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TELEMEDICINE AND CONSULTAION IN NEPAL

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Telemedicine is the process of remotely diagnosing and treating patients by the means of telecommunication technologies. Telemedicine is not a newly discovered concept. It has been in practice since few decades in the world. The only difference is that in some place it is widely used whereas in some it is barely used. Therefore, telemedicine is a novel approach in the developing countries, like Nepal and it may have a more profound effect in these countries than in developed nations due to unmet demands for health and unprecedented health-related challenges. In the context of Nepal, the use of telemedicine is rising and currently being implemented slowly, mostly by the private health institutions. The main purpose of this thesis is to explore and analyze the history and implementation of application providing telemedicine services in Nepal.

To understand how telemedicine is implemented in Nepal, a case study on Kathmandu Model Hospital was carried out. Kathmandu Model Hospital, is the medical partner of Nepal Research and Education Network. With the joint effort of Nepal Research and Education Network and Nepal Wireless a pilot project was initiated in 2006 that connects more than 80 km of far rural community hospitals through setting up a wireless network.

The project work included the Symptoms Recognitions application and the development of a dynamic website. From the application, patients can choose their symptoms from the symptoms list and then view the diagnosis. They can also view the treatment procedure of those diagnosed disease. The application also provides the features such as home treatment, different types of health tips and prevention against various diseases.

The thesis also contains the comparison of Telemedicine between Nepal and Finland. In the comparison, the past and the present situation of health condition and telemedicine progress are discussed. For the comparison between Nepal and Finland, online research as well as visiting the local hospital from Finland was done. About Nepal online interaction was made through social medias to collect the data.

Here the comparison was made to have the clear idea of telemedicine and its situation in the different part of the world. The outcome from the comparison was briefly explained so that there is fair understanding about the concept of telemedicine and its technology. Finally, the thesis is concluded with the outcome from the comparison.

CONTENT

FIGURES

TABLES

LIST OF ABBREVIATIONS

IATV	Interactive Television
MRI	Magnetic Resonance Imaging
WHO	World Health Organization
VOIP	Voice Over Internet Protocol
NREN	Nepal Research and Education Network
NWNP	Nepal Wireless Networking Project
ICT	Information and Communication Technology
IT	Information Technology
IS	Information System
2G	Second Generation
3G	Third Generation
IP	Internet Protocol
ECG	Electrocardiography
API	Application Programming Interface
ADSL	Asymmetric Digital Subscriber Line
VDC	Village Development Committee
UI	User Interface
PHP	Hypertext Pre-processor
OPD	Out Patient Department
CT	Computed Tomography

1 INTRODUCTION

1.1 What is Telemedicine?

We are living in the age of information and communication technology (ICTs) but also have long-standing problems when it comes in the improvement of health. The term Telemedicine can be defined as the delivery of e-health services, using telecommunication technologies for the exchange of medical information for diagnosis, treatment and prevention of diseases and injuries [1]. Telemedicine uses ICT to provide clinical health care from a distance when geography is a barrier. It helps to eliminate the distance obstacle and helps to improve accessibility of medical services that are rarely available in the rural communities. It could be used in emergency situations as well as to save the patients in critical condition. Telemedicine has unfolded the possibilities of narrowing the gap between developed and developing countries, between cities and villages and between the 'have' and 'have not'. By making services available at the remotest areas, telemedicine reduces mortality, morbidity, expenses and psychological strains and can be a very useful tool for providing health services for the people at large. This technology is very beneficial for people living in the isolated communities and remote regions where they can receive care from doctors or specialists far away without the patient having to travel to visit them [2].

Accessibility, equity, quality and cost efficiency are the key issues in both developed and developing countries. Doctors serving in the rural and small health clinics encounters with the various diseases irrespective of their specialties. On the other hand, rural hospitals are not well equipped with the latest technologies. In other words, telemedicine can also be defined as the exchange of medical information from one location to another by the means of electronic communication that helps in the advancement of patient status. Telemedicine has multiple applications and can be used for different services that may include wireless tools, two-way video, smartphones, emails, or other latest modes of information technologies.

The definition of Telemedicine can be summed up as the situation where an individual receives a medical assistance without travelling or visiting a hospital regardless of their location and this eases the patient in different ways for example by saving the time as well as money, since one does not have to travel to receive the clinical health care. Also, telemedicine is the use of electronic information and communication (ICT) technologies to provide and support health care when distance separates the health providers and the patients.

1.1 Origin, Approach and History

The journey for the research of telemedicine started with the ancient societies and the early attempts to establish rudimentary communications connectivity between the rural village and the large hospitals for the contingency of the patients and the physicians. The history of

telemedicine would also give the valuable information and experiential lesson to the present and to the future direction of it. Remote patient monitoring through mobile technology can reduce the need for outpatient visits and enable remote prescription verification and drug administration oversight, potentially significantly reducing the overall cost of medical care. Telemedicine can also facilitate medical education by allowing workers to observe experts in their fields and share best practices more easily [3].

The practice of Telemedicine started in different places in different times. As we see the history of Telemedicine, the first interactive telemedicine system, that operated over standard telephone lines, was designed to remotely diagnosis and treated patient requiring cardiac resuscitation (defibrillation) was developed and launched by an American company called MEd Phone Corporation, in 1989. After a year under the supervision of its president /CEO S Eric Wachtel, MEd Phone introduced a mobile cellular version, the MD-Phone. It served twelve hospitals in the U.S as receiving and treatment centers [4]. Similarly, the people living in the remote areas of Australia used two-way radios to communicate with the hospital.

The concept for the study of telemedicine was developed due to the discussion between the staff of the National Library of Medicine (NLM) and the Institute of Medicine (IOM). The NLM has a long history in supporting in the development of information and communication technologies to assist health researchers, clinicians, policymakers, and increasing patients. Later the modern form of telemedicine was started in large part driven by the military and space technology sectors. Also, it has been used by few individuals through readily available equipment [5]. The introduction and popularization of the internet and its various applications has further increased the pace of ICT advancements. These advancements have led to the creation of areas in telemedicine applications that the world is coming to utilize.

2 OVERVIEW OF TELEMEDICINE

2.1 Advantages

Telemedicine is a concept that can be very beneficial for a large number of people residing far away from the cities in rural areas, where large hospitals and the Modern technology are beyond of reach. Thus, it could provide improved assess and care for the patients in the remote locations. On the other hand, telemedicine also helps in cost management. By reducing the cost of healthcare, telemedicine increases the efficiency of chronic disease treatment for the patient and saves time for treatment.

