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Cardiac patients' willingness to use tele-health for cardiac rehabilitation and institutional readiness to adopt telemedicine in Sahid Gangalal National Heart Centre (SGNHC), Nepal

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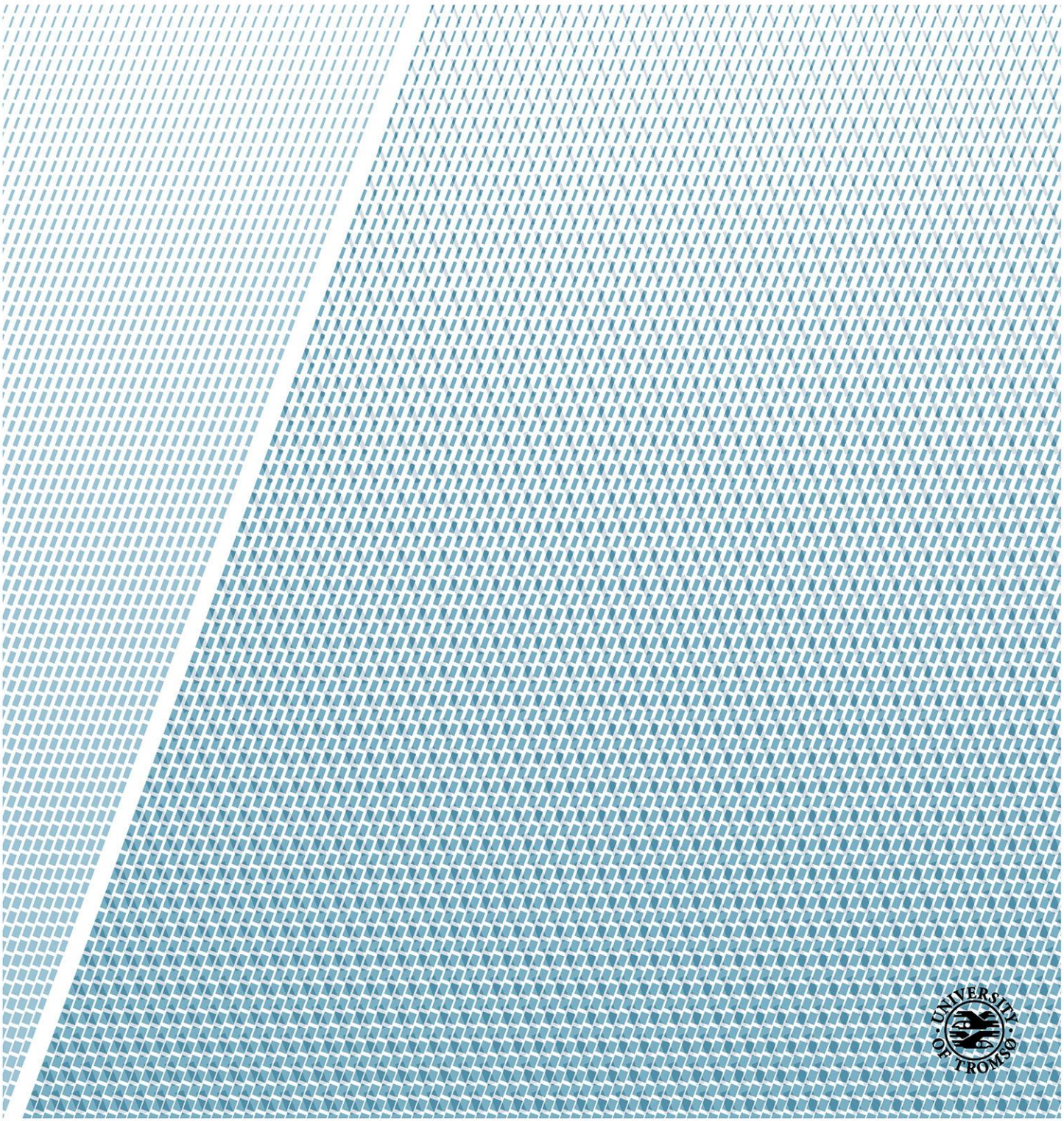
Master's Thesis in Telemedicine and E-health (TLM-3902)



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Acronyms

AHA: American Heart Association

BMI: Body Mass Index

CABG: Coronary Artery Bypass Graft

CCHP: Center for Connected Health Policy

CHD: Coronary Heart Disease

CR: Cardiac Rehabilitation

CVD: Cardiovascular Diseases

DALYS: Disability Adjusted Life Years

DoHS: Department of Health Service

FCHVs: Female Community Health Volunteers

HF: heart failure

HP: Health Post

ICD: implantable cardioverter-defibrillators

ICT: Information Communication Technology

ITU: Internation Telecommunciations Union

MDG: Millenium Development Goals