expressed 'genuine need' for the service by the all the domains (patients, practitioners, organisation and the public), and the actual status of infrastructure in the country. In order to explore complex culture and geographical make-up of the country like Nepal, participatory action research was adopted focusing on the impact and acceptance of the provision of health care, advice and support via tele-communications in remote settings in a mountainous region of Nepal.

The developmental nature of the research in a complex environment like Nepal, gave rise to the different presentation of PAR: the developing, the maturing and early sustaining phases. These phases were further analysed through the analytic concepts of Unlocking, Unblocking and Validation illustrated in Figure 10.1. The PAR phases and their analytical concept further enable the development of a Conceptual model of telemedicine (Figure 10.2) based on the evidence presented in the different PAR phases. However, three cross cutting themes emerged: they are Access, Communication and Empowerment. They are

crucial for telemedicine to function be understood effectively. These themes are linked together by two positive reinforcement cycles see Figure 10.3. These themes further validated that the telemedicine is primarily about people rather than technology. These further led to the development of a combined model of telemedicine and concepts indicating the interaction between access, communication and empowerment for holistic telemedicine system development.

These concepts are relevant through all layers of the telemedicine model as shown below (Fig 10.4).

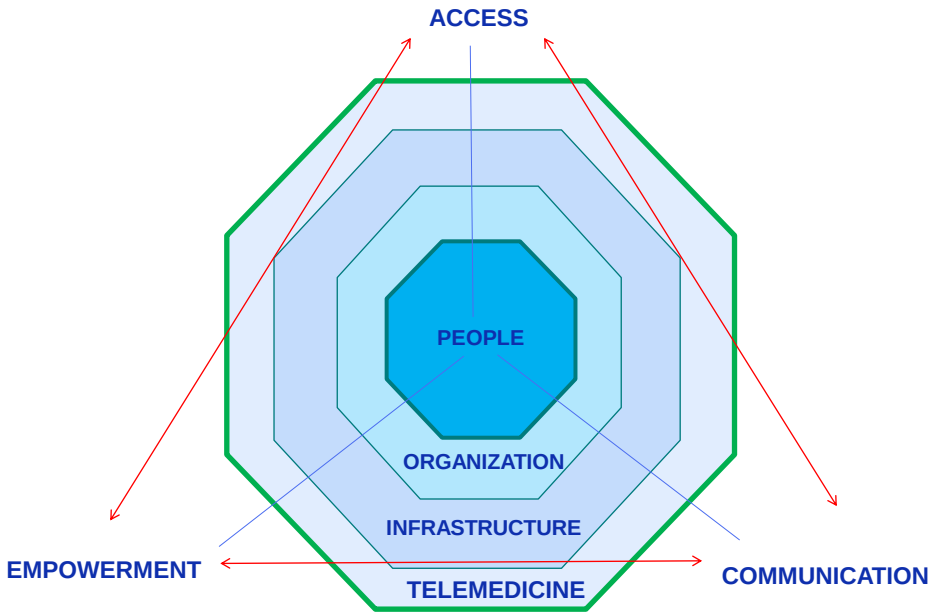


Figure 10.4: The combined model of telemedicine and concepts indicating the interaction between access, communication and empowerment

10.9 Conclusion

Rural health care in Nepal remains in crisis and hence one can argue that for the majority in Nepal, all health care is still in crisis. The findings of this study have emphasised the pivotal role that the rural health care workers play and the place telemedicine has in improving access to healthcare through communication and hence the empowering of this group of workers. However these people need substantial support and development

to both enhance their competencies and also boost their confidence as part of an integrated health care system enabling the hospital to support the villagers at a distance.

Despite suggestions that telemedicine will offer hope in developing countries there is only limited published evidence to support this claim. Whilst 'Telemedicine is and must remain a process of delivery of care rather than a technology' (Wootton 1998, 2008): the system must focus on connecting patients and healthcare professionals in a chain of care and meeting their needs in delivering healthcare rather than following the wide array of existing or new and advanced technology in communication which are being created. Furthermore, telemedicine developments, important though they have become, must not deflect attention and resources from addressing wider socio-economic inequalities in health.

Postscript

Introduction

Participatory Action Research (PAR) has been very challenging but effective in this research, expressing the real underlying issues in a very complicated health care system in rural remote Nepal. The context of Nepal chapter highlighted a unique interrelation between health and culture. The unique inequalities in access (socio-economic barriers to access) to health care services for large numbers of the rural population further overwhelmed by the geographical barriers imposed by the country's rough terrain. These issues were mostly Unlocked, Unblocked and Validated by the PAR approach which is the central to developing telemedicine in this particular rural environment.

An iterative and continuous development is at the heart of the PAR approach. This development has continued (and still is) beyond the lifespan of the research project. The following paragraphs identify *what needs to be done* next to remove blocks to introduce telemedicine in the existing health care system in Nepal. The following actions are a) telemedicine related and b) non-telemedicine related.

Telemedicine related

The benefits and promises that telemedicine holds are well documented. But for the success and the early sustaining of the telemedicine system in Dhulikhel Hospital and its outreach centres, the following actions are anticipated to Unlock, Unblock and Validate the process further.

Telemedicine service: Integrated into care delivery

- Inclusion of telemedicine services as a formal part of a comprehensive (outreach) health care delivery package of the Hospital. This means, integrating the telemedicine service in the job description of the hospital staff (doctors, nurses and other medical staff) and the outreach staff. For the effective implementation in the health system, the introduction of "Standard Protocols" for telemedicine operation towards consultations, referral and distance follow up of patients and the support for outreach staff to deliver health care in a more effective way, in full confidence is required. The protocols will be followed with the introduction of

effective lines of communication and with proper documentation mechanisms to establish best practice and maintain the excellence in delivering care.

- Wider use of telemedicine equipment and ICT infrastructures. Due to the high initial expense of setting up telephones, computers and other equipment, their wider use should be encouraged for other purposes, such as administrative support, training and continuing education, public health education, data collection for research purpose and also for recreational purpose, watching movies or documentaries.
- Training and Continuing education: As more health professionals and other stakeholders become interested in telemedicine and implementing telemedicine as part of the health care delivery, there is an increasing demand to develop educational / training programmes in each medical discipline, for example, teledermatology, telepaediatrics, telepsychiatrics and others. Introducing telemedicine into the curriculum for medical students and other allied health care courses in Nepal needs to be explored and encouraged. Finally, compulsory telemedicine training on using basic ICT, followed up refresher and customized IT courses and one-stop support systems (equipment repair and exchange when it breaks down) should be in place and applied as a mandatory requirement for health workers and doctors.
- Distance support for academic development or Continuous Professional Development (CPD) within their fields of practice needs to be encouraged and developed through the use of the telemedicine system. Furthermore, online training to boost competence and confidence of the village health workers should be run alongside normal training. Best practice and telemedicine related experiences should be encouraged for scientific publication in national and international journals as well as presented at conferences. This should be promoted and encouraged amongst doctors and health workers. This furthers clarify the benefit of telemedicine for health workers (for example training and education) doctors (for example CPD and international exposures) and Hospital (for example, living up to its vision – taking the service to the poor and developing the institution as a centre for excellence).

- Continued Research and Development: As the telemedicine system requires a multi-disciplinary team as highlighted in the discussion chapter: Nine, multi-disciplinary research should be conducted where and when possible

Above all, telemedicine is a system which connects patients and healthcare professionals in a chain of care rather than following the wide array of existing or new and advanced technologies in communication. Therefore, the organization should create an environment where trust, respect and knowledge of each other as an individual in the chain of care can flourish. These issues are further discussed in the non-telemedicine related section below.

Non telemedicine related issues

Non-telemedicine related issues emerged as perhaps the most important outcome of this research. During the course of the research it became very clear that if the existing system was not working as well as it could then it was difficult to add a new component such as telemedicine. These issues were both shared with all the participants and were also specific to either health workers or doctors. These issues are ongoing and continue to be addressed by the hospital and for some need to be developed more extensively. They are:

- The importance of having defined referral system between outreach centres and the hospital
- The importance of having clear definitions of roles and responsibilities in job descriptions of either doctors or health workers
- The importance of having a clear lines of communication
- The importance of feeling valued as a staff member
- The importance of having adequate training

The outreach conference needs to be repeated to continue the existing processes of building trust between doctors and outreach health workers and sharing knowledge and best practice amongst health workers. This relationship is crucial. Furthermore, the researcher anticipates presenting his final research findings at the outreach conference when it happens.

In addition specific actions need to be taken to support outreach centre staff within the hospital. One way of doing this is by strengthening the role of the Community Department in the hospital to provide holistic support for outreach staff. Another approach is to add detailed information about the outreach centres to the hospital website and other hospital communication materials, clearly demonstrating the inclusion of these outreach sites in the hospital. This is a small gesture but with huge impact and enhancing the sense of belonging.

The final action in this category is to restate the philosophy and the vision of the hospital frequently to its doctors and other staff – *reach them before they reach us* (in other words take health care to the people before they need to come to the hospital). Therefore, telemedicine certainly has a great potential for decentralizing health care as the system shares this common vision. The system needs to be embedded in the health care system alongside face-to-face medicine. Combined systems of care can provide a high quality and sustainable service to which the hospital aspires meeting all six components of quality – safety, effectiveness, patient centeredness, timeliness, efficiency and equity.

Beyond Dhulikhel Hospital

This research journey started with visiting, listening (formally and informally) and being with both the Dhulikhel staff, (Hospital and outreach centres) and the Government health centres staff. Both Dhulikhel Hospital's staff and the Government health centre staff were equally involved in the data collection phase of the project, however due to the nature of the research, no actions were taken with the government health centre staff. The government health worker's issues were far worse than those at Dhulikhel Hospital.

Government Health Workers: Unsung Heroes

As highlighted in the Nepal section, the government signs up to all the international health conventions and on paper its system of health care delivery from national to village level looks excellent (Refer to 4.6 Health in Nepal section Figure 4.2). A telemedicine system could work well in the government health system if its structure on paper ever became reality but this is not likely to happen in the near future. Unfortunately the reality on the ground is completely different with a highly ineffective

system and frustrated (but trained) health workers who find themselves between a rock (the government) and a hard place (the patients). Despite these complex challenges, their dedication in attempts to provide primary care with their skills and knowledge and with very limited medical resources to the people who are in much need are highly appreciated. There is enough evidence documented to show the critical role, village health workers have in reducing the mortality rate of children under the age of five in Nepal.

This project highlighted that there was a clear indication of enthusiasm and willingness to take part in the further development of the telemedicine project and desire to improve current practice. Their willingness should be further encouraged to explore collaborative actions to address the blocks which were highlighted in the developing phase of this research Chapter 7 and 8. The research findings show that there are some interesting opportunities for collaborative research and actions through this participatory ideology. Besides the long term strategy for revitalizing and supporting the government health centres, there are some immediate but basic initiatives (most of them physical) which need to be taken. They are:

a. Renovating Health centres (improving the working environment) “one cannot treat a sick patient in a sick hospital”

    - Many government health centres are located in very poor and old infrastructure (buildings), lack proper furniture, have inadequate water and sanitation facilities, lack electricity and the list goes on. A poor working environment further de-motivates village health workers and encourages them to move either to city health centres or into private health centres. Therefore, there is a great need for infrastructure improvement to inspire both health workers and patients to utilise with the full confidence.

b. Increased access to basic medical materials (Drugs and diagnosis equipment)

    - Many health centres lacked basic but essential medical resources which hindered health workers utilizing their knowledge and training to the fullest.

c. Introduce training and continuing education as part of staff development

- Despite much research evidence that training and continued education has a strong motivating effect, and enable health workers to take on more demanding duties to achieve both personal and professional goals at work with up-to-date information. In reality many rural health workers do not have access to such urban based training.
- Those who had training raised issues around the importance of having training customized and locally orientated to meet local needs.

d. Developing effective Partnership with other primary centres including with Dhulikhel Hospital's outreach centres where and when needed.

- This partnership is already in practice informally, informing and referring patients to outreach centres during doctors visit days; government health centres sharing freely available health products; and with government centres working with the outreach centre for patient care to be available to the maximum numbers of people. These needs to be further developed towards partnership work and would be more useful to take up as formal partnership including for training wider community health development.

e. Organizing further Health Worker's conferences (collective voice) to share good practice

- To have a collective voice to express their frustrations and explore collective but constructive solutions to the challenges need to be sought through organizing a further village health workers' conference. This will enable village health workers to both share their good practice with others and to build the peer support network.

f. Recognition and Appreciation for their services in remote and rural health care

- Recognition and appreciation, from, local government bodies, colleagues and community should be promoted and encouraged. In this research,

health workers reported that they were encouraged and motivated by getting results from their work, being valued and being useful to society and taking care of people. Public recognition and appreciation would further boost their confidence and enhance the trust of the community they care for.

g. Introducing telemedicine in the government health centre

- Telemedicine should be introduced as a pilot project with participatory ideology in a few government health centres. If this works, it needs to be further developed as a demonstration site for the government to take up the service in line with the health system structure as defined on paper. This could be possible only through identifying and training telemedicine "champions" in the government health centres.

Beside some of the actions highlighted above, as the motivational factors for village health workers to serve in the remote rural areas, there should be a high level strategy in the government introducing financial incentives (special salary rate) and support mechanisms (with the opportunity for career progressions for those serving in the remote and rural areas). These issues would further motivate many health professionals to serve in the rural communities.

The actions highlighted above are implementable but there should be a period of time for reconciliation, after being let down so many times, ignored by the government for so long and reluctant to work in isolation. There is a need to create an environment to grow trust, respect and self-confidence again to take the renewed challenge to improve the health system.