The use of telemedicine has improved healthcare quality. In some cases, it has an outstanding record compared to the traditional way of treatment. Patients feel less stress about the travelling, getting appointment and waiting for their turn in the hospital. It is also more realistic method of testing the effectiveness of alternative clinical practices. Because of all these benefits, telemedicine has been increasingly popular among the people [6]. The recent developments in the mobile application also allow healthcare professionals in multiple location to share information and discuss patient issues as if they were at the same place. Due to all these, the patients are demanding the use of Telemedicine.

Telemedicine can eliminate the risk of spreading infectious diseases or parasites between patients and medical staff [7]. In some situations, patients are shy to explain their diseases and the symptoms. Some patients may be surprisingly nervous and act very differently when there is the presence of medical staff. In this situation, telemedicine applications could be very fruitful for them to express their feelings. This medium acts like a virtual world for them but works like a real world and hence it would be easier for the health specialist to treat those patients. Also, the patient gets good care and clinical healthcare afterwards.

2.2 Disadvantages.

Telemedicine has a long history of evolution and has served health care in different ways, however it is not free from its drawbacks. One of the most common disadvantage of this concept is that it is very expensive to establish for the first time. Many countries do not have large budgets. Also the medical personal need training. Establishing this technology for the developed countries has been a great challenge. Therefore, for the developing and the developing countries it has become like a dream project.

Telemedicine is a virtual system to treat the patient. In the real world a patient could be given some drugs according to the symptoms and the diagnosis and observe the effect of that

particular drug and if it does not work then the further treatment process could be started immediately which is not possible through Telemedicine

Likewise, there is also the concern that telemedicine may actually decrease time efficacy due to the difficulties of assessing and treating patient through virtual interaction; for example, it has often been said that a tele dermatology consultation could take up to thirty minutes, whereas it takes only fifteen minutes in the traditional way of treatment [8]. Some of the telemedicine practice have also the legal regulation issues and have difficulties in claiming reimbursement from insurers or government programs in some fields. In addition to this telemedicine also has the inability to start treatment immediately. For example, a patient suffering from a bacterial infection might be given an antibiotic injection in the clinic and observe for the reaction before that antibiotic is prescribed in the pill form. However, it cannot be done in a virtual treatment. Therefore, in some cases, the traditional way is still the reliable way of treatment.

2.3 Clinical Purpose of Telemedicine

The clinical purpose of telemedicine application are as follows [9]

- Robotic surgery where the robots are guided to perform surgery
- Supervision of primary care and provision of specialist care through teleconsultation
- Telemedicine for initial urgent evaluation and diagnosis
- Telemedicine to gain access to patients in critical condition and patients with chronic diseases

Hence, the clinical application involves the sharing and consultation of information and education of patient and their care.

2.4 Non-Clinical Purpose of Telemedicine

Similarly, the non-clinical purpose contains the followings things; [9]

- It helps to carry out the research easy for the researcher, since it has the easy availability of information.
- Internet-based professional medical education and continuous medical knowledge
- It assists in administrative purpose such as recording via electronic patient and helps in regulating and improving the availability of clinical and non-clinical data
- Telemedicine can be used for patient education such as online help
- It also gives advantage in public health by making easy access to underserved population and has potential to raise health awareness in the public

2.5 What Services can be Provided by Telemedicine?

Sometimes telemedicine is best understood in terms of the services provided and the mechanisms used to provide those services. Here are some examples:

- Primary care and specialist referral services may involve a primary care or allied health professional providing a consultation with a patient or a specialist assisting the primary care physician in rendering a diagnosis. This may involve the use of live interactive video or the use of store and forward transmission of diagnostic images, vital signs, and/or video clips along with patient data for later review.
- Remote patient monitoring, including home telehealth, uses devices to remotely collect and send data to a home health agency or a remote diagnostic testing facility (RDTF) for interpretation. Such applications might include a specific vital sign, such as blood glucose or heart ECG or a variety of indicators for homebound patients. Such services can be used to supplement the use of visiting nurses.
- Consumer medical and health information includes the use of the Internet and wireless devices for consumers to obtain specialized health information and on-line discussion groups to provide peer-to-peer support.
- Medical education provides continuing medical education credits for health professionals and special medical education seminars for targeted groups in remote locations.

3 TELEMEDICINE IN NEPAL

Many developed countries have struggled so much to establish telemedicine and provide continuity for this. Therefore, when we talk about developing countries like Nepal, it is a very huge challenge because of lack of the latest technical equipment's and the economic condition of the country.

3.1 Telemedicine Status Nepal

Health workers in rural health care serve most of the population in Nepal, but are isolated from specialist support and access to current medical information. Fortunately, the initiation of (ICT) has unleashed new opportunities for the delivery of health services. In Nepal, there are very remote and less developed communities with limited access to roads and poor infrastructure to access direct health services. Here, telemedicine can be taken as the best alternative form to physically travelling and treating people. The strengths of telemedicine for remote populations include making specialty care more accessible, eliminating lengthy travel and costly transportation, and reducing the cost of some medical services in rural settings.

In addition, due to the lack of facilities in the rural areas, even doctors do not want to go and serve the patient. Mostly they are based in the capital. Either they go to work in the hospital that is located in the cities or they open some small clinics and start working there but nobody wants to travel far away from the city. Due to the geographical condition where roads and communication are badly developed, doctors prefer to stay near the urban areas. This is one of the biggest problem in the developing countries like Nepal. Therefore, telemedicine plays a vital role in the support of healthcare for the people living in these areas. The strengths of telemedicine for remote populations include making specialty care more accessible, eliminating lengthy travel and costly transportation, and reducing the cost of some medical services in rural settings. In remote areas due to the absence of doctors and nurses leads to the poor health outcome for the local population. Even a common disease becomes epidemics in these situations.

Nepal is a hilly country consisting of around 4000 village development committees (VDCs), around 60 municipalities, and 75 districts. It is a poor country having a low GNP, low per capita income, and low literacy rates but higher population density. There is also an acute shortage of doctors with the person to doctor ratio at approximately 4800:1 [10]. These factors have contributed to the prevalence of communicable, respiratory, and nutrition deficiency diseases, which are among the most common disorders seen in hospital outpatient departments. Nepal Wireless Networking Project is a not-for-profit making initiative running in the rural areas of Nepal. It was started in 2002 to bring communication services in some villages of Myagdi district and to find ways to bridge digital divide between urban and rural areas of Nepal [11]. Telemedicine is therefore an attractive potential means of improving health services in Nepal.