Furthermore, there are other opportunities for partnership working between government health centres and the private hospitals. These opportunities need to be explored where a private hospital may adopt a government health centre for technical and teleconsultation support as part of their Social corporate responsibility (SCR). If the partnership works, there are huge possibilities for public – private partnerships in telemedicine and overall in primary health care delivery for remote rural Nepal.

Sharing findings with the wider community in Nepal

During the development phase of the research, the researcher and the Nick Simon institute (an INGO) in Nepal organized a one day workshop with the main objectives 1) to learn from the experience of others in the field of Telemedicine and 2) identify and discuss issues critical to successful telemedicine development in Nepal. Beside the main two objectives, the workshop served a further two very important purposes for this research. One was to explore number of people and organizations involved in telemedicine projects and to listen to their experience and another was to reassure that no one else in Nepal was involved in any similar (PhD level research) work. Therefore, the researcher anticipates organizing follow up telemedicine conference to share his research findings and experience with the wider community.

Beside presenting in the conference and completing his PhD thesis, the researcher has been following the traditional approach to disseminating research outcomes by publishing in academic journals (Appendix 10), has presented several times and is still presenting findings at local (outreach conference and hospital), national (national IT conference), and international (Canada and UK) multidisciplinary scientific conferences and workshops and has also been subject to the media (UK and Nepal). Above all, as PAR emphasises on "real" participation and "worthy" action. The real participation has left the researcher with more questions such as '**Is telemedicine system solution to societal barriers as well?'** which highlighted in Nepal in context chapter 4 and the 'worthy' action has further encouraged the researcher to explore wider international collaborative work, which is currently under way to address some of the blocks highlighted in the *developing and the maturing phases* of the research. Therefore,

What we call the beginning is often the end and to make an end is to make a beginning. (Elliot, 1974)

Is telemedicine a solution to societal barriers as well?

One of the greatest benefits of telemedicine is to improve access in health care where distance is involved. There is further potential in the context of Nepal: overcoming societal barriers: gender and cast system in Nepal. As highlighted in the Nepal in context (Chapter 4), certain groups (*Dalit and Janajati)* of people face a multitude of discrimination which sometimes becomes a barrier to accessing public services including health. Many of the service providers, including health care providers (health workers and doctors) are from higher cast groups, *Dalit* and other socially marginalized people widely known as the *untouchable* group may feel uncomfortable at being touched or having to touch. These are highly sensitive issues due to religion and culture practice. In this context telemedicine practice which does not involve either physical face-to-face contact or touch might be a solution socio-cultural barriers (discrimination created social structure) as well as to the geographical barriers (distance created by geography).

References

Abu-Lughod, L (1991) Writing against culture, in R. Fox (ed) *Recapturing anthropology: working in the present.* School of America Research Press. Santa, Fe.

Aday, L.A. and Andersen, R. (1974) A Framework for the study of access to medical care. *Health Service Research.* Fall 1974: 208-220.

Adewale, O.(2004) An Internet base-telemedicine in Nigeria. *International Journal of Information and Management.* **24:** 221-234.

Adikari,S.R and Maskay, N.M (2003). Health sector policy in the first decade of Nepal's multiparty democracy: Does clear enuciation of health priorities matter? *Health Policy,* **68:** 103 – 112.

Allen, D. (2003)Ethnomethological insights into insider-outsider relationships in nursing ethonographies of healthcare settings. *Nursing Inquiry,* **11**(1): 14- 24. Available at http://www.itu.int/ Accessed on 25/03/07

Amenta F, Dauri A, Rizzo N. (1998)Telemedicine and medical care to ships without a doctor on board. *Journal of Telemedicine and Telecare*. **4** Suppl 1: 44-5.

Bell, J. (1999) *Doing your research Project.*3rd Edition Buckingham: Open University Press.

Bergmo, T.S.(2010) Economic evaluation in telemedicine- still room for improvement. *Journal of Telemedicine and Telecare.* **16**(5):229-31.

Blanchard (2007) *Leading at a higher level.* Pearson Education Limited, London.

Brandling-Bennet, H. A., Kedar, I., Pallin, D.J., Garry, J., Gumley, G.H., and Kvedar, J.C. *(*2005) Delivering Health Care in Rural Cambodia via Store-and-Forward Telemedicine: A pilot study. *Telemedicine and e-Health,* **11**(1): 56-62.

Brandling-Bennet, H. A., Kedar, I., Pallin, D.J., Garry, J., Gumley, G.H., and Kvedar, J.C. *(*2005) Delivering Health Care in Rural Cambodia via Store-and- Forward Telemedicine: A pilot study. *Telemedicine and e-Health,* **11**(1): 56-62.

Brandon, T (2005) Empowerment, policy levels and service forums. *Journal of Intellectual Disabilities.* **9** (4*)* 321-331.

Butta, Z.A. (2003) Beyond informed consent. *Bulletin of the World Health Organization.* **82**:2. 771-

Caddell, M (2006) Private schools as Battlefields: contested vision of learning and livelihood in Nepal. *Compare,* 36(4), 436 -479.

Carpenter, C. (1997) *Conducting Qualitative Research in Physiotherapy. A methodology example. Physiotherapy*, **83**(10), 547 – 552.

Cassies, A and Janovsky, K (1998), Better health in developing countries: are sector-wide approaches the way of the future? *The Lancet.* **353(28),** 1777 -1779.

Central Bureau of Statistics (1995) S*tatistical Pocket Book.* National Planning Commission. Kathmandu Nepal.

Central Bureau of Statistics (2004) S*tatistical Pocket Book.* National Planning Commission secretariat, Kathmandu, Nepal.

Chambers, R. (1983). *Rural Development: Putting the Last first.* Longman: London

Chilvers, J (2009) *Deliberative and participatory approaches.* In Castre, N. Demeritt, D., Liverman, D. and Rhads, B (eds) *ACompanion to Environmental Geography.* Blackwell Publishing Ltd

Clifford , C. (1997) *Qualitative Research Methodology in Nursing and Health care.* The Open Learning Foundation. Churchill Livingstone.

Cook, T. (2007) *The Purpose of Mess in Action Research: building rigour through a messy turn.* Northumbria University Available *northumbria.openrepository.com assessed on 20 / 12/2009*

Cook, B. and Kothari, U. (2001) *The case for participation as Tyranny'* in Cook, B. and Kothari, U. eds. Participation the New Tyranny? Zed Books: London: pp. 1-15.

Cornwall, A. and Jewkes, R. (1995). What is participatory research? *Social Science and Medicine,* **41** (12), 667 – 676

Craig, J. and Patterson, V. (2006) *Introduction to the practice of Telemedicine.* In Wootton, R., Craig, J. and Patterson, V. (2006, 2nd Edition) *Introduction to Telemedicine.* (Edited), The Royal Society of Medicine Press Limited,London.

Crocco, A.G., Villasis-Keever, M. and Jadad, A.R (2002) Analysis of Cases of Harm Associated With Use of Health Information on the Internet. *JAMA*.**287**(21):2869-2871.

Dahlgren G, Whitehead M (2007) A Framework for Assessing Health Systems from the Public's Perspective: The ALPS Approach. *International Journal of Health Services.* 37 (2): 363-378

Darkins, A, Dearden, C.H., Rocke, L.G., Marine, J.B., Sibson, L. and Wootton, R. (1996) An evaluation of telemedical support for a minor treatment centre. *Journal of Telemedicine and Telecare.* **2:** 93-99.

Darkwa, O. (2000) An exploratory survey of the application of telemedicine in Ghana. *Journal of Telemedicine and Telecare,* **6:** 177-183.

Department of Health (DoH 2003) *Annual Report.* Ministry of Health. Nepal.

Department of Education Nepal (2009) Annual Educational Report 2009. Ministry of Education Nepal.

Desai, S., Patil, R., Chinoy, R., Kothari, A., Ghosh, T.K., Chavan, M., Mohan, A., Nene, B.M. and Dineshaw, K.A. (2004) Experience with telepathalogy at a tertiary cancer centre and a rural cancer hospital. *The National Medical Journal of India,* **17** (1): 17-19.

Dhulikhel Hospital (2007) *Annual Report 2007.* Dhulikhel Hospital, Dhulikhel

Dhulikhel Hospital (2010) *Annual Report 2009.* Dhulikhel Hospital, Dhulikhel

Dhulikhel Hospital (2010) *Dhulikhel Hospital Prospectus 2010* . Dhulikhel Hospital, Dhulikhel

Dixit, H (1999) *The Quest for Health* 2nd ed. Educational Enterprise (P) Ltd. Kathmandu.

Dixit, H. (2003) *Health in the Himalayas.* In Gurung, D.B. (2003) *Nepal Tomorrow voice and Vision: Selected Essay on Nepal.* (Edited) Kosele Prakasan, Kathamandu, Nepal.

Dixon-Wood, M., Bona, S., Booth, A., Jones, D.R., Sutton, A., Shaw, R.L., Smith, J.A. and Young, B. (2006) How can systematic review incorporate qualitative research? A critical perspective. *Qualitative Research,* **6**(1): 27-44.

Downie, R. S. and Calman, K. C. (1994) *Healthy Respect: Ethics in Health Care,* 2nd edn. Oxford: Oxford University Press.

Dzenowagis, J (2009) *Bridging the digital divide: linking helath and ICT policy*. In Wootton, R., Patil.N., Scott, R.E. and Ho, K (2009) *Telehealth in the developing world*. (Edited),The Royal Society of Medicine Press Limited,London.

Edworthy, S.M. (2001) Telemedicine in developing countries. *British Medical Journal,* **323:** 524-525.

Ekeland AG, Bowes A, Flottorp S. (2010) Methodologies for assessing telemedicine: A systematic review of reviews. *Int J Med Inform*. 79(11), 736–771.

El Ansari and Philip, C, J. (2001) Community development for a changing world? Innovative join working in health care – a South African Parnership Model. *International Journal of Public Private Partnership.* 3:1

Emanuel, E.J., Wendler, D., Killen, J. and Grady, C. (2004) What Makes Clinical Research in Developing countries Ethical? Then Benchmarks of Ethical Research. *The Journal of Infectious Diseases.* **189. 930-937.**

Escott, R.E. (2007) Future proffing telehealth in developing countries. *Journal of Telemedicine and Telecare.* **13:** supp 3. 70-72

Eysenbach, G, Powell, J Englesakis M, Rizo C , Stern, A (2004) Health related virtual communities and electronic support groups: systematic review of the effects of online peer to peer interactions. *BMJ* 328:1166

Fals-Borda, O., and Rahman, A. M. (1991). *Action and knowledge*. London: IT Publications.

Foster-Fishman, P.G. and Keys, C.B. (1995), "The inserted pyramid: how a well meaning attempt to initiate employee empowerment ran afoul of the culture of a public bureaucracy. *Academy of Management Journal Best Papers Proceedings* pp. 364-72.

Fraser, H.S.F., Jazyeri, D., Nevil, P., Karacaoglu, Y., Farmer, P.E., Lyon, E., Fawazi, M.K.C.S., Leandre, F., Choi, S.S., and Mukherjee, J. (2004) An information system and medical record to support HIV treatment in rural Haiti**.** *British Medical Journal,* **329:** 1142-1146.

Gagnon, MP., Lamonthe, L., Fortin, JP., Cloutier, A., Godin, G., Gagne, C., and Rienharz, D. (2005) Telehealth Adoption in Hospitals: An organisational Perspective. *Journal of Health, Organisation and Management.* **19** (1): 32–56.

Ganapathy, K. (2002) Telemedicine and Neurosciences in Developing countries. *Surgical Neurology,* **58:** 388-394.

Garshneck, V. (1991) Applications of space communications technology to critical human needs, rescue, disaster, relief, and remote medical assistant. *Space Communication,* **8**(3): 311-317.

Garshneck, V., and Burkle, F.M. (1999) Application of telemedicine and telecommunications to disaster medicine: Historical and future perspectives. *Journal of American Medical Informatics Association,* **6**(1), 26-37.

Geenberg, A. (2005) *ICTs for Poverty Alleviation: Basic Tool and Enabling Sector*.Stockholm: Swedish International Development Cooperation Agency. Available at . http://www.eldis.org Accessed on 22 / 10/2009.

Gerald I. S. (1983) *Action Research: A Sociotechnical Systems Perspective*, ed. G. Morgan. Sage Publications: London

Gibbon, M. (2002) Doing a Doctorate Using Participatory Action Research Framework in the context of Community Health. *Qualitative Health Research,* **12** (4): 546 -558.

Gibson, B.E., Martin, D.K.(2003) Qualitative Research and Evidence Based Physiotherapy Practice. *Physiothera*py, **89(6),** 350 – 358.

Global Forum for Health Research (2008) Equitable access: research challenges for health in developing countries. *A report on Forum 11.* 29oct- 2 November 2007. Beijing

Grbich, C.(1999) *Qualitative Research in Health: An Introduction.* Sage Publication Ltd, London.

Green, J. and Thorogood, N.(1998) *Analysing Health Policy: a sociological Approach*.Longman, London.

Greenwood, D., & Levin, M. (1998). *Introduction to action research*. Thousand Oaks, CA: Sage.

Guillen, S., Arredondo, M.T., Traver, V., Garcia, J., and Fernandez, C. (2002) Multimedia telehomecare system using TV set. *IEEE Transaction on Biomedical Engineering,* **49**(12), 1431-1437.

Guler, N.F. and Ubeyli, E.F. (2002) Theory and Application of Telemedicine. *Journal of Medical System.* **26**(3): 199-220.