Telemedicine as a service is the process of providing medical expertise and health services to remote, rural, and underserved communities in primary care, secondary care, and in emergency conditions with the help of telecommunications. It is particularly helpful to deliver health care to remote and rural areas, and is therefore very useful in Nepal where there is an acute storage of medical specialists separated from most of the population in remote places [12]. Since people in all parts of the country need proper health care, telemedicine can be used as an alternative form of treating people in the absence of medical facilities in the area [13]. At the district level, many diseases can be diagnosed and treated via specialists' advice through telemedicine. Using telemedicine for surgeries and complex examinations may prove to be more difficult, but common diseases and ailments can be diagnosed and treated in a timely manner; furthermore, follow-up treatment and routine health checks are made easier by this technology [14].

3.2 Related Works

The Nepal Wireless Networking Project (NWNP) [15], which has been proposed by Mahabir Pun and his team, is used for installing of wireless networking over some villages, which enabled tele teaching and telemedicine facilities to the people of that village. In conjunction with some hospital in Pokhara, medical services are offered to the villagers through audio-video conferencing with the help of Internet telephone equipment and high-resolution network cameras. This telemedicine is provided with limited audio-video conferencing only, thus patient medical reports and images cannot be examined. Om Hospital & Research Centre in Kathmandu and Apollo hospital in New Delhi had started offering telemedicine services. They also provide simple audio-video conferencing services with the help of Voice over Internet Protocol (VoIP) technology and web camera. The following figure 1 and figure 2 shows the sample of video conferencing between a doctor in Kathmandu and a rural village health staff.

Figure 1. Heath Worker in Rural village using Telemedicine technology [16].

Figure 2. Doctor in Kathmandu Model Hospital: Videoconferencing [17].

The authors started the task of writing the book with open mind and put aside whatever preconceived notion or information about telemedicine [18]. Telemedicine projects have been carried out in developing countries such as India, Bangladesh, South Africa, the South Pacific,

and Nepal. Telemedicine has also been used in underserved regions of industrialized countries such as the United States and the United Kingdom. Services include tele radiology to improve neurosurgical consultations, email consultations, Internet and email distribution lists, remote mental health assessments, and the use of personal digital assistants (PDAs) to improve access to information. The majority of telemedicine initiatives have been successful in improving certain aspects of health service delivery. For example, one international project has been operating since 1999, and has been successful in providing diagnoses and management advice for doctors in developing countries, and in sparing patients the cost of unnecessary international travel. It has expanded from serving a single hospital in Bangladesh to offering specialist second opinions to doctors in 45 participating hospitals in 18 developing countries. Although the majority of telemedicine projects are not as ambitious in scope, they all appear to increase access to better health services. However, little is known about the cost-effectiveness and sustainability of these services [19].

Several efforts have been ongoing in Nepal to provide access on quality health services for rural majority through Telemedicine. In 2006, with the joint effort of Kathmandu Model Hospital, the medical partner of NREN, and the support of NREN and Nepal Wireless have initiated a pilot project, which connects more than 80 Km far rural community hospital through setting up wireless network. This is one of the very fruitful initiatives and it has been replicating in different remote areas of Nepal. Currently about 10 of the rural health, Centre's are connected with this services and have been conducting regular virtual classes and real time tele-consults. Succeeding in the connection with TEIN3, the telemedicine initiatives has broadened and have established better communication and relation with different Medical university, Teaching hospitals and the related medical persons across the globe. They are connected to number of universities in the US, Japan, Korea, Australia, and conducting regular session with Kyushu University Hospital Japan, Seoul National University Bundang Hospital Korea, University of Kansas and the University of New Mexico United States. Presently they have built active connection among following medical organization of Nepal to enhance telemedicine initiatives:

• Kathmandu Model Hospital, Bagbazar (Medical Partner of NREN
• Institute of Medicine, Teaching Hospital, Kathmandu

• Nepal Medical College and Teaching Hospital, Kathmandu

• Communication Health Education Services by Telehealth (CHEST),

Maharajgunj, Kathmandu

• Gauri Shankar General Hospital, Dolakha

• Manmohan Memorial Community Hospital, Pharping

One of the central weakness among underserved population is that the literature contains rather limited evidence of successful and sustainable use of telemedicine in underserved areas. In addition, the other fault is that the potential and long-term use of it in the health

service delivery. Other weaknesses include potentially cumbersome and difficult to use equipment, a potential increase in physician workload, and limited resources for set-up and ongoing operation of telemedicine services.

3.3 Challenges

Telemedicine service is supposed to be as simple as using telephones but it also has its limitation. The main challenge for the implementation of telemedicine in developing countries like Nepal is as follows.

- **Equipment's and Device**s: The equipment required for this technology is very costly. The equipment's like optical fibers, satellite connections etc. are so expensive to afford for the developing countries and the installation of these apparatus is always costly.

- **Geography**: Also Nepal is a country with its most of the parts covered by mountains and hills. Therefore, geography is also another problem. Due to the high mountains and hills, it is very difficult to establish the proper communication system. For the implementation of telemedicine, communication is also another main factor without which it is almost impossible to run. Also because of the geography and less facilities doctors and nurses, do not want to go to the remote areas and serve patients. On the other hand, developing countries already have many more problems to take care and solve. Hence they cannot give invest much more in these stuffs even though it is beneficial for them.

- **Politics**: Likewise, these countries do not have stable government as well. Due to the unstable political situation, the government is changing frequently. When the political situation is not stable, then the plan made by one political party is not followed by other. The new government introduces their own plan and do not give continuity to the old projects that has been started by the previous ones. Due to this, many projects do not start and many other are not completed and left half a way behind.

- **Technology Acceptance**: In the developing countries, people have the habit of visiting doctors in person whenever they have some problems or they do not feel good. Therefore, for these people its little difficult to accept this technology even it is fruitful for them. Also for some users it might be that way that they want to use to but they are unable to use due to lack of proper knowledge about it. In this situation, they trust more to visit the doctor than to use these technologies.

3.4 A Case Study

Currently there are many universities interested in this telemedicine technology. Many private and government companies, college, and universities are trying their best for the development and implementation of Telemedicine. Many hospitals are also trying to install Telemedicine. Kathmandu Model Hospital is one of them, which has started a telemedicine service from the early of 2008. Kathmandu Model Hospital has the connection with the Gauri Shankar Hospital in Dolakha District that is more than 140 km away from Kathmandu.

According to the chief of telemedicine highlights that the main objective of their telemedicine project is to help in making better health care service available to remote areas by empowering local health workers through ICT implementation. The chief also presented in a conference that their goals are to have enough bandwidth that would help to establish a meaningful communication between marginalized communities in remote areas and centrally located to achieve health for people [20].

Kathmandu Model Hospital is also a member of the Nepal Research and Education Network (NREN). It has been providing many opportunity and platform for the students that are studying technology. Among various university and college, St. Xavier's College that is affiliated to Tribhuvan University has made an attempt for this. Students from this college studying information technology have made an effort for the development of telemedicine application. They have attempted to develop a web application using PHP. The application uses MySQL as database server to store the data generated with the joint support of Kathmandu Model Hospital. Whereas they have unfolded the Symptoms confirmation engine in python. In this project, they tried to connect remote patients and doctors with the help of desktop application and dynamic website. This is not something new they started but they tried to simplify the things through it.

Currently the central hospital is connected to health post and hospital in ten remote areas and has been providing the services to the patients. Those ten health posts are as follow in the figure.
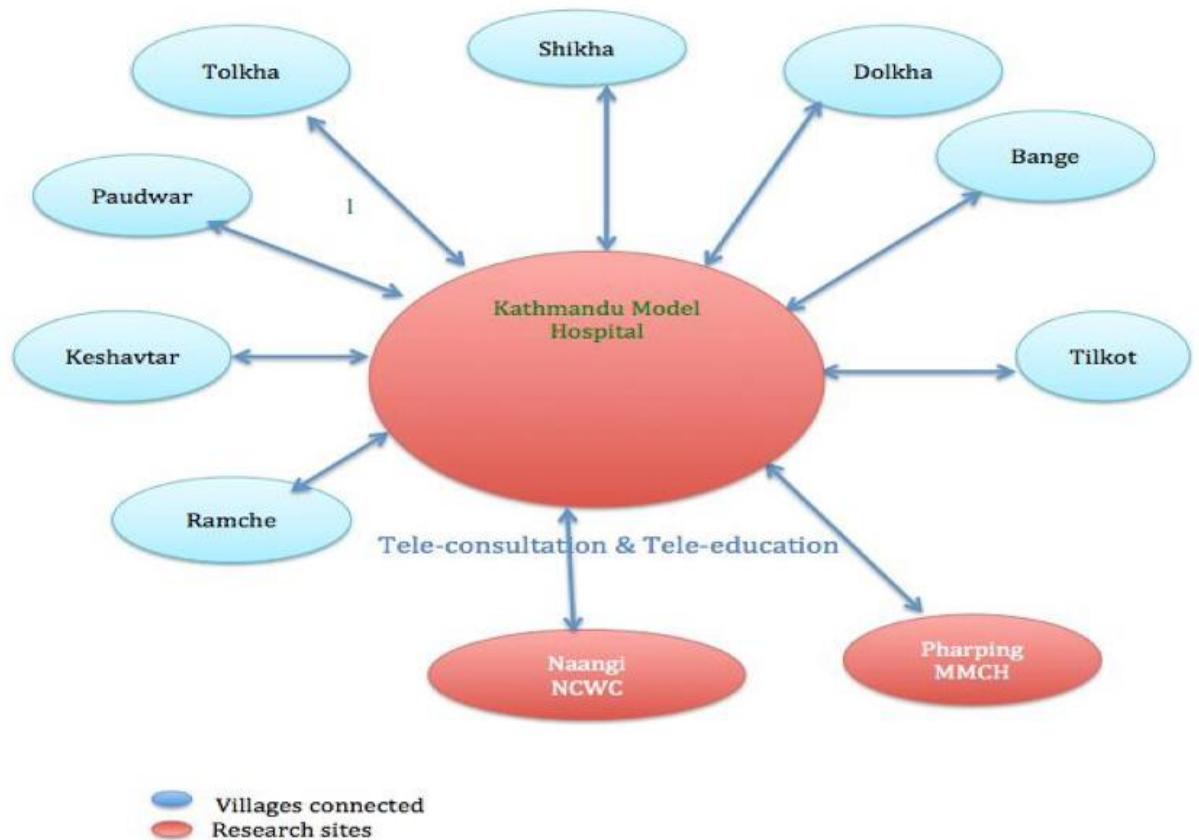
Figure 3. Villages connected to Kathmandu Model Hospital for Telemedicine Service [21].

3.5 Telemedicine Implementation in Nepal

Health net Nepal in 2004 has conducted a pilot project for the telemedicine that was funded by ICT R&D Grants program for Asia. The main objectives of the project were to test the potentials of telemedicine based on the store and forward principle for still images captured through digital cameras in the areas of pathology [22]. There are five regions in Nepal among which the projected was carried out in three of them namely; Eastern, Western, and the Central region. It was conducted for the two years of period and in these two years; they did not figure out that much difference between the diagnosis through store and forward method using picture and textual data as well as the conventional method.

There has been a trend of many Nepalese patient going for the special treatment every year and it is increasing all the time. Travelling to India for the treatment is very costly, since the patient has to pay for the travel, food, with the treatment cost. Therefore, to end the burden of travelling and to give quality care, Om Hospital and Research Centre collaborated with Apollo Hospital India in 2004. Since then they have been using the telemedicine to treat the patient [23]. However, this service cannot run as long as it was planned. Due to the financial issues and other factors, it has to be stopped and is not working anymore.

Similarly, to provide the quality health care to the patients, Dhulikehl Hospital also started a telemedicine service. It started to communicate with the outreach Centre by the help of a walkie-talkie radio that was based on communication system linking Bhunipati Health Centre and Bolde Phediche Health Care [24]. The walkie-talkie system was also available in the ambulance to communicate while they were on the way to pick up the patients and when they were on their way to the hospital. Unfortunately, later on it was replaced by the phone due to the better network connection as well as the cost effectiveness.

Nepal Government and the Ministry of Health and Population started a telemedicine program in 2011. The project helped to connect 25 regional hospitals with Patan Hospital. According to the authorities, they have planned to extend the project and provide the service in other regions as well in the coming future. Some of the equipment used in that projects are; computers, cameras, scanners, software for recording patient's data such as x-ray, lab tests, etc. Apart from these, many other private organizations have started those services.