Hall, B. (1981). Participatory research, popular knowledge, and power: A personal reflection. *Convergence, 14*, 6–9.

Heen, H. (2005). About feelings in action research. *Action Research, 3*(3), 263–278

Heinzelmann, P.J., Lugn, N.E. and Kvedar, C. (2006)*Telemedicine in the Future.* In Wootton, R., Craig, J. and Patterson, V. (2006, 2nd Edition) *Introduction to Telemedicine.* (Edited), The Royal Society of Medicine Press Limited, London.

Hernett,B. (2006) Telemedicine systems and telecommunications. . In Wootton, R., Craig, J. and Patterson, V. (2006, 2nd Edition) *Introduction to Telemedicine.* (Edited), The Royal Society of Medicine Press Limited, London

Hersh, W., Helfand, M. and Wallace, J. (2002) A systematic review of the efficacy of telemedicine for making diagnostic and management decisions. *Journal of Telemedicine and Telecare,* **8:** 197-209.

Hudson, H.E. (1999) *Telemedicine and Telehealth: Issue for Developing Region.* Second World Telemedicine Symposium for Developing Countries : Argentina 7-11 June 1999.

Hurt, L.S., Rossmands, C., and Saha.S. (2004) Effects of education and other socio-economic factors in middle age mortality in rural Bangladesh. *Journal of Epidemiology and Community Health*, **58**:315-320.

International Telecommunication Union (1999). Available at http://www.itu.int/ITU-D/hrd/publications/reports/1999 Accessed on 13/08/08

IRIN News (2009) *NEPAL: Lives at risk as severe power cuts hit hospitals.* Available at: http://www.irinnews.org/Report/82384/ Accessed 20/10/2010

ITU (1996) Telemedicine in Developing countries, A conference document, Beirut. Available at http://www.itu.int/ Accessed on 25/03/07

Jalayar, B. (2004) e-health, Electronic Health Record and Technology Infrastructure. Presented at WHO – EMRO, Iran, September, 2004. http://www.emro.who.int/ Accessed on 18/07/09

Jennett, P.A., Affleck Hall, L., Hailey, D., Ohinmaa, A., Anderson, C., Thomas, R., Young, B., Lorenzetti, D., Scott, R.E. (2003) The socio-economic impact of telehealth: a systematic review. *Journal of Telemedicine and Telecare*. 9:311-320.

Johnston,K . Kennedy C., Mudoch, I Taylor P, Cook C (2004) The cost-effectiveness of technology transfer using telemedicine. *Health Policy Plan.* 19.:302-9

Justice, J.(1989) *Policies, Plan, and People: Foreign aid and health development*. Mandala Publication, Kathmandu.

Kasitipradith, N. (2001) The Ministry of Public Health Telemedicine network of Thailand. *International Journal of Medical Informatics,* **61:** 113- 116.

Kaufert,P.A(2000) Health Policy and the new genetics. *Social Science and Medicine.* **51:** 821 – 829.

Kennedy, C., Bowman, R., Fariza, N., Achkuaku, E., Ntim-Amponsah, C. and Murdoch, I (2006) Audit of web-based telemedicine in ophthalmology. *Journal of Telemedicine and Telecare,* **12:** 88-91.

Koch, T. and Karlik, D. (2006) *Participatory action research in healthcare*. Blackwell, Oxford.

Lama, T. (2006) Is telemedicine a viable strategy for healthcare provision in the rural areas of developing countries like Nepal? : A systematic review of telemedicine and its feasibility, cost-effectiveness and sustainability in rural areas of developing countries. Master of Public Health, Thesis, Northumbria University.

LaMay. C.L. (1997) Legal Forum: Telemedicine and Competitive Change in health Care. *Spine,* **22** (1): 88-97.

Llewellyn, C. H. (1995)The role of telemedicine in disaster medicine. *Journal of Medical Systems,* **19**(1), 29-34.

MacIssac, D. (1996) *An Introduction to Action Research*, Available at: http://www.physics.nau.edu/~danmac. Accessed on 4/ 03/ 2007 .

Mars M (2009) Telemedicine in South Africa. In Wootton, R., Patil.N., Scott, R.E. and Ho, K (2009 EDT) *Telehealth in the developing world*. The Royal Society of Medicine Press Limited, London.

Martinez, A., Villarroel, V., Seoane, J. and del Pozo, F. Journal of Telemedicine and Telecare (2004) A study of rural telemedicine system in the Amazon region of Peru. *Journal of Telemedicine and Telecare,* **10:** 219-225.

Martinez. A., Villarroel, V., Seoane, J., and del Pozo, F. (2007) Analysing of information and communication needs in Rural Primary Health care in Developing countries. *IEEE Transactions on Information Technology in Biomedicine.* **9** (1): 66-72.

May, C., Maire, Finch,T., MacFarlane, A., Dowrick, C., Treweek, S., Banllini, L., Rapley, T, Ong, B.N., Rogers, A., Murray, E., Elwying, G., Legare, F., Funn, J.,and Montori V.M., Gask, L., Rapley, T., Wallace, p., Anderson, G., Burns, J and Heaven, B (2007) Understanding the implementation of complex interventions in health care: the normalization process model. *BMC Health Service Research*. **7:**148

McDonald, S. (2005) Studying actions in context: a qualitative shadowing method for organizational research. *Qualitative Research.* **5 (4):** 455 -473.

McIntyre, D. Thiede.M, Dahlgren, G. and Whitehead, M (2006) What are the economic consequences for households of illness and of paying for health care in low- and middle-income country contexts? *Social Science & Medicine.* **62(**4): 858-865

McNiff, J. and Whitehead, J (2006) *All you need to know about action research.* Sage Publication, London

McTaggart, R. (1997). *Participatory action research: International contexts and consequences*. Albany: State University of New York Press.

Miranda, J.J. and Zaman, M.J. (2010) “Exporting Failure”: Why Research from Rich Countries may not benefit the Developing World. *Rev. Saude Publica.* **44:** (1): 185 - 189.

Mora F., Cone, S., Rodas, E., and Marrell, R.C. (2006) Telemedicine and electronic health information for clinical continuity in a mobile surgery. *World Journal of Surgery,* **30:** 1128-1134

Mulenberg-Buskens, I. (1996). Critical awareness in participatory research. In K. de Koning&M. Martin (Eds.), *Participatory research in health*. London

Murray, E., Treweek, S., Pope, C., MacFarlane, A., Banllini, L., Dowrick, C., Finch, T., Kennedy, K, Maire, F., O’Donnell, C., Ong, B.N., Rapley, T., Rogers, A. and May, C. (2010) Normalisation process theory: a framework for developing, evaluating and implementing complex interventions. *BMC Medicine.* **8:**63. (doi: 10.1186/1741-7015-8-63).

Murray E, Burns J, May C, Finch T, O'Donnell C, Wallace P, Mair F. (2011) Why is it difficult to implement e-health initiatives? A qualitative study. *Implementation Science.***6**:6.(doi: 10.1186/1748-5908-6-6))

Naylor, P., Wharf-Higgins, J., Blair, L., Green, L., & O’Connor, B. (2002). Evaluating the participatory process in a community-based heart health project. *Social Science and Medicine, 55*, 1173–1187

Newton, N.C. Andrews, G ., Teesson, M., Vogl, L.E. (2009) Delivering prevention for alcohol and cannabis using the internet: A cluster randomised controlled trial. *Preventive Medicine.* **48**(6), 579-584.

Nuffield Council on Bioethics (2002) *The ethics of research related healthcare in developing countries*. A Nuffield Council Publication.

Ohinmaa, A., Hailey and D., Roine (2001) Elements for assessment of Telemedicine Applications. *International Journal of Technology Assessment in Health Care.* **17 (**2): 190-202.

Paalman, M.(2004) *Macroeconomics and Health Nepal Situational Analysis*, WHO http://www.who.int/macrohealth/action/en/nepalsitanalysis.pdf Accessed: 29/08/2008

Pal, A., Mbarika, V.W.A., Cob-Payton, Fay, Datta, P., and McCoy Scott (2005) Telemedicine Diffusion in a Developing country: The case of India. *IEEE Transactions on Information Technology in Biomedical,* **9**(1): 59-65.

Perednia, D., and Allen, A. (1995) Telemedicine technology and clinical applications. *Journal of the American Medical Association,* **273**(6): 483-488.

Pesamma, L., Ebling, H., Kuusimaki, M.L., Winblad, I., Isohanni, M. and Moilanen, I. (2004) Videoconferencing in child and adolescent telepsychairtry: a systematic review of the literature. *Journal of telemedicine and telecare,* **10:** 187-192.

Pirisi, A (2000) Low health literacy prevents equal access to care. *The Lacent.* 356(9244):1828

Pope, C., Mays, N. (1995) Reaching the points other methods cannot reach: An introduction to qualitative methods in health and health service research. *British Medical Journal.* **311:** 42-45.

Pope, C. (2003) Resisting Evidence and the Epidemiological Imagination: A vital Relationship. *Health,* **7** (3): 267-282.

Pope, C., Ziebland, S., Mays,N.(2000) Qualitative research in health care: Analysing qualitative data. *British Medical Journal.* **320:** 114 -116.

Poudyal K. (2004) Health a casualty of Maoist attacks in Nepal. Kathmandu: One World Asia 2004. Available: http://southasia.oneworld.net/article/view/84604/1 Accessed on 23/ 07/06

Reason, P and Bradbury, H (2008, 2eds) *Action Research:Participative Inquiry and Practice.* Sage Publication, London

Rendon, A, Martinez, A., Dulcey, M.F., Seoane, J., Shoemaker, R.G., Villarroel, V., Lopez, D.M. and Simo, J.(2005) Rural Telemedicine Infrastructure and Services in the Department of Cauca, Colombia. *Telemedicine and e-health,* **11** (4): 451:459.

Rigby, M. (2002) Impact of telemedicine must be defined in developing countries. *BMJ.* 5: 324(7328): 47.

Roine, R., Ohinmaa, A., and Hailey, D. (2001) Assessing telemedicine: a systematic review of the literature. *CMAJ,* **165:** 765-771.

Rosser, C.J., Bell, R.L., Harnett, B., Rodas, E., Murayama, M., and Merrell, R (1999) Use of Mobile, Low-bandwith Telemedical Techniques for extreme Telemedicine Applications. *Journal of American College of Surgeon,* **189**(4): 397-404.

Russell, S (2004) The economic burden of illness for households in developing countries: A review of studies focusing on malaria, tuberculosis and human Immunodeficiency Virus/Aquired Immunodeficiency Syndrome. *American Journal of Tropical Medicine and Hygiene*, **7** Suppl. 2 (2004), pp. 147–155.

Rychetnik, L., Hawe, P., Waters, E., Barratt, A. and Frommer, M. (2004) A glossary for evidence based public health. *Journal of Epidemiology and Community Health,* **58:** 538-545.

Scott, R.E. (2007) Future proofing telehealth in developing countries. *Journal of Telemedicine and Telecare*, **13** (Suppl.3):70 - 72.

Scott, R.E., Ndumbe, P., Wooton, R. (2005) An e-health needs assessment of medical residents in Cameroon. *Journal of Telemedicine and Telecare,* **11**(Suppl.2): 78-80.

Sharma, S (2004) The Nepali state and the Maoist Insurgence, 1996 2001, in Hutt (Ed) *Himalayan People's War: Nepal's Maoist rebellion, 38-57.* Indiana University Press, Bloomington

Silverman, D. (2001*) Interpreting Qualitative data: Methods for Analysing Talk Tex and Interaction* (2nd Edition). Sage Publications. London.

Slak, W.V. (2001) *Cybermedicine: How computing empowers doctors and patients for better health care*. Jossey Bass Sans Francisco.

Smith A.C., Bensink, M., Armfield, .N, Stillman, J., Caffery, L. (2005) Telemedicine and rural health care applications. *Journal of Postgraduate Medicine,* **51**:286-293 A**vailable from:** http://www.jpgmonline.com/article.asp?issn Accessed on 20/07/08

Smith. S., Sinclair, D., Raine, R. and Reeves, B (2005) *Health Care Evaluation.* Open University Press, London.

Sozen, C., Kisa, A. and Kavuncubasi, S. (2003) Can rural Telemedicine help to solve the Health Care access problem in Turkey? *Clinical Research and regulatory Affairs,* **20**(1): 117-126

Spreitzer, G.M. (1996), Social structural characteristics of psychological empowerment. *Academy of Management Journal,* Vol. 39 No. 2, pp. 483-504.

Sproull, N.L. (2002 2nd Edition) *Handbook of Research Methods: a guide for practitioners and students in the social science.* Scarecrow Press, Inc. Kent.

Stanberry, B. (2000) Telemedicine: barriers and opportunities in the 21st century. *Journal of Internal Medicine.* **247:** 615-628.

Strasser R. (2003) Rural health around the world: challenges and solutions. *Family Practice*. **20:** 457-463.

Swallow, V., Newton, J., and Lottum C.V.(2003) How to manage and display qualitative data using 'Framework' and Microsoft Excel. *Journal of Clinical Nursing,* **12:** 610-612

Swinfen P., Swinfen R., Youngberry K., Wootton R. (2003) A review of the first year's experience with an automatic message-routing system for low-cost telemedicine. *Journal of Telemedicine Telecare*;**9**:63-5.

Swinfen, R. and Swinfen, P. (2002) Low-cost telemedicine in the developing countries. *Journal of Telemedicine and Telecare.* **8**(Suppl.3): 63-65.