4 COMPARISON OF TELEMEDICINE BETWEEN NEPAL AND FINLAND

4.1 Telemedicine Finland

In equivalent with other European countries, Finland also has long record of telemedicine and the use of its technology in the medical field. Finland is one of the leading countries in the field of technology. Finland has always been trying to do better in telemedicine. Since 1995, the Finnish Society of Telemedicine has been enhancing the use of ICT in the health care sector. It has been investigating and investing on it a heavily. The first experiment was carried out in 1969 and later in the beginning of 1990's it started to enter in the practical world. The hospitals started to use multimedia medical records in 1995, and in the present days, the features called e-referrals and e-discharge letter have been merged together. They have also introduced the first pocket sized Nokia communicator PDA (Personal Digital Assistant) device with integrated GSM phones [25].

The pharmacies in Finland are entitled to check each prescription by law. Due to this, it has helped to figure out the fake physicians and forged prescription. In this process, a doctor creates a prescription with a legacy system and then signs it with the electronic signature and forwards it in the form of SSL secure message. Afterward when the patient goes to the pharmacy, then the pharmacist accesses the database with their personal smart card, from where they see the prescription that was sent as an electronic form and finally the medicine is handed to the patient. Even though the prescription is issued in the electronic form, the patient can always ask it in the paper form but for the contingency people nowadays prefer it in the electronic form rather than the paper. This database aims to fully connect and integrate with different EPRs to cover all pharmacies. Therefore, the patient can always go to any of the nearest pharmacy and ask for their prescribed drugs. It helps them to save time by avoiding visits to any particular pharmacy and provides an open option to afflict any dispensary.

Finland has also been taking parts in the various health service campaign and seminar organized by the European Union (EU). They have always aimed to make the health service easy and convenient to their people. To record the data of the patient they have started to use the EPR system in the National level since 2006, which is handled by the Social Insurance Institution (KELA). In this system, the prescription information is stored for thirty months and then it is archived for next ten years. Therefore, if someday someone tries to access the data and see the record it could be done until that period.

4.2 Present and Future Situation of Telemedicine Finland

There are several changes going on presently in Finland. The government has recently changed and they are implementing new policy and plans. They are focusing on the better performance and easy accessibility of health care for all the people residing in Finland. Due to the vast ongoing changes it is quit difficult to figure out the total number of hospitals and health care operating currently. However the estimated number have been listed in the table below in the comparision section. Also there are many new (private) health institutions are opening gradually.

Figure 4 shows the situation of health care system in Finland. Although all of it has not been completely accomplished, they are trying to reach their goal by 2020. In the large university hospitals these models are currently in practice but there are many other small health clinical where it has not been implemented. Thus, they have made a target to complete this and make it available for the patients in all the health care centre in Finland.

The Kanta service is a website from where you can access your health information, records of doctors visits, the valid and the expired prescription of the medicine. For the use of this service we need to verify ourselves through the online banking The authorisation for the website takes pace through the Finnish banking system. Those who have Finnish banking can login in themselves through the netbank and browse all their history of the medical record. Through this service the patients can access their data from anywhere in the world [26].
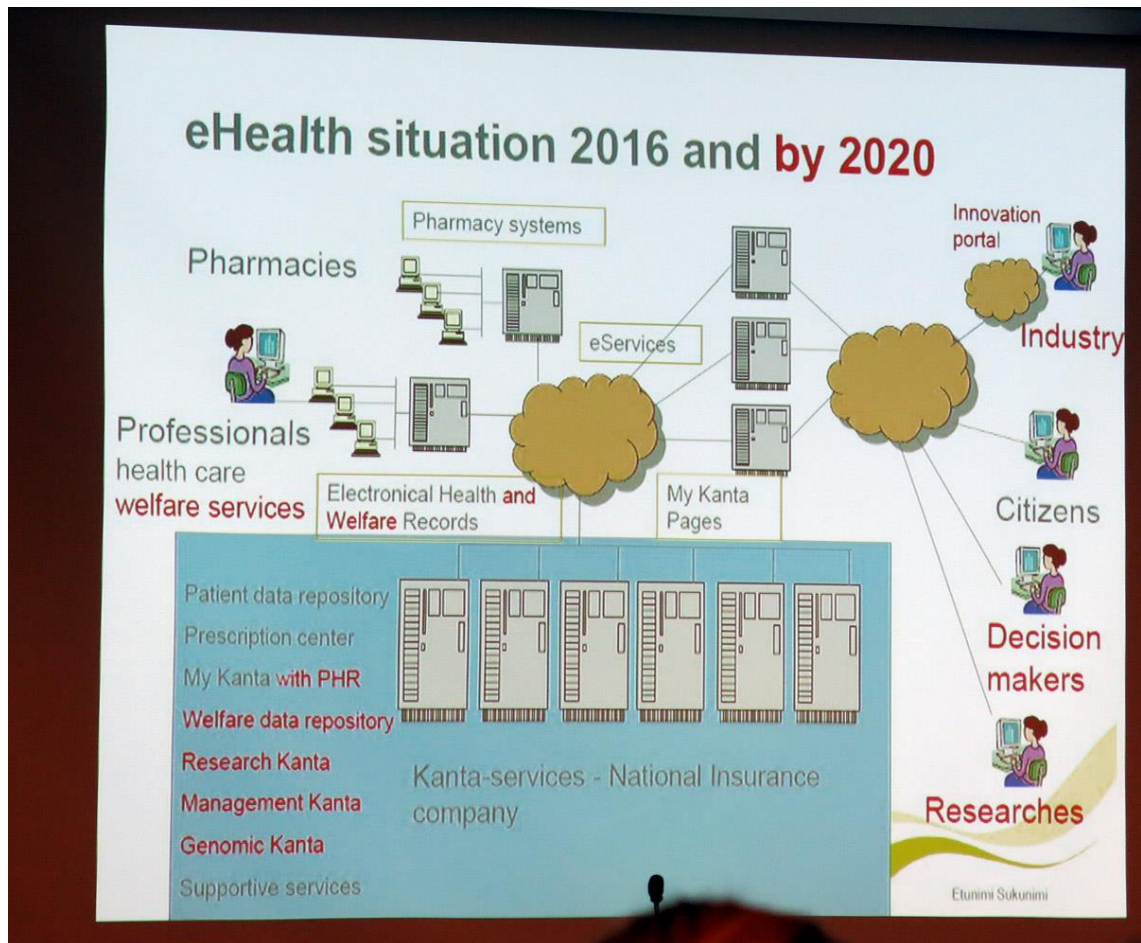
Figure 4. Plan of telemedicine Finland [27].