Tewdwr-Jones,M. and Allmendiger, P. (1998) Deconstructive communicative Rationality: a critique of Habermansian collaborative planning. *Environment and Planning.* **30**, pp 1975-1989.

Taylor, P. (2006) *Evaluating telemedicine systems and services. .* In Wootton, R., Craig, J. and Patterson, V. (2006, 2nd Edition) *Introduction to Telemedicine.* (Edited), The Royal Society of Medicine Press Limited,London.

Thapa, B.K. (2003) Geographic Origin of Nepali Doctors. *Kathmandu University Medical Journal.* **2(**6): 152-156.

Thiede, M. (2005) Information and access to health care: is there a role for trust? *Social Science & Medicine.* 61: 1452-1462.

Thomas, K. W. and Velthouse, B.A. (1985), *Cognitive Elements of Empowerment,* Academy of

Thorogood, N. and Green, J.(1998) *Analysing Health Policy: a sociological Approach.* Longman, London.

Tolley, E. E., & Bentley, M. E. (1996). Training issues for the use of participatory research methods in health. In K. de Koning&M. Martin (Eds.), *Participatory research in health*. London

UNDP (2009) Millennium Development Goals:

available http://www.beta.undp.org/undp/en/home/mdgoverview.html, Access 4/ 7/2008

UNDP (2009) Nepal Developement Report 2009. Available http://www.undp.org.np/ Accessed on 20 / 04/2010

UNICEF (2006) Women health volunteers save children's lives in Nepal. Available athttp://www.unicef.org/infobycountry/nepal_35925.html
Accessed on 24/02/2009

Van Doorslaer, E. Masseria,C. and Koolman, X. (2006) Inequalities in access to medical care by income in developed countries. *Canadian Medical Association Journal.* 174 (2): 177-183.

Vassalo, D.J., Hoque, F., Farquharson, R.M., Patterson, V., Swinfen P, Swinfen R. (2001) An evaluation of the first year's experience with a low-cost telemedicine link in Bangladesh. *Journal of Telemedicine Telecare*,**7**:125-38.

Wagstaff, A. (2002) Poverty and health sector inequalities. *Bulletin of the World Health Organization*. **80**:97-105.

Whalley, J. (2006) Recent developments in the telecommunication industry of Nepal. *The journal of policy, regulation and strategy for telecommunications,* **8**(1) : 57-71.

Whalley, J. Lawn, J.E.; Tinker, A. deFransisco,, A. Chopra, M. Ruda, I. Bhutta, Z. Black R.E. (2008) Primary health care: making Alma-Ata a reality. *The Lacent.* **372 (9642):** 1001 – 1007.

Whitten, P.S., and Allen, A. (1996) Organizational Structure in Telemedicine programme.*Telemedicine Today,*4 pp 28-29.

Whitten, PS, Mair F,C, Haycox, A., May, C.R., Williams, T.L., Hellmich, S. (2002) Systematic review of cost effectiveness studies of telemedicine intervention. *British Medical Journal,* **324:** 1434-1437.

Whitten, P. and Adams, I (2003) Success and failure: a case study of two rural telemedicine projects. *Journal of Telemedicine and Telecare,* **9,** pp 125-129

Whitten, P. (2006) Telemedicine: communication Technologies That Revolutionize Health Services. *Generation.* Summer. 20-24.

Whitten, P., Holtz, B and Nguyen, L. (2010) Keys to a successful and sustainable telemedicine program. *International Journal of Technology Assessment in Health Care.***26:** 2, 211-216.

WHO (1987) Primary Health Care in the WHO Regions. *WHO Chronicles.* **32:** 431-438.

WHO (2005) Social Determinants of Health. Available http://www.who.int/social_determinants/en/ Access on 2/09/ 2010

WHO (2006) Nepal a country profile. Available at http://www.who.int/countries/npl/en/ Accessed on 20/06/06.

Willis-Shattuk, M. Bidwell P. Thomas, S. Wyness, L. Blaauw, D. and Ditlopo, P (2008) Motivation and retention of health workers in developing countries: a systematic review *BMC Health Services Research* 2008, **8:**247

Wimpenny, P. Gass, J.(2000) Interviewing in phenomenology and grounded theory: is there a difference? *Journal of Advance Nursing,***31(6**) 1485 – 1492.

Wonderling, D., Gruen, R. and Black, N (2005) *Introduction to Health Economics.* Open University Press, England.

Wootton R, Tahir MSM (2004) *Challenges in launching a Malaysian teleconsulting network.* In: Whitten P, Cook D, (2004 eds). Understanding Health Communications Technologies. San Francisco, CA: Jossey-Bass,

Wootton, R and Bonnardot, L. (2010) In what circumstances is telemedicine appropriate in the developing world? *Journal of the Royal Society of Medicine Short Reports.* **1**:37

Wootton, R. (1996) Telemedicine: a cautious welcome. *British Medical Journal.* **313:** 375-1377.

Wootton, R. (1997) The possible use of telemedicine in developing countries. *Journal of Telemedicine and Telecare,* **3:** 23-26.

Wootton, R. (1998) Telemedicine in the National Health Service. *Journal of the Royal Society of Medicine.* **91,** 614 – 621)

Wootton, R. (2001) Recent advances in telemedicine: a clinical review.*British Medical Journal,* **323:** 557-559.

World Bank (2006) Nepal: Telecommunications sector reform project. Available at http://www.worldbank.org.np/external/projects/main?pagePK=64283627&piPK=73230&theSitePK=223555&menuPK=286968&Projectid=P050671 accessed on 24/06/08

World Bank (2009) W*orld development indicators database.* Nepal Data File http://data.worldbank.org/country/nepal accessed on 24/06/2010

World Bank (2010) W*orld development indicators database.* Nepal Data File http://data.worldbank.org/country/nepal accessed on 24/06/2010

World Health Organisation (2006) Nepal a country profile. Available at http://www.who.int/countries/npl/en/ accessed on 20 / 07/ 2009

World Health Organization (1998) *A Health Telematics Policy (*Document DGO/98.1). Geneva: WHO.Available at http://whqlibdoc.who.int/hq/1998/WHO_DGO_98.1.pdf accessed on 20/07/2009

Wyatt J.C. and Liu J.L. (2002) Basic concepts in medical informatics. *Journal of Epidemiology Community Health* .**56**:808-812

Appendix 1 Formal letter from the hospital

DHULIKHEL HOSPITAL
KATHMANDU UNIVERSITY TEACHING HOSPITAL

August 20, 2007

TO WHOM IT MAY CONCERN

This is to mention that Dhulikhel Hospital Kathmandu University Teaching Hospital is willing to provide possible assistance (in allowing to use the existing facilities of the institution) for the Ph. D. research on *A Participatory Action Research Approach to Telemedicine: Supported Healthcare Delivery in Rural Nepal* of Mr. Tshering Lama of Northumbria University. We wish him success.

Prof. Dr. Ram K.M. Shrestha, MD,
Director
Dhulikhel Hosptial, Kathmandu University Teaching Hospital

GPO 11008, Kathmandu, Nepal
Tel : 00977 11 490497 Fax : 00977 11 490707
Email: dhos@mail.com.np

Appendix 2 Participant information sheet

PARTICIPANT INFORMATION SHEET

Telemedicine: A pilot project involving Dhulikhel Hospital and 3 Outreach Health Centres

My name is Tshering Lama. I am a Ph.D. Research student from Northumbria University Newcastle Upon Tyne in the UK. I am inviting you to take part in a joint project exploring the potential use of telemedicine to support and enhance primary healthcare in rural communities.

Before you decide to participate it's important for you to understand a little about the study and why you are being asked to become involved. This information sheet provides some important detail about the project. Please read the following carefully and if you have any questions you will be able to ask me when we meet.

What is telemedicine?

Telemedicine involves the use of telephones, mobile phones and computers to improve communication between health workers in rural areas and hospitals. It may involve diagnosis, treatment, consultation and education. For example: a village health worker might telephone a Doctor at Dhulikhel hospital to discuss a particular problem which she has with a patient at a local village Health post. A doctor then offers advice which may mean that patient can be helped at the time without involving difficult and lengthy journeys.

What is the purpose of the project?

Telemedicine holds the promise of improving access to health care, especially in remote areas. Though it looks promising, we want to explore how local people and hospital staff understand, accept and use telemedicine. The project involves talking to local village health workers, patients, families and hospital staff who are potential or current users of telemedicine.

Why am I being asked to take part?

You are being invited to participate because your village outreach health centre is being linked with Dhulikhel Hospital. Your views on the use of telemedicine, how acceptable you find it and whether it offers benefits to you and your community are important to the project workers.

What might I have to do?

During the year of the project you will be invited to take part in one or more of the following:

- Individual interview – this may last 30 – 45 minutes and will happen at a convenient place to you and with your permission will be tape recorded. You may be invited to be interviewed more than once.

- Group interview – this may last 30 - 45 minutes and may involve health workers and other village members. In some cases the groups may be all male or all female. The conversation with your permission will be tape recorded. You may be invited to take part more than one group interview.

- Complete a questionnaire: - this may take 15 minutes of your time. The questions explore your views, attitudes and possible use of telemedicine.

- Observation: - this will involve, with your permission photography or video recording of different events relating health issues within a telemedicine context.

- Health reports: - where a consultation takes place the information sent and received may be used in the project report. However, your name will be omitted from the final report.

The tapes will be stored securely and only the researcher will have access. The information recorded (Audio and Video) will be deleted at the end of the project. No participants' names will be used in the project report. Your permission will be required, before any photographs are used in the report,

What if I do not want to take part?

Agreeing to be part of the project is completely voluntary. If you decide not to take part your health care or job will not be affected in any way. If you do decide to take part you will be asked to give your consent (in a format suitable to you) before any activities take place. You will be invited to sign the consent form if you agree to take part. A copy of the signed consent form will be given to you. Even if you do take part, you can choose to leave the project at any time.

What will happen to the information collected?

All taped information will transcribed and translated into English (where necessary) by the researcher. Your views and opinions will be collated with other people's so that we collect a wide set of views and experiences of telemedicine. You will be given an opportunity to read and comment on these views during the project. The comments will play an important part in the implementation and monitoring of the use of telemedicine. Changes may be made to the way telemedicine is used as a result of your involvement.

Thank you for taking time to read this information and I hope you will be able to participate in this important project. Please do not hesitate to contact me or drop into the health post or hospital, if you require further information.

Our contact telephone numbers:

Tshering Lama	**Hospital (Dr Biraj)**	**Village health worker**
XXXX XXXX	**XXXXX XXXXXXX**	**xxx**

Appendix 3 Consent form

CONSENT FORM

Researcher (facilitator)
Tshering Lama

Name of the health post:

Name of the person doing the interview:

Name of the patient / carer / staff member:

(*delete as necessary*)

Please Tick

- I have had the study explained to me by …….. ☐
- I have read, or have read to me, the leaflets about the evaluation and I have had time to think about it and also had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐
- I agree to take part in a tape – recording / video- recording / participate in the focus group / interview by Tshering Lama or someone who works with him. (*delete as necessary)* ☐
- I understand that relevant sections of any of data collected during the study may be looked at by responsible research partners (team representing Dr from the hospital, health worker from the health posts, facilitator and village participants) in the research where it is relevant to my taking part in this research. I give permission for these individuals to have access to my records. ☐
- I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, without my medical care, job or legal rights being affected. ☐
- I have been given a copy of this Consent Form to keep. ☐
- I agree to participate in the above study. ☐

_____	_____	----------
Name of Patient	Date	Signature
_____	_____	----------
Name of Person taking consent (if different from researcher)	Date	Signature
_____	_____	----------
Researcher	Date	Signature

When completed, 1 participants and 1 for researcher site file (original).

Appendix 4 Survey

Survey

Attitude towards using telemedicine (phone and email to discuss about the patients) amongst Hospital staff and Village Health Workers.

Dear Participation,

I am, Tshering Lama, a PhD Research Student at Northumbria University in the UK and Dhulikhel Hospital jointly conducting this research on feasibility of Telemedicine in Nepal. We are asking if you would agree to take part in a research project which is to explore the acceptance, understandings, applicability and efficacy of the use of telemedicine to support healthcare (i.e. through healthcare assistants) services in rural Nepal, using participatory action research.

The research is being undertaken as part of my course and the information gathered will be put into action with high degree of participations of the service provider, service users and facilitator (researcher). All information that you provide is on an anonymous basis, and will be treated with confidentiality or otherwise state (**Please find more on about research on A Participant Information Sheet)**

I would appreciate your time and the completing of the following questionnaire about your views on the use of telemedicine.

The questionnaire should take about 10 minutes, and mostly a matter of ticking (√) boxes to indicate your opinion.

I would like to thank you in anticipating of your participation in this exercise.

Tshering Lama, MPH, BSc (HONS) Health Dev. Studies

PhD Research Student

Northumbria University

UK

Instructions:

[1] Please tick boxes like this 〕

[2] Please write in the boxes provided when asked to do so.

[3] Please ignore any questions that you don't wish to answer. Your remaining answers are still

[1] **INFORMATION ABOUT YOURSELF:**

[1.1] What was your last birthday? Please tick.

18 – 25	26 – 35	36- 45	Over 45

[1.2] Are you: Male □

Female □

[1.3] What is your ethnic group?

[1.3] Your Designated post

Medical Doctor □

(Please write in your speciality)

Outreach Clinic Staff □

(Please write in your designated post)

[2] **TELEMEDICINE**

Telemedicine can be defined as "medical practice at a distance". It encompasses as whole range of clinical activities including diagnosis, treatment, and clinical consultation and education carried out at a distance via a telecommunication network (Phone, Radio, Email or Video conferencing)

[2.1] Have you ever personally used any method of telecommunication to communicate about the patient or disease with doctors and experts within last one year?

Never □ (go to question 2.6) Once □

Between 2 – 5 occasions □ On more than 5 occasions □

[2.2] what cases or problems that needed communication most?

(Please write briefly to elaborate the case histories.)

[2.3] How many DIFFERENT TELEMEDICINE METHODS have you used?

Telephone □ Mobile □

Email □ Video Conferencing □

Telephone and Email □ Mobile and Email □

Radio communication □ All methods mentioned above □

Other (please write it down)

[2.4] Did you inform your patient that you were looking for advice or making consultation for expert opinion?

Yes □ No □

[2.5] How satisfied were you with the advice that you received? (Village Health Worker)

In the following question, [please tick] the box which comes closest to matching how you feel about YOUR MOST RECENT TELEMEDICINE CONSULTATIONS.

	Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
a) Telemedicine provided an effective treatment advice for my patient's condition					
b) Consulting using telemedicine methods were too expensive.					
c) Communication connection are were very poor and unreliable					
d) I felt at ease telling my colleagues, patients, family and friends that I was using Telemedicine for experts opinion (or second opinion)					
e) Doctors in the hospital adequately explained how to handle such case and how the patient should be treated					
f) Doctors from other end of the communication displayed a professional attitude					
g) It was easy to get a hold of doctors in the Hospital when needed					
The patients were satisfied with the consultation that involved telemedicine.					

Any further comments:

[2.6] Possibility of using phone and E-mail for consultations

In the following question, please tick ⟩ the box which comes closest to matching how you feel about things.

Questionnaire for Health Worker

1) I (am) would be happy to talk to Doctors on the phone about the patient.

Strongly Agree	Agree	No opinion	Disagree	Strongly Disagree

Any comments:

2) Patients (do not) would not like me to discuss about their case (diagnosis) with the Doctor over telephone.

Strongly Agree	Agree	No opinion	Disagree	Strongly Disagree

Any comments:

3) I (am) would be happy to communicate with Doctors through email about the patient.

Strongly Agree	Agree	No opinion	Disagree	Strongly Disagree

Any comments:

4) Patients (do not) would not like me to discuss about their case (diagnosis) with Doctor in email.

Strongly Agree	Agree	No opinion	Disagree	Strongly Disagree

Any comments:

[2.7] How important would the following be in influencing your views about Telemedicine.

In the following question, please tick 〕the box which comes closest to matching how you feel about things.

	No influence at all	Little Influence	Not Sure / Undecided	Some Influence	Strong Influence
[a] Recommendation from a friend or colleague					
[b] Published evidence about the effectiveness of treatments.					
[c] Recommended by the Hospital					
[d] Information from television, radio, newspapers or magazines.					
[e] Easy access to experts.					
(f) Availability of equipment and training					
[g] Oneself (due to circumstances)					
[h] Cost					

YOUR KNOWLEDGE ABOUT TELEMEDICINE

[2.8] How much do you know about the following mode of communication?

In the following question, please tick 〕the box which comes closest to matching how much you know about these methods of telemedicine.

	High level of knowledge	Fair level of knowledge	Little amount of knowledge	Familiar with Name Only.	No Knowledge Whatsoever
[a] Phone (including mobile).					
[b] Radio communication.					
[c]. Internet					

[d] Email.					
[e] Video Conferencing					

[2.9] How effective are Telemedicine in the treatment and consultation of the following conditions?

In the following question, please tick 〕the box which comes closest to matching your views.

	Negative Effect OR Potentially Harmful.	Marginal OR Nil Effect.	Don't Know	Some Beneficial Effect.	Highly Effective.
[a] Musculo-skeletal Disorders e.g. Muscle spasms, Arthritis, back pain.					
[b] Headaches / Migraine.					
[c] Skin Disorders.					
[d] Allergies.					
[e] Gastro-Intestinal problems.					
[f] Stress.					
[g] Cardio-Vascular diseases.					
[h] Respiratory problems.					
[I] Mental Health problems.					
[j] Neurological Cases					

Other Comments:

[2.10**] Your Beliefs About Telemedicine**.

In the following question, please tick 〕 the box which comes closest to matching how you feel about things.

	Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree.
[a] Telemedicine is effective in delivering health care in remote part of Nepal					
[b] Telemedicine is effective ONLY when used in a system of follow up by doctors to confirm the diagnosis made over the telemedicine were right.					
[c] Telemedicine should be offered by the Hospital.					
[d] Telemedicine will provide important forms of treatment in the future.					
[e] Health professionals should be suitably qualified to operate technologies and advise about health problems.					
[f] Telemedicine system can save time, money and life in the remote areas.					
[g] I would feel confident in using telemedicine consultation and treatments for myself					
[h] I would take my child for telemedicine for early diagnosis of disease and medical treatment.					
[I] Village Health care workers are the best candidates to communicate with Doctors on behalf of the Patient					

This is an early phase of the research however it requires in depth understanding and high participation from all the stakeholders. Therefore **would you like to get involved in the focus groups, interviews and group discussions in the future?**

Yes **No** **I will inform you later**

If **YES** or might participate in the future, we would appreciate if you leave us which your contact detail.

Thank-you for completing this questionnaire.

Appendix 5 Interview Schedule:

A semi-structured interview schedule was used to guide the interview

Some of the villagers may have journeys of more than four hours to get to the health centres. In Nepali culture people are generally very willing to talk about their lives, their children and their work and often the health issues emerge spontaneously. Often villagers come with members of their families and friends and conversation can take convoluted pathways. Villagers attending the health centre will inevitably talk about the project when they return home. Where appropriate (where there are personal concerns for example), villagers, health workers and hospital staff will be interviewed separately.

Interviews with Villagers (Individual or Group as this cannot be predicted in the remote centres)

Topics:

General Health and Wellbeing discussion – Ice breaking question for example

"Where are you from?", "What is your job?", "How far have you had to travel to reach here?" "What was the journey like?" "How much did you have to pay for the transport?" "Who is taking care of your children/ animal/ elderly / work while you are here?" "Have you ever used a telephone, what was it for?"

More specific: "Why have you come to the health centre today?", "Have you spoken to the health worker?", "Did the health worker use the telephone?", "Did the health worker use a camera to take photographs?" "What did you think about that?" "Are you happy / satisfied with this visit?" "Do you have any question about the health centre?" "Do you think the health care is changing?"

Interviews with health workers (Individual and group depending on circumstances)

Topics:

General aspects: "How did you come to be working here?" " Were there any difficulties securing this job?", " Is your family happy you are working away from home?" "How do you communicate with your family?", " How often do you see members of your family and friends?" " Are you happy working here?" " What are the specific challenges for you?"

More specific: "Do you feel prepared for working in the health centre?" "Do you feel supported working in a remote centre?" "How often have you used telephone connection to the hospital?", "Did you find the discussion / advice useful, effective, timely etc?" "Do you find the hospital staff understand the health centre's need?", "What are the different reasons for using the telephone?" "Do you think an internet connection would be helpful to your work?" "If so how and in what way?" " Do you

think the new technology is helping to improve healthcare for the community?" "Do you have any training needs for using the technology?" " How else do you think the technology could be used?"

Interviews with hospital staff (Individual or group depending on circumstances)

Topics:

General aspects: "How long have you been working here?", "Where do you come from?" "What is your speciality?", "Have you been involved in any discussion on telemedicine?", "Have you used technology in consulting about your patients with others?", "Have you ever taken a call from outreach centres?", "How many calls?"

More specific: "Can you tell me about the call you have taken from the outreach centre?" "Could you hear clearly / understand what the health worker is saying?", "Were you able to respond at the time or did you have to seek additional information?" "Did you feel comfortable giving advice over the telephone?", "Have you had to advise transfer to the hospital?", "How was this arranged?" What was the outcome?", "Do you have any concerns about the use of the telemedicine?"

Appendix 6 Example of transcribed and translated interview

- Introduction
- Reconfirmed orally: Dr read Participants information sheet and signed consent form
- Researcher thanked for the taking part in this interview

Me: How long you have been working here in the hospital?

I have been in this job for last five years and I don't know about the future but I have worked here since **1 year back**

Me: where you come from?

Janakpur, terai part of Nepal and living in Kathmandu and working in Dhulikhel

Me: How you manage to adjust in DH and KTM as coming from Terai?

I completed my school from Janakpur and started my higher studies in Kathmandu and its been 20 years so Im used to the environment (ktm) and there days there isn't much difference either climate wise.

Me: Speciality?

Dermatologist and Post Grade from India

Me: Any Involvement in Telemedicine?

Not yet but I have taken participated in lecture in Telemedicine but not in teledermatology

Me: Have you ever done consultation using technology?

Yes, recently Tshering Lama (researcher) brought Photograph from outreach and we made diagnosis and accordingly we advice and the patient been treated. I do encourage my patient to send good quality of photographs (email) and I will send my advice.

Me: Have you receive any call from outreach centers regarding dermatology?

Not just telephone call but have received call with photograph and I have give them advice what to do.

Me: How many call you have received so far?

Recently there wasn't much call but I did get call from Dhading and Bahunipati. Those outreach staff who been with me for a week for training usually call me and they know

what need to be done and I know what is mode of treatment they require and treat in the oureach centers. They can call me anytime – day and night I am happy to help them.

Me: Do you understand what outreach staffs explaining to you?

Dermotologist are blind if there is no photographs .Photographs is very important in the field of dermatology and its difficult to understand what outreach staff talking about without photograph. But with photograph and phone it is very clear. Picture can tell thousand words so picture is very important. And picture with history would be very good but in many cases we can illustrate history by looking the picture .

Me: How was the quality of pictures?

Some of them are very good but most of them are not good quality. like not very clear and you cannot make out whether it is raised abrasion or flat lesion or scaly. Out reach staff should know how to take picture and in what pixel and distance. And how to send good quality of photograph picture through email too.

Me: Did you ever consult with any other specialists regarding cases?

I haven't consulted with anyone yet as I am alone here. If I have got access to the patient over the phone to take history and with picture I can make diagnosis and many time got positive response.

Me: Do you feel comfortable giving advice just looking at the picture?

Simply looking at the picture hard to justify and we need to have history. Only photograph is not sufficient so phone conversation is equally important. Progression of diseases and so on. Sometime even with photograph and phone call its difficult to make decision so I ask them to send the patient. First send the photograph with detail history and can be follow up phone. Again if I am not able to make diagnosis I will ask them to send the patient for further management.

Me: have you got any concern regarding Telemedicine ?

Gov data, dermatology is the highest incidence and highest peak of the disease in Nepal. Because of ignorance and dermatological disease patterns is differ according to the topography of the country – terai, hilly and mountain region. Sun allergy photo dermatitis related to sun light –dry skin and infected disorder scabies, pediclosis - due to lack of water, unhygienic skin , part secondary bacteria infection – terai region – fungal infection due to high humidity, sweat and even certain group of people who are working

in India and gulf countries - they have STIs and HIV too and STIs are part of skin disorder too. Those condition can be diagnosis with photographs. So in the future teledarmatology in Nepal will be one the best services for the people who are living far from the cities where there is no doctor or dermatology but there is some limitation to teledarmatology incase of some skin procedure or surgery we have to ask patients to the centre. But most of the dermatology cases can be seen through telemedicine.

Me: Do you think telemedicine could reduce stigmatization of STI and HIV Patients to come forward?

There are couples of project such as late night TV shows

Success of TD – good quality of photograph, trained staff (outreach centre) and dermatologists in the hospital should know how to identify the picture and how to download the picture, how much you can rely on the history- these are things we can discuss together and share skills and create team work on teledermatolgoy. Training should be similar for dermatologist and outreach staff so they can interact each other and create working environment and feel free to call anytime. Training for dermatologist and outreach staff should be similar and at the same setting so they can interact each other.

Me: How important is to know each other – between outreach staff and dermatologists?

It is very very important, if I don't know who the person I am referring and consulting with, I am very much reluctant for patient to refer. That's my personal view. First one is recognition who is dermatologist, how is he treating, is he treating properly, identification, introduction of person referring to and with. Its all part of interactive programme and also what everyone have learnt from the basic course. Medical knowledge is changing and they should be updated regular basis on typical diseases.

Me: Any thought on Tele education on Dermatology?

We train physically and sending photographs and diagnosis would help them to understand which case need to refer and which do not require. They know their limitation. The first thing is medical personnel should know their limitations.

I shouldn't limit where we are and we should go beyond where unreachable .

Appendix 7 Workshop Report

Success and Failures of Telemedicine in Nepal

21/11/ 07

Kathmandu

Introduction:

Over the last 20 years an extraordinary number of articles have been written about telemedicine in developed countries. There are editorials, commentaries, reviews, case reports, conference proceedings and accounts of technical innovation, experiments and assessments. Many research articles and international health organisations advocate “telemedicine” as the only way to achieve health for all and provide modern medical service to underprivileged and rural populations in developing countries.

Telemedicine may in fact have profound impact on rural areas of developing countries like Nepal than on developed ones. For people living in rural areas, the distance to main metropolitan centres often places restrictions on access to essential health care services, including specialist healthcare. In other word, telemedicine is the delivery of health care services to the underserved (urban and rural) through communication technology and has the potential to bring medical care to remote areas where healthcare either inadequate or nonexistent.

Telemedicine’s applications have been encouraging for many developing countries due to the widespread use of cheaper more user-friendly telecommunication equipments such as personal computers, internet access, satellites, videoconferencing, and telephone among others. Despite suggestions that telemedicine will offer hope in developing countries there is only limited published evidence to support this claim but it certainly has attracted many health care providers, Government, NGOs and INGOs and even researchers and communication service providers to invest their time and money. However, there are evidences around the world (especially in the developing countries) that telemedicine pilot projects fail after their first year of services.