The following picture is an example of how Telemedicine in Finland is currently operating. In Finland, it is possible to book an appointment with a doctor by a phone service or even through online. If a patient wants to book the time through the telephone, then the patient just needs to dial in the given number and follow the instruction. The easier way is the online booking because through telephone the answering machine speaks in Finnish language which would be little difficult for those who do not understand Finnish. However, via the online service the patient could choose the language to English or Swedish as well. In addition, nowadays it is possible to translate the language to the desired one in internet. Once the patient is in the page that is displayed in the picture below they just need to click in the icon with the name ''book an appointment''. Then it will lead us to the fill the further details like if the patient is private or a corporate customer. Once the patient has chosen the correct info, it will show all the available time and the patient can even choose the various city and the branches differently. There is also a possibility to chat with the doctors, which is available round the clock. From this service, the patient can receive a quick help.

Figure 5. Booking appointment with Doctor online_ Terveystalo Finland [28].

4.3 Telemedicine in Nepal and Finland

Telemedicine is achieving more popularity due to the provision of worldwide health care services that is necessary to each socialized community. Either it is a developed country (e.g. Finland) or developing countries (e.g. Nepal) health is always a fundamental need. Therefore, in all those countries they are trying their best for the easy access of health service for their people. The health condition and its development are affected by to various factors like geography, economy, and politics as well. This comparison it will clarify the situation of health services and implementation of telemedicine and its technology in developed and the developing countries.

Table 1. Total Hospital in Nepal compared with the total population and areas [29].

Total Number of Hospitals	89
Primary Health Care Centre	160
Health Clinic	710
Sub-Health Clinic	3176
Total Population	28.51 Million
Total Area	56,827 Square Meter

Table 2. List of hospitals in Finland according to the size of population and area [30].

University Hospitals	5
Central Hospitals	18
Regional Hospitals	62
Main Private Hospitals	10 +
Total Population	5.482 Million
Total Area	130,128 Square Meter

The above tables show the condition of health service and the total number of population in Nepal and Finland respectively. In the Table 1, we can see the total number of hospital that is providing health facility actively in Nepal. Though there seem to be many hospitals, health care Centre's, health post and sub health post in Nepal, there is much more population as well. The total population residing in that area is quite a lot. On the other hand, when we see the total population and the total area of Finland, it looks much more balanced. The area of Finland is more than double of Nepal. In addition, the population of Nepal is more than five times than Finland. From this, it is clear that even though there are more health care institutions in Nepal it is not enough to that population. When there is more population, there is a need for of more health care units. The consumption of health facility, health instructors, and the nurses are always more in the place with high population density.

However, when we look through the table of Finland it is obvious that it has a huge area and the number of people residing in it is much less in comparison than to Nepal. In addition, when we see the total numbers of health care provider for Finland, it looks little less than Nepal but

that is more than enough for the population what it has. In Nepal, there is more sub health clinic than the main hospitals. In a way it is good but they are not well equipped and do not have the good technology and the health specialist. These health clinics and the sub-health clinic are far from the city in some remote village. Hardly few of them are connected to the main hospitals in the city and can operate minor problems of the patient. However, when it comes to the major problems the patient is obliged to travel several kilometers to the city for the treatment. When they are finally in the city in large hospitals for the treatment they have to wait, sometimes even for the months for the surgery. The city hospitals are always crowded with patients. Everybody comes to the city for the treatment but the total number of beds and doctors are not enough for all the patients.

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Total Population      • 28.51 Million

Total Doctors         • 16432

Doctor to Population Ratio   • 1:1724
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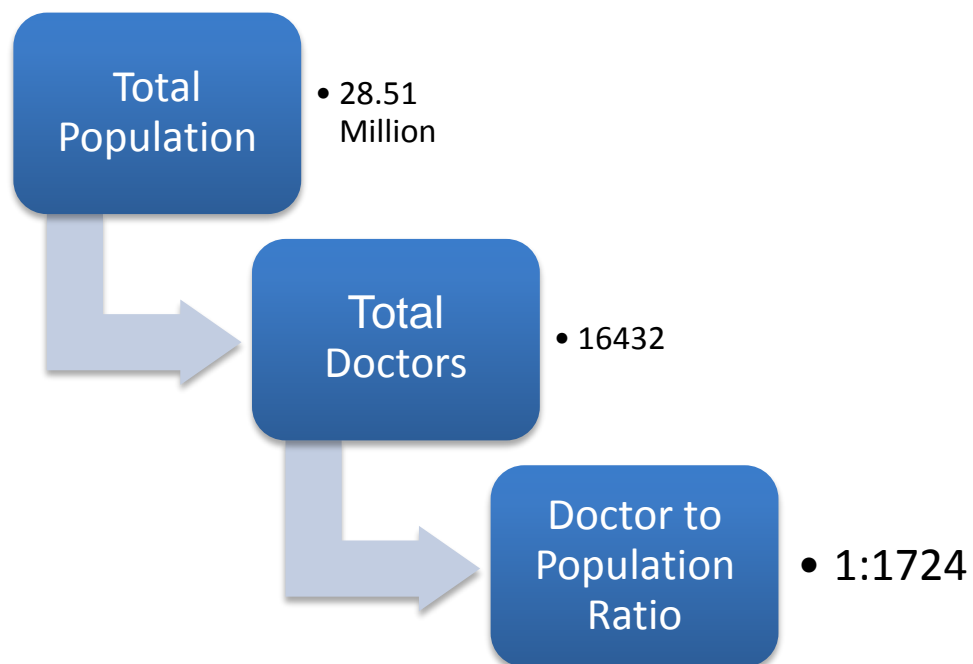
Figure 6. Ratio of Doctors to the population Nepal [31].

Figure 6 shows the condition of Doctors in Nepal. There is a population of 28.5 million and the total doctors to look after them are just 16000. This is the reason behind the hospital getting crowded and the patient not getting proper care in time. When we look through the total numbers of hospital, health care and the doctors, it is clear that for that size of population it is definitely not enough. Health is a basic need for every individual but due to lack of facilities, many people are dying untimely even from common diseases. In addition, the life expectancy from the people from Nepal is very low compared to Finland. Many children die due to the lack of proper delivery system while giving birth. In some villages, the hospital is very far that people might lose their life on the way to the hospital. In addition, the transportation is not so good in all the regions. Therefore, they are walking on their foot even they are sick. Sometimes people find some other person who could carry and take to hospital but not always.