This paper is a conferences proceeding of “**Successes and Failures of Telemedicine in Nepal**” which was held on 21st November, 2007 in Kathmandu.

Nepal is one of the poorest countries in the world and relatively small with a population of 24.2 million in which the majority (86%) live in rural areas of the country (WHO 2006). The physical barriers posed by the country’s rugged terrain, lack of modern transportation and communication and health facilities; and economic hardship for the majority in rural areas, are

challenges which compound the difficulties of seeking healthcare. These challenges are further tested by an acute shortage of Doctors, Nurses and Hospital per capita in the country: 1:18,439, Doctors, 1:4,987 Nurses and one hospital bed for 2,349 people. Despite the overall shortage, the majority of the health professionals and best equipped hospitals are based in the capital and other major cities. These resources are not accessible for the majority of the population who live in rural areas.

Therefore the rural population is more vulnerable than its urban counterpart mainly due to: **late discovery of an ailment, transport time to urban based healthcare facilities and inexperienced primary health-care provider with high workloads in rural areas.** Health workers (who serve most of the population) are isolated from specialist support and up-to-date information. Due to the recent advent increase in availability of Information Communication Technology (ICT), telemedicine has opened up the potential to address the above concerns, to serve the rural population and contribute to wider community development. Furthermore, the telemedicine system can be seen as an ethical and sustainable intervention as it allows the delivery of healthcare to under-served people in places where, previously, services were either inadequate or non-existent.

Due to wider claims are made for the higher benefits of telemedicine for rural settings in developing country like Nepal, it has stimulated the interest of the government, private hospitals and NGOs in Nepal. A number of rural hospitals and villages in Nepal are already linked with urban based hospitals and specialists, and some with foreign hospitals and specialists and many are on their way to implementing these links, including the government (Figure 1). Despite several attempts and planning to implement the system, it is found that there is no comprehensive study on needs analysis and in Nepal to date, apart from one at Dhulikhel Hospital. The hospital has teamed up with Tshering Lama, a PhD research student, to conduct a comprehensive research on "**A Participatory Action Research approach to Telemedicine: Supported Healthcare Delivery in Rural Nepal",** which is due to complete in 2010.

As many institutions and people in Nepal are involved and many are interested in adopting Telemedicine to deliver health care in the remote areas, it was certainly a worthwhile idea to bring everyone together and hold an interactive workshop on Telemedicine. Therefore, the date was fixed for 21st November 2007 and invitation to the workshop was sent a selected group of professional – from both health care and information communication technology (ICT fields to share and discuss their experiences of telemedicine in Nepal.

The main objectives of the workshops were to **1) to learn from the experience of others in the field and 2) identify and discuss issues critical to successful TM developing in Nepal**. In order to meet the objective, the organizer requested the atmosphere of open and honest sharing furthermore; a certain number of participants were asked to present their experience in the field

(table 1). The organizer asked selected participants to submit written summaries of their TM project (Appendix 1).

The workshop was organized by the Nick Simon Institute and coordinated by Tshering Lama (PhD Research Student on Telemedicine). Professor Richard Wootton, a world-renowned expert in Telemedicine from the University of Queensland was the main speaker for the workshop.

"**Success and Failures of Telemedicine in Nepal" a one-day workshop, 21st November, 2007.**

The Nick Simons Institute organized the first ever Telemedicine workshop to discuss the development of telemedicine in Nepal. Tshering Lama was the workshop coordinator for a diverse group – a mix of medical and information technology (ICT) professionals from NGOs, government, and private organizations.

The workshop started with introduction of all the participants and followed by the Professor Wootton's presentation on "Telemedicine in Developing Countries". The workshop was divided in two distinctive parts: a) **Telemedicine in Nepal** (*oral presentation from the selected participants – who already involved in Telemedicine project and who are in the planning phase)* and b) **Discussion on latest development in the field of Information Communication Technologies.**

Professor Wootton defined telemedicine as "medicine at a distance", and outlined the areas where it has worked and where it has failed around the world. Although telemedicine has much public appeal, in fact the evidence for its benefits is more limited. The challenge is to construct a system that encourages the doctors and health care workers to send consultations or to obtain medical education at a distance. In some cases around the world, systems are set up with much publicity; do well for a year or two, and then decline (Professor Wotton's presentation attached – appendix 2)

Hospital	Type of TM	Date Started	From	To	Specialities	Cases in 6/12 mnth	Funding
Government	Email and Video conferencing V-sat.	Planned	18 District Hospitals	Specialists	Various	0	Ministry of Health
NSI	Email	2000	Mission Hospital	International	Various	20	Charitable
Nyaya Health	Email	Planned	Health centre	Hospital		0	NGO
Patan	Email	2001	Hospital	International	Ortho	1	Charitable

							Hospital
STM telecom	Satellite broadband	Recently	Villages	Hospital		Low	private
PHASE	Telephone cdma	2006	Health post	Specialist	Obs Paed GP	10	NGO
Kathmandu Model Hospital	Email wire less	Planned	Health posts	Hospital	Various	0	Hospital
OM Hospital	Email and Video conferencing	2004	Hospital	Apollo hospital	Various	11/9	Hospital / private
Dhulikhel Hospital	Telephone CDMA	Oct 2007	Health Posts	Hospital	Med, Derma	10	Research

Table: List of participants who presented a summary of their Telemedicine Project.

Discussion on latest development in the filed of Information Communication Technologies

Deputy managing Director of Nepal Telecom highlighted on CDMA both fixed and mobile coverage in Nepal. The CDMA network is already available in around 70 districts in Nepal both rural and urban and in near future, Nepal Telecom intends to cover 75 District Head Quarters and 3914 VDC (Village Development Committee). In terms of cost, it is cheapest and more widely available compared to other service provider. However, cost issues were challenged by participants from STM Telecom, the company who are licenses for rural V -SAT for Nepal and currently started Telemedicine service from villages to BPK Institute to Health Science, able to provide in cheaper rate then Nepal Telecom but this reduced cost is only applicable if the Nepal Telecom waive their licensing fee.

Other ICT companies like I4 Technology, Wireless Nepal, ComproComputers, and Kathmandu Engineering College participated in the workshop and shared their ideas and experiences of telemedicine. I4Technology provides satellite services in Nepal and suggested in using satellite technologies and connection only when there is nothing else is available as mode of communication. Managing Director of the company further offered a cheapest rate as possible (*probably one the cheapest rate possibly get in the world*) for those who want to use the service in the field of Telemedicine. Participants from Wireless Nepal, stress on why WIFI very suitable for connecting rural areas of Nepal and latest development in wireless in Nepal.

The interactive workshop managed to attracted a very interesting pool of people including leaders from the Health Ministry, Nepal Telecom, Model Hospital, Patan Hospital, Dhulikhel Hospital, Om Hospital, Nyaya Health, Nick Simons Institute, and a number of ICT providers. The group shared various efforts that are just now beginning in Nepal to link rural areas to higher centres of medical care. These include the government's new plan to provide telemedicine to 18 districts in the immediate future. The workshop concluded that all efforts in this regard should be undertaken after careful study, piloting of systems and a realization that telemedicine must go hand-in-hand with other efforts to build up rural health care systems.

Participants

Presented a summary of Telemedicine Project they are involved

- Dr. Saroj Dhital / Mahabir Pun (Kathmandu Model Hospital)

- Dr. Biraj / Tshering Lama (Dulikhel Hospital) CMA Bal Krishna Gautam (Dulikhel Hospital Outreach Centre)

- Dr. Mark Z (NSI, Mission Hospitals)

- Macha Bhai Shakya and Dr. Rajesh Gongal (Patan Hospital)

- Dr. Mingma Sherpa (Minstry of Health and Population)

- Dr. Greta Pohl (PHASE Nepal)

- BPKIHS / STM (Shiva Prasad Adhikari)

- Mr. Saroj Dahal (Om Hospital)

- Dr Duncan Maru (Nyaya Health)

Non-Presenting

- Lochan Lal Amatya (NTC)

- Craig Drown (Sustainable Solution.)

- Muni Shakya (High Tech Pioneer)

- Er Anil Piya (I4T)

- Er Ramesh Shrestha, Lecturer (Kathmandu Engineering College)

- Pramanananda Dev (Compro Computers)

INVITATION LATTER AND PRESENTATION TEMPLATE

13 November 2007

Regarding: **Invitation to Workshop**

"Successes and Failures of Telemedicine"

Dear sir,

With this letter, we'd like to invite you to participate in an interactive workshop on Telemedicine, scheduled for Wednesday 21 November. This will be an opportunity for a select group of professionals – from both health care and information communication technology (ICT) fields – to share and discuss their experiences of telemedicine in Nepal.

Professor Richard Wootton, a world-renowned expert in telemedicine will be leading this workshop and will compare his experiences around the world with the emerging field in Nepal.

The objectives of this workshop are (1) to learn from the experiences of others in the field, and (2) to identify and discuss issues critical to successful TM development in Nepal. In order to meet this objective, the organizers will be seeking an atmosphere of open, honest sharing. Towards that end the group will be limited in size and only those active in the field will be invited.

Date: **Wednesday 21 November 2007**

Time: **9:30AM – 3:00PM**

Venue: **Dhokaima Cafe, Patan Dhoka (Contact No :5553767)**

If you are interested in participating in this workshop, please contact Mrs. Rabina Shakya at the NSI Office (nsi@nsi.edu.np) by 18 November.

A certain number of workshop participants will be asked to present their experience in this field. **Presenters only** will receive with this letter a questionnaire template for their presentation:

-- Presentation will be oral, with no power point or overheads.
-- Presentation will be limited to 5 minutes.
-- Submit presentation template sheet (attached here) by 18 November.

We hope to see you at the workshop.

Sincerely,

Mark Zimmerman, MD
Executive Director

Tshering Lama
Workshop Cordinator

PRESENTATION TEMPLATE

Your presentation will be limited to 5 minutes.

Oral presentation, with no LCD or overhead.

Fill in the attached form before the conference and submit to NSI by Nov. 18 (nsi@nsi.edu.np).

(1) ORGANIZATION Name

Presenter Name

(2) DESCRIPTION OF YOUR TELEMEDICINE PROJECT (or planned project)

(Location/History/Linking Institutions)

Methods used-

(email/web/fax/phone/other. Any video - real-time or pre-recorded video clips?)

Telecommunications medium

(ordinary telephone network/digital line/satellite/other)

CONT'd →

(3) Briefly describe your telemedicine project's SUCCESSES.

(4) Briefly describe your telemedicine project's FAILURES.

(5) What outstanding questions do you have about further developing your telemedicine project?

Kathmandu, Nepal

21 November 2007

Meeting Schedule

9:30	Tea	
10:00	Welcome and Program Introduction	- Mark Zimmerman
10:15	Telemedicine workshops in perspective	- Richard Wootton
10:20	Telemedicine around the world	- Richard Wootton
10:50	Sharing of experiences in TM in Nepal	- 8 presenters x 5 min
12:00	Lunch	
1:00	Focused discussion of issues	
3:00	Closing	

Photos:

Professor Richard Wootton

Workshop Participants

Group picture: Participants with Prof Wootton


Dinner at Bhojan Griha: Dr Mingma Sherpa, Prof. Wootton and Tshering

Appendix 8 Taking a service to the people – a personal account of a Remote Surgery camp

27 September 2007

Visiting remote areas of Nepal, especially remote and rural mountain areas has always have been my passion. My deep affection and love towards remote and rural areas could be due being born and brought up in a remote mountainous region. This Surgery Health Camp was just after a 10 day long trek with my advisor Dr Victor and Dr Jane Patterson around Helambu, the place where I spent my early childhood. Despite just recovering from a recent trek to Helambu, I was thrilled to join the Surgery Health Camp team for Bolde Phediche of Kavre District as this health centre might be one of my project sites for the telemedicine project.

I left home early in the morning to catch the Dhulikhel Hospital's staff Bus to the hospital. This is how I travelled everyday to the hospital with the staff from Kathmandu. I enjoyed taking an hour long bus trips to and from the hospital everyday and join the hospital daily morning meetings. However, the morning meeting was cancelled on the day due to the health camp.

Once I arrived at the hospital, I saw everyone was getting ready for the trip and we all cramped into two 4 Wheel Drive Toyota people career (*quite frequently one of the cars is used for transporting patients but on the day it was specially carrying health care professionals)* including me. It was certainly a huge medical team: two surgeons, a cardiologist, an anaesthetist, a community medical doctor, three medical officers, two Gynaecologists (one German), nurses and paramedics. Amongst the team, I only knew few of them at the time, which includes **Dr Ram Kantha Makaju Shrestha** (Director of Dhulikhel Hospital), **Dr Rajendra Koju** (Chief Executive Director) and **Dr Biraj Karmacharya** (a community health programme coordinator).

I introduced myself to the team but was quite anxious about being an only non-medic in the group. As the journey began, a very interesting discussion broke in the group – from health care challenges to current political crisis of the country. We even managed to discuss how national resources has been misused by the government with an example of government supporting a "grand Yoga Camp" providing security of Yogic teachers where at the same time more than 100 civilian people been killed in the southern part of Nepal due to lack of security. Despite the discussion on the entire current affairs, some in the

group did manage to crack jokes and the vehicle was filled with laughter. The ambulance journey certainly wan a memorable one.

Getting there…

There are several routes you can take to reach Bolde; for example, walking along the Sunkoshi River bank from Dolalghat, driving via either Palanchowk or Pokhari Narayansthan and driving along the bank of Hokse Doban. However, due to torrential rain for couple of days before our departure, many roads were washed away and unsafe to drive, so we took Hokse Doban route. Despite being the better route amongst rest, road was very muddy and bumpy, many places you could see fresh landslides and some of them still in active stages – rocks and soil sliding down towards a roaring river below. The driver drove us up to where road still existed as we drove along, in many places we simply held on to our breath and had our eyes shut. Finally, our motor road came to end due to huge landslide. Here we stopped our vehicle, almost 300 meters of road was completely washed away. Before making an attempt to walk through the little path *(where only your feet can fit in)* we took a short rest and had our picnic lunch.

Indeed crossing an active landslide road (*now left with a small trail to place just your feet*) was a daunting thought for all. However, we managed to cross with a great fear by crawling through unstable stones and muddy caused by landslide. This was just a beginning of our trek to health centre. Our treks involved walking ups and downs the hill, using suspension bridges in order to cross the rivers, walking through lovely villages, corn and paddy fields, rocky and slippery trails, through the deep remote jungles and fighting through heat and rain for 6-7 hour until we reached our destination on the top of the hill.

At a one point, I thought myself, is it worth taking doctors who are well trained and qualified to the remote area through such a rough terrain risking their lives to treat some basic diseases which are mostly preventable with basic preventive measures. On the other hand, this was certainly a great educational trek for health professionals who are mostly born, brought up and educated in the towns. It enabled them to understand and appreciate the suffering that the patients, they see in the hospital beds had to go through before arriving in the hospital. For the very same reason many patients (who lack of good transportation system), wait to seek health care and often loose their lives when they are rushed to the hospital. Due to these challenges, of both having access to doctors and

patients on time, telemedicine could provide a very effective solution where people face of challenges of transporting patients or health care professionals.

As we started our trek through the valley with our own bag packs *(I had two bags – one carrying at back another one hanging in the front with my laptop and telephone equipment)* I tried to walk with as many as individual as possible as it would give me a great opportunity to get to know team members better. While walking we have more time to talk about ourselves. But this varied on how fast an individual walked to accompany them. Sometimes I was with a fast walker, sometime with slow one, for some, they were happy to stay in their group and it was hard to get involved in their conversation and many times walked alone humming and whistling through the hill trail. While walking with someone from the team, it was a fantastic opportunity to get to know each other through sharing stories and experiences and even talking about my own project telemedicine.

We passed through several green lush valleys, climbed several hills which was above the cloud and climbed down again, walked through some amazing beautiful villages and stopped by to chated with locals as we walked through. We found a very mixed-reaction from the people, many simply came and chat with us and others hesitated. Those who came, they simply asked us, full of curiosity who we were and where we going and so on. Our huge group might have intimidated many villagers due the civil war that lasted for more than 10 years and many suffered from threat and extortions (theft) of their food and properties in the remote villages. But when we introduced ourselves, that we were health personnel and were trekking for a surgery camp next day in Bolde, many took a breath of relief and started conversation with more normality.

I asked many people regarding current political situation, many simply didn't want to talk about it and some had a strong opinion against political leaders and parties for ignoring villagers once they have been elected. I did ask one of the farmers who was taking a rest on the edge of his field, how the life had changed since democracy first introduced to the country? He gave me very simple and thoughtful answer "nothing has changed, my grandfather ploughed this field with a wooden plough, my father did and I am doing it same and my son will follow the same too." This was clear indication of how people had understood the meaning of democracy in the remote areas due to ignorance of corrupt politicians who, once elected from that kind of place, now enjoy the luxury lifestyle in the town. Utilization of freedom and democracy of the country has been only for those few

who live in the cities but for rest of the remote population, they still carry these fears grown through 10 years of civil war and intimidation from political party workers.

We arrived at our destination after a wonderful trek of 4-7 hours; however this walk was challenging for many health care professionals who had never have done this kind of trek before. I saw a sense of achievement with some members of a team, relief and enjoying the country side of Bolde Phediche. The health care staff at the outreach centre and the community had put up a great feast for the team. That was a luxury meal after a hard walk, locally produced organic food, vegetables and meat. Despite all the hard walk and tiredness, I saw the team spirit amongst the group boosted as well as the energy after a great feast and hot shower (water heated by the solar energy). Many team members gathered near the *Stupa* (MaNe) and started singing songs and dancing in the moonlight. Around midnight we all headed to our tents. This was certainly a mini adventurous holiday so far.

Bolde Phediche Health Centre:

Bolde Phediche a small village situated in Northeast of Kavre District almost boarder to Ramechhap district. It is beautifully located in the slope of the hill and the inhabitants are mainly "Tamang" ethnic group and followed by few household Newars, Kamis , Brahamins and Jogis. The majority of the people are into subsistence farming. Bolde Phediche Health Centre was built with a help of German donors and is now managed by Dhulikhel Hospital as one of the 8 outreach centres of the hospital in 2007. The health centre serves people of Bolde and several other neighbouring villages such as Kartike Deurali (4 hours walking distance), Birta Deurali (2 and half hours walking distance), Narayanthan (two hours vertical distance) and several other little villages.

Like other health centres of the hospital, Bolde Phediche health care centre provides 24 hours primary health care service, basic laboratory test facilities, family planning, minor surgery, health education and health camps for the local community. The centre is staffed by 1 CMA, 1 ANM and 1 Helper and all are native people of Bolde and one medical officer routinely visits the health centres fortnightly. The daily patient flow is around 10 to 15 patients per day.

The village is connected by the earthen road (*neither gravelled nor black topped)* and only one bus service runs a day in winter connecting the village and the cities. The road is only open 3-4 months during winter, summer and rainy season the road is disrupted by

landslides. It was almost autumn when we were there for the surgery camp but still we had to walk more than half of the way to Bolde.

Bolde Surgery Health Camp:

People start queuing up from early in the morning. Many knew about the leaflets that were distributed around the villages, oral messages and through "*an emergency light*" that turned on the previous night. This is a special way of communicating to villagers who are illiterate and gave the assurance of Doctors and health care team have arrived in the health centre and there is definitely going to be a health camp or medical doctor visit. When I saw, that an amazing little apparatus which flashes an emergency light sends message to thousands of people living in the area, it simply wowed me. This saves unnecessary travelling for many villagers who have to travel more than 4 hours, prevents patients from disappointment having to return home without being seen by doctors when the doctors not able to reach the health centres due to several obstructions on the way. It is simply a great way of sending a message which could be seen by many people who reside around the village.

Young village volunteers were helping villagers with registration, giving them direction for examination by doctors, surgeons were busy operating, the dentist busy pulling out decayed teeth of old poor people *(some even came giving local aesthetic treatment – drinking homemade alcohol)*, Gynaecologists, medical officers, almost everybody was really busy. Due to limited space inside in the outreach centres, many patients were given post-operative care in the field nearby using locally available sticks to hold drips and intravenous medicines. Their carers used umbrellas to give shade until they fully woke up from unconsciousness (post operative). However, everything was used very efficiently to give care at the local level for the local people.

I was very pleased to experience, a mutual understanding between doctors and patients – patients were very appreciative about how far Doctors had to travel to examine and treat them and Doctors were completely aware how far and with what difficulty they had to travel to get to the health centres. By the end of the day – from 7 am till 3pm, 138 patients were seen by medical team who were examined, treated and referred to the hospital if they required further tests and treatment.

Amongst 138 patients, 54 were male and 84 were female, with age ranging from a 3 years old child to 86 years old elderly. Out of 138, 27 had a dental treatment including

extraction of teeth, 12 had successful Hernia Operation by two surgeons and the rest handled by medical doctors and other paramedics. All the operating and other medical equipments were powered by Solar Energy.

Over all it was a very successful, surgery camp.

What did I do?.

I was a bit of waste of space for the camp as I couldn't get involved with treating patients but helped lifting patients after operation and most of the time I spent on two things: a) **testing telephone phone connections of different networks and service providers** and b) **talking with patients and patient parties both formally and informally for my project.**

Testing telephone connection: I did manage to get signal for my CDMA phone, but it was very poor and had to go around the building to find the signal. Inside the building of the outreach centre, there was no signal available at all. However, having a very week signal for the CDMA mobile phone, it gave me assurance that it could be boosted up with using Patch Antenna: a signal booster.

Talking with villagers:

It was certainly was a highlight of my day listening to the patients and their carers regarding how far they travelled; how they came to know about the health centres; and did they receive the services what the expected from the health centre and at the health camp. Besides talking with patients, I was introduced to a couple of well known champions amongst the villagers and it was certainly a great opportunity for me to understand what the real needs for the village and what they have already done by themselves.

While talking to patients and carers they told me how much they appreciated the hospital putting up a surgery health camp at the centre and being able to get best treatment at home. They didn't have to travel long distances which saved them both time and money. One of the patients told me that, including bus fare and living expense while in the hospital it is not worth even thinking about going to hospital without having minimum of Rs 2000 to 3000 (Nepalese rupees around £ 20 -30 GBP). Despite all the positive and complementary feedback, there were some complaints too. There were group of patients mumbling around and I went to them ask if they were fine, they thought that the health

camp was completely free of charge and came without any money. It was bit of a pain and they felt misled when they came to know that there was a little cost involved after travelling for 3 hours. The cost was for medications, little amount towards surgery and other medical procedures though it was nothing compared to the cost if they had to go to the city but it wasn't wise for them spend another six hours to go and return back with money. Having said that, even the medical team felt that it was not fair for them to be sent home without any treatment after travelling for 3 hours so they were given free treatment including surgery.

Furthermore, despite the busy schedule, I had a very brief interview with the local health worker Mr **Chandra Lama.** He completed his Community Medical Assistant training in 1999 and since then he has been working in the village. He told me that he is very lucky to be able to help his fellow villagers with his knowledge and expertise however due to lack further training and required information on different diseases he sometimes fell really frustrated. He has done tele consultation with Doctors in the hospital however just one or two due to the very poor signal of mobile phone in the village. He strongly believes that patients would be more than happy for him to consult with Doctors regarding their illness and he is willing to learn how to use a computer in near future both for professional and personal reasons.

Way back!

After a late lunch, we made our descent journey towards our vehicle where we left it on the previous day. Before being fully recovered from previous days trek and the long shift since morning till 2:30 pm non-stop involvement with the camp, the team pulled themselves together for another 3-4 hours tough trek.

On our way back, I accompanied **Dr Ram**. We had a wonderful conversation where he shared with me his experiences of being a medical student in Austria, starting Dhulikhel Hospital from scratch and his PhD in surgery, his vision for the hospital and even his personal and his family life. I was honoured to be with him and listen to his wisdom. I have a learnt a great deal from his experience on how to work in Nepal after living abroad for a long time and the early challenges when you want to initiate something which no one had done before. The wisdom involved was very motivational, encouraging and indeed with challenges. I shared with him my personal journey too – the journey I had taken so far and he listened passionately. As we walked through trails we stopped to chat

with people and many knew Dr Ram, greeting him with Namaste and asking if he still remembered them (pervious patients). We both had a wonderful trek toward the vehicle until we reached the active landslide point which we had crawled through the day before. This time it was completely washed away, Dr Ram and I attempted but as I took a couple of steps, I started sinking and sliding through the mud and stones slowly. We were both convinced it was not worth taking the risk to cross this time as we were both tired and it was dark. So we had to take another route.

We started climbing the hill for another 45 minutes to reach the top where basically the landslides had started and descend the other side of the hill in the dark and on a slippery road. Once we reached the vehicle we came to know two that medical team members had gone missing. It was pitched black dark; you could hear the river roaring and frogs cracking. We yelled their names, lit up our torch and headlights of our vehicles. On several occasions, we used emergency siren of our vehicle (ambulance) with lights so that they could hear and see where they had to come. I led the team down the rocky hill, through thorns and nettles plants in order to search for them but had to return unsuccessfully. Finally they arrived, completely covered in the mud and soaked. There was a sense of relief and many bursts of laughter when they told us how they fell into the gullies made for irrigating the paddy fields. It was simply they took the wrong route to avoid the landslide and became completely lost.

Once again we were crammed into the vehicle, we didn't really care about the road that our car was going to drive through and even didn't really care about banging our heads on the ceiling of the car and with each other. We reached Dhulikhel around 9pm in one piece but completely exhausted. I had no energy to take another hour bus journey so I stayed with Dr Biraj in his flat.

Phew! Despite of all tiredness, it was one of the most amazing health treks I have ever done. I now am full of admiration towards the Nepalese doctors who made the decision to take the risk to provide services to those who are living in the remote and rural areas of the country. But there is still lot more need to be done in order to make services more accessible for those living in these remote and rural areas. Organizing health camps to serve people is not always a sustainable method. People need access to experts when they need it rather than when the expert can come to the villages. This trip certainly gave me further strong evidence that there is a great potential for a telemedicine system to bridge these gaps – either be it overcoming landslides, informing patients not only arrival

of doctors but also about the cost, finding missing team members and overcoming professional isolation for those who are serving 24/7, 365 days a year needy patients with their limited knowledge and skills.

Please visit the following link for the complete pictorial journey of Bolde Surgery Health Camp 2007.

Link: http://good-times.webshots.com/album/565377306RuyYzW?vhost=good-times

Appendix 9 University Ethical committee approval

School of Health, Community and Education Studies

Postgraduate and Research Support Office

Room H007

Coach Lane Campus East
Newcastle upon Tyne NE7 7XA
Tel: 0191 215 6276
Fax: 0191 215 6605
lorna.kennedy@unn.ac.uk

17 April 2008

Tshering Lama
[redacted]

Dear Tshering

School of HCES Research Ethics Sub Committee

Title: A Participatory Action Research approach to Telemedicine: Supported Healthcare Delivery in rural Nepal.