However, there are many people studying to become doctor in various countries, but not all of them can pass the license exam. As it is stated that every year more than 3000 student join medical studies but unfortunately the number of doctor and the health care has not been improved yet. Every year many people go to study medical in many different countries like China, India, Pakistan, Russia and many more. Unfortunately, when they finish their studies and return to Nepal then they cannot pass the license exam. Foe some of them the Government of Nepal they do not even let them to give the license exam because of the different way to teaching and the syllabus do not match with the one that is in implementation in Nepal.
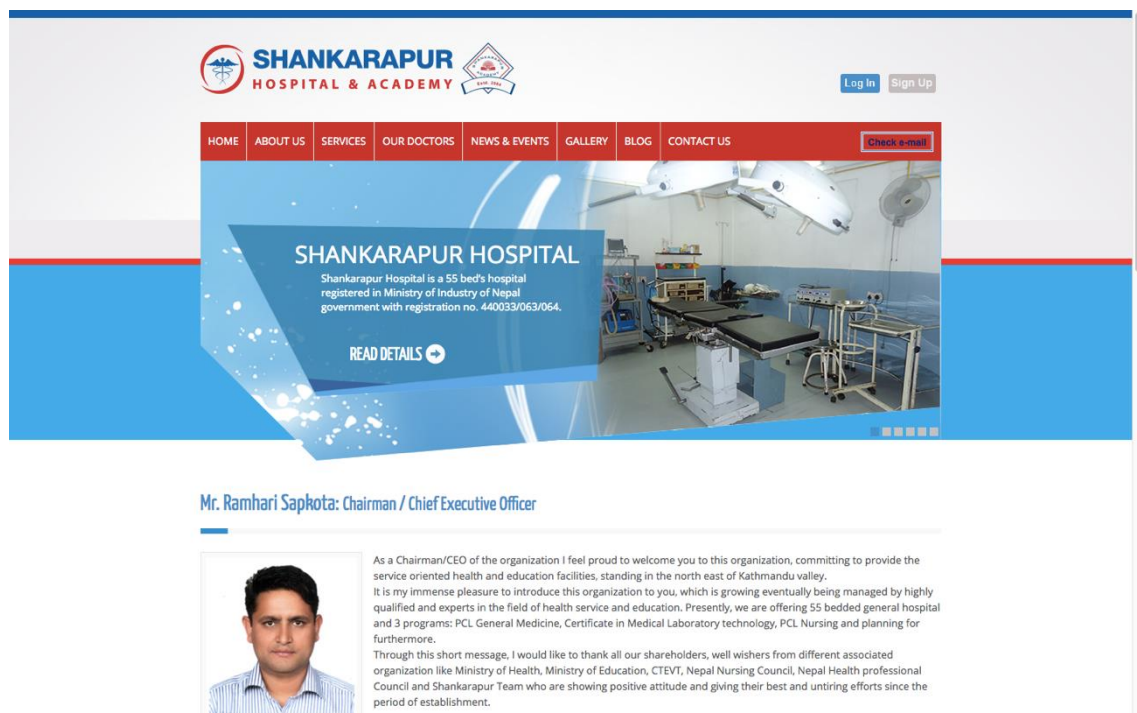
Figure 7. Hospital Website sample Nepal_ Shankarapur Hospital Nepal [32].

In Nepal, there is still the practice of old system to visit the hospital. When a patient wants to visit the hospital then he/she has to go early in the morning and wait in a queue to get the ticket to visit the doctor. Once if the patient gets the ticket then they have to wait until their number comes. If the patient does not get the ticket, then they have to come again the following day and repeat the same process. Due to the less number of doctors sometimes, it takes couple of days to get the ticket. It is not possible to book an appointment or a doctor's time before hand through phone or by any means in Nepal. The only way is to visit the hospital and follow the traditional way. When we visit the hospital, then the doctor will check their next available time and then tell us to follow-up in the given date. Until then, he/she prescribes some antibiotics or painkiller to avoid the complication if there occurs any. Many times patient lose their Out Patient Department OPD card or forget to bring when they visit hospital. Due to this, it is difficult for doctors to treat the patient since there is not any online system of recording the patient's data and the OPD Card is the only way to see the record.

Many hospitals still do not have their website. Few of them have attempted to make the website but they also do not have full function and info in their website. The above shown picture is one of the example of website of a hospital from Nepal. It is not possible to make any reservation to doctor's time online through the website. It is just a basic website. One good point in the website is that the people can view which doctor is working in the morning and who is in the evening as well as the working days of those doctors.

Total Inhabitants
- 5.482 Million

Registered Physicains
- 28,565

Docotr to Inhabitants Ratio
- 1:262
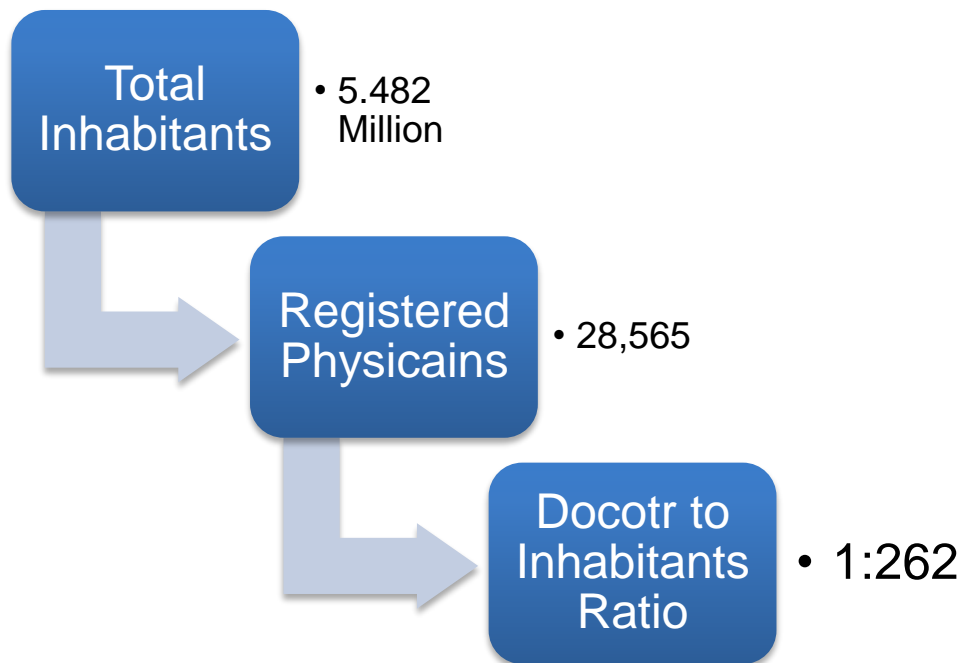
Figure 8. Ratio of Doctors to Population Finland [33].