Thank you for forwarding the additional information. I am pleased to inform you that University approval has been granted on the basis of this proposal and that the University Policies on Ethics and Consent are followed.

You may now also proceed with your application (if applicable) to:

- NHS organisations for Trust approval where appropriate.
- National Research Ethics Service (NRES). [Please forward a copy of this letter where appropriate plus the peer review comments and your response to those comments]. **Please notify the University once you obtain NRES / REC favourable opinion.**

IMPORTANT: PLEASE FORWARD A COPY OF YOUR NRES / REC APPROVAL LETTER TO THE ABOVE ADDRESS.

NB The mention of NRES/REC is part of a standard letter sent out to all researchers and should only be taken forward by those for whom it is appropriate. You do not need to do this.

- Where appropriate you will also need honorary contract(s) with Trusts. **Please forward a copy of any agreed honorary contracts to the above address.**
- Note that occupational health and criminal records bureau clearance will also be required if working with children or vulnerable adults.

- Where necessary, the Committee will be willing to forward the independent peer review forms to relevant external research ethics committees upon receipt of a signed request from yourself.

All researchers must also notify this office of the following:

- Commencement and completion of the study;
- Any significant changes to the study design;
- Any incidents which have an adverse effect on participants, researchers or study outcomes;
- Any suspension or abandonment of the study;
- All funding, awards and grants pertaining to this study, whether commercial or non-commercial;
- All publications and/or conference presentations of the findings of the study.

We wish you well in your research endeavours.

Yours sincerely

Dr Tina Cook

Appendix 10 Telephone management of severe wasp stings in rural Nepal: a case report

Telephone management of severe wasp stings in rural Nepal: a case report

Tshering Lama*†, Biraj Karmacharya*, Colin Chandler† and Victor Patterson‡

*Dhulikhel Hospital, Dhulikhel, Nepal; †School of Health, Community and Education Studies, Northumbria University, Newcastle-upon-Tyne, UK; ‡Queen's University, Belfast, UK

Summary

We describe a young woman from a rural village in Nepal who suffered multiple wasp and hornet stings. She collapsed and was managed by a telephone consultation between a village health worker and a hospital specialist. The patient recovered fully. Not only was the telephone consultation efficient in terms of cost savings from avoided hospital treatment, but it was also effective since, with conventional care, there was a strong possibility that the patient would have died on her way to hospital. This case illustrates the potential for telephone-delivered rural care and management in emergency situations.

Introduction

Stings by bees, wasps and hornets are common in Nepal, especially for farmers living in the mountains. Although there are no official records of the number of people who die from stings in Nepal, there are accounts in many villages of people who have been severely stung and have lost their lives.

Stinging insects are classified as hymenoptera, an order which includes Apids (honey bees, Africanized bees) and Vepids (wasps, yellowjackets and hornets).[1] Insect stings and bites are known to cause a variety of allergic reactions and direct toxic effects.[2] Multiple stings can sometimes lead to angioedema, vasculitis, encephalitis and acute renal failure. Acute renal failure after wasp stings is usually the result of acute tubular necrosis secondary to intravascular haemolysis, rhabdomyolysis or shock.[2] In some cases, red, swollen, itchy patches develop and anaphylaxis (a life-threatening allergic reaction in which blood pressure falls and the airways close) occurs. Isolated nerves may become inflamed and seizures may occur. The main cause of fatalities from multiple stings is usually heart malfunction and collapse of the circulatory system.

In the present case report, we describe a young woman from a rural village with multiple wasp and hornet stings who was managed by a telephone consultation (telemedicine) between a village health worker and a hospital specialist. This case illustrates the potential for telemedicine in the management of an emergency situation, the need for efficient communication and most important, the need for mutual trust between the doctor and the health worker based on knowledge of resources and competence.

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Correspondence: Tshering Lama, Room H005, School of Health, Community and Education Studies, Northumbria University, Coach Lane Campus East, Newcastle-upon-Tyne NE7 7XA, UK (*Email: tshering.lama@northumbria.ac.uk*)

Case report

A 26-year-old mother of two was stung by wasps and hornets while cutting grass in the afternoon. She was attacked and chased by a swarm of wasps for more than five minutes until she fell. Villagers rescued her and called in her family. With the help of everyone she was carried home and given local remedies – 'Karkalo ko Pani' (yogurt and herbal leaves) and 'Nilotutho' (a solution of copper sulphate). However, she deteriorated rapidly, so family and friends rushed her the 5 km to the Bahunipati Health Centre (Figure 1). This is an outreach centre of Dhulikhel Hospital which is 45 km away, but takes 3–4 hours to reach in a four-wheel-drive vehicle over a narrow and very bumpy road. After a two-hour journey through rugged terrain, they arrived at the health centre at about 18:00. The following account is taken from interviews with the participants in the incident: the patient, her husband, the village health worker and the doctor.

Patient's account

I remember up to five or six wasps which stung me on my head and I crushed them as they got into my hair. I felt a burning sensation in my head and my vision faded away and became blurred. Despite the burning sensation and

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Figure 1 Site of the injury (village) and the Bahunipati Health Centre (aerial distance is 5 km with 350 m descent)

blurred vision, I started running away from the field towards the nearest village. But the swarm of wasps kept chasing me until I reached the nearest house after running for 5–6 min. The situation was not improving – I felt an increased burning sensation, felt dizzy and my voice seemed to be fading away. I was not able to talk or swallow food. I was semi-conscious and asked to them to call for my father and my husband.

Husband's account

She was stung by 16 wasps and once by a 'Bachhiun', which is regarded as far more dangerous than a wasp. Recently I heard that a person had died after being stung by three Bachhiuns (they are slightly larger than wasps and they are very black in colour).

We carried her to the health centre and arrived at about 18:00. We asked the health worker if he could handle the case or not. He told us that he would do his best and started treating the patient immediately. After a while, the health worker told me that the patient's condition was deteriorating and he started consulting with the doctor by telephone. I was ready to do anything to save her life – like hiring an ambulance and taking her to hospital, for example. After consultation by telephone and treatment, it was already 21:00 but she was able to urinate. I did hear that once a patient is able to urinate after wasp bites, things will get better. The health worker told me that he thought she was now out of danger. He checked the urine for blood and started a physical examination, asking questions of my wife. From that moment on things started getting better – I was very relieved.

Health worker's account

When she was brought in she kept slipping in and out of consciousness. Her pulse was 150 beats per minute, temperature was 38.2°C and blood pressure was 150/100 mmHg. Once I found out that she had been stung by 16 wasps and one Bacchiun (hornet), I was very nervous about handling the case. But there was no other option as it was difficult to get transportation to hospital at that time of day: the hospital was at least three hours away and her bad situation meant she might not survive the journey. I asked my assistant to act quickly and assist me in taking out any stings, setting up an intravenous saline drip (1 litre) and administering other intravenous medication (furosemide 20 mg, pheniramine 45 mg and hydrocortisone 100 mg). Calamine lotion was applied to calm her down. I asked the patient's husband to remain calm and told him that I needed to consult a doctor. I managed to get hold of Dr Biraj and he told me what to do and at the same time asked me to stay calm and follow his advice step by step. I told him what I had done and what the vital signs were.

I followed his advice although I had already administered many of the drugs he suggested, and after two hours the patient showed signs of recovery when she passed urine. I kept her under observation for the whole night and she was discharged the next morning. I am very happy that we managed to handle such a case through telephone consultation, although I was very nervous and frightened. I think I maintained professionalism and did what was best. The patient's family were very cooperative and supportive too.

Doctor's account

I was at the meeting of the Rotary Club and it was about 20:00 in the evening when I was called from the Bahunipati Health Centre. The patient had multiple wasp stings on different parts of the body and we have seen cases like this many times in the hospital. One of the most dangerous consequences of this is anaphylaxis and patients can die within a short time. If the patient survives they may go into acute renal failure or shock. It is essential to do first level management in these cases. The patient must be given high doses of steroids, and drugs like adrenaline (epinephrine) should be on hand, as they are life-saving if anaphylaxis develops. To avoid acute renal failure the patient is usually given forced diuresis with intravenous fluids. These are some simple but life-saving steps.

The staff did not know what to do, so both the staff and patient were panicked. I knew that we had the necessary drugs in the outreach centre. I advised the health worker and told him what he should look for (the signs for anaphylaxis and shock) and how to deal with them and when to refer. I was quite confident he would understand what I told him. I am glad that he managed it very well. I feel really good about this case because the patient could easily have lost her life if we had attempted to bring her to the hospital.

Husband's final remarks

The village health worker was a bit nervous and frightened by the situation of the patient. His advice to his assistant was very clear and to the point, and things moved carefully

but fast. My friends who helped me to carry her and the other people who were watching the drama were nervous and afraid too. It was not one or two wasps: it was 16 wasps and one Bachhiun. I was losing hope. The health worker did everything he could to the best of his knowledge and skills, and with the help of a doctor at the other end of the phone. He and his assistant did everything very smoothly – injecting medication and administering saline through a vein. Basically everything was done very professionally. The health worker kept talking to the doctor about the patient, and I followed him everywhere as I was very nervous and afraid of losing my wife. I kept telling him that there was no point in keeping her at the health centre if he could not treat her, and that we needed to rush her to hospital as soon as possible.

The health worker talked every 8–10 min with the doctor and observed her progress, administered the treatment and gave me advice and counselling. I really appreciated his hard work and the way he handled my wife's case. If he had not been there at the time, we wouldn't have her here now. It [telemedicine] is a very good thing for our country and for people like us living in rural areas. It could also be used for snake bites too, which are quite common here, and might be life-saving.

Patient's final remarks

When I heard someone telling me not to worry, we have arranged an ambulance, I really thought I was going to die. I started missing my family and especially my children and worried about them. If they weren't able to treat me at the health centre, that meant it was very serious and I was going to die. I am very grateful and I am in debt to all of you. I really wish I had something to give but I have got nothing special to offer. You have given me my wonderful family back so I thank you for that (Figure 2). I now have my life again and my children have still got their mother.

Figure 2 The husband and wife

Follow-up

The patient was seen one month later and reported an occasional mild burning sensation and loss of temper, probably not related to the stings.

Discussion

The overall cost of treatment at the health centre was approximately one-tenth of the cost of referral and treatment at hospital. The present episode cost the couple about 600 Nepalese Rupees (NR). The cost of the telephone calls was about NR 150 (20 min for the first call and then four subsequent calls totalling 25 min until the patient was out of danger). If the patient had had to travel to Kathmandu, the transportation costs would have been about NR 2500 to rent a vehicle or an ambulance. With transportation cost, living (carer and patient) and medical costs, it could have cost them about NR 6000 which makes the cost saving of local treatment approximately NR 5250. The average annual income of a Nepalese is NR 28,350 (about US$400).[3] That is, the cost of transport to and treatment at the hospital would have amounted to about 20% of annual earnings, as compared to treatment at the health centre which represented about 2% of annual earnings.

Not only was the telephone consultation efficient in terms of cost saving but it was also effective since, with conventional care, there was a strong possibility that the patient would have died on her way to hospital. The case shows how a simple mode of telemedicine – telephone consultation – can be life-saving in remote areas of the world.

This case illustrates features of the telemedicine service linking Dhulikhel hospital with a number of outreach centres. Three factors made this successful: communication, knowledge and trust.

(1) There was an effective communication system by telephone. This is not straightforward as Nepal is too poor to have extensive landline coverage and is also very mountainous which is problematic for mobile phones. In Nepal, code division multiple access (CDMA) mobile phones work best and coverage is increasing in rural areas. It was necessary to install a small mast to enable a reliable CDMA signal at the Bahunipati Health Centre;
(2) There was comprehensive knowledge on the part of the doctor about the competency of the health worker and the availability of drugs at the health centre;
(3) There was trust between the two individuals involved.

Mobile phone use is becoming more widespread all over the world.[4] It needs to be incorporated into health care, not just in reminding people to take their tablets, but in obtaining expert opinions instantly for patients who,

because of poverty or isolation, may not be able to access such opinions face-to-face. This requires a fundamental change in how doctors practise, because they have to acquire the skills to manage patients by telephone rather than expecting patients to come to them. In Nepal, for example, 80% of patients live outside the Kathmandu Valley, whereas 90% of the country's doctors live within it.

Telephone care, like any other form of telemedicine, is a process of delivery of care rather than a technology. It is a system which connects patients and health-care professionals in a chain of care[5] so it is about people as much as technology, as shown in the present case. The following phrase sums up how beneficial telemedicine was here: 'I now have my life again and my children have still got their mother.'

References

1 Frankland AW, Lessof MH. Allergy to bee stings: a review. *J R Soc Med* 1980;**73**:807–10
2 Sharma A, Wanchu A, Mahesha V, Sakhuja V, Bambery P, Singh S. Acute tubulo-interstitial nephritis leading to acute renal failure following multiple hornet stings. *BMC Nephrol* 2006;**7**:18
3 World Bank. *Gross national income per capita 2009*. See http://siteresources.worldbank.org/DATASTATISTICS/Resources/GNIPC.pdf (last checked 15 June 2010)
4 Kaplan WA. Can the ubiquitous power of mobile phones be used to improve health outcomes in developing countries? *Global Health* 2006;**2**:9
5 Wootton R. Telemedicine: a cautious welcome. *BMJ* 1996;**313**:1375–7