The above figure 8 reflects the total number of doctors in Finland and the ratio of doctors to the total population. The ratio here is does not look as bad as in Nepal. The ratio is almost seven time better than in Nepal. It is possible to book an appointment with the doctors through telephone as well as online in Finland. It is even possible to visit the hospital and try to get an appointment but the most recommended way is to book an appointment beforehand. The probability of getting the same physician in every visit is also possible in Finland. The physician also prefers to have the same patient. Therefore, when we make the appointment from same hospital then the possibility of getting the same doctor is very high that makes everything easier. However, when we compare this with Nepal it very rare that you get the same physician. To get the same doctors time it takes very long time since the doctors have many patient waiting in queue.

Table 3. Economic Situation Nepal and Finland _ OEC - Nepal (NPL) Exports, Imports, and Trade Partners_ OEC - Finland (FIN) Exports, Imports, and Trade Partners [34].

List	Nepal (NP)	Finland (FI)
Exports	$1.06B	$77.3B
Imports	$7.75B	$72.8B
GDP per Capita	$2.37K	$40.7K
ECON Complexity	-0.51	1.74

Similarly, Table 3 shows the comparison between Nepal and Finland with their economic status respectively. From the table it is clear that, the import is seven times more than the export in Nepal. They import much more than the export. As they invest more in importing and do not earn anything. This is the main reason behind the weak economy of Nepal. When the economy of a country is so weak it cannot focus in other sector like health. As Nepal has a huge population density as well as the economy is also weak it is difficult for them to invest more in the health sectors only. It cost much more for the technology and the health equipment. The devices are always too expensive for the communication and the health. However, they are still trying to make the technology and telemedicine easy for their people.

On the other hand, when we check the table about Finland it is understandable that the economy is much more balanced. They even have more exports than the imports. The exports always bring benefits to the country as proved from the economic condition of Finland. Due to its strong economy, Finland has made exemplary development in each sector including health. They have the latest technology and equipment's in the health institution.

4.4 Interpretation from Comparison

Here from the comparison it is clear that Nepal is far behind than Finland in the sector of health. There is much more to learn from the progress of countries like Finland and there is much more to do in Nepal. Although few steps are taken but they are not enough. In comparison to Finland, Nepal is a very small and geographically challenged nation. However, Finland is not so much geographically challenged but it is also challenged with the weather. Almost 7-8 months the land is covered with deep snow. So here, what we come to know is that there is always some kind of problems and challenges in every place. The main difference is that how do we tackle our problems and solve them. In this context, it seems like Finland has tackled it problems very well and found the solution. Nepal has high number of population and the limited resources and facilities. Finland being more than double in the size than Nepal still has five times less population than Nepal. This is the one main reason behind its success. The lesson that Nepal has to learn is that having too much population is the negative points for them and they should find some solution for this.

As Finland is far ahead than Nepal in the field of technology, they have better website and online system from the hospital than Nepal. Every year many students from Nepal come to study in Finland but the bitter truth is only very few of them return back home and work. Here the irony is not only the website or the students who do not go back, there are many other factors affecting it. The low number of doctors is one of the main factors followed by the economic condition, political condition and so on.

The above comparison was made just to give open view of health condition in the developed countries and the developing countries where Finland was taken as the example of developed country and Nepal represented as the example of developing countries. The comparison was not made to show which one is strong and which is weak. It was made to give a clear idea to the people that what could be the reason behind the lack of development of health sector. There are many more factors affecting in the development of health sector and telemedicine in the developing countries among which some of them were mentioned and compared with the developed countries above. In addition, it makes it clear that even the developing countries have some affecting factors for the development in the infrastructure of telemedicine and health sectors they are always so curious to take next step on it and have been doing their best to achieve their goal.

5 CONCLUSION

There has been a great increase in the use of information and communication technologies in the health sector termed as ''Telemedicine'' to improve the quality of care in developed countries for many decades. Many authors have also stated the potential benefits of addressing health care issues in developing country. However, very little is known about the implementation of telemedicine in Nepal.

Today telemedicine has already become one of the essential factor for the health sector. Directly or indirectly, health is connected with communication and communication is connected to the technology. Therefore, these three elements are inseparable. All the countries in the world are trying their best for the easy access of health to the people from their nation. Some nations have strong economies and have developed very well in this field. On the other hand, some other nation is trying to catch up the same level as those developed nations. Even the developing countries are struggling from their place to give the best health facility to their people.

The project Telemedicine and Consultation in Nepal clarifies the need of development and deployment of telemedicine applications and website while improving the medical assistance, allowing a large number of people to have specialized medical care. Although it will take a lot of commitment, time, and effort to address these critical success factors, the long term benefit of increased accessibility and improving the health status of Nepal maybe worthwhile. Long-term benefits are also expected to be seen with proper implementation and success of telemedicine projects.

The case study that was carried out in Kathmandu Model Hospital presents the role of telemedicine in Kathmandu hospital and its outreach Centre. The study found the teleconsultation and tele-education has been supporting health care delivery in KHM and its outreach Centre. Telemedicine in KMH has reached out to people in remote areas improving access to essential health care and specialist consultation without having to travel for many hours and days, in lower cost (compared to hospital in city). Tele-education is used for information sharing and assistance from other renowned medical organizations in order to empower the health professionals. However, there are many loopholes and challenges of this project from lack of sufficient infrastructures like electricity, internet, funding, training, policies, and awareness among health workers and public, that questions the effectiveness and sustainability of the program.

Nepal is also one of the developing country among various other. It has already taken the first step in the development of telemedicine long time ago and now it has to focus little more to make it better. There are already many governmental and private organization working for

this. The development of this technology could help many villages and many patients that are living in the far isolated remote areas from the city. Especially in a nation like Nepal, where there is very different and difficult geographical condition, it would be very beneficial.

In conclusion, telemedicine can be used as a tool to improve health care all over Nepal. Telemedicine has the potential to address the issue of health care accessibility and availability. However, telemedicine programs need strong support from the Government for information infrastructure building and sustainability. There is also need for more research into the clinical and cost effectiveness in the context of Nepal to encourage more organizations to implement telemedicine. Despite the fact that most organizations have identified the needs and benefits for telemedicine implementation, they are in a dilemma because of lack of information and adequate infrastructures for telemedicine.

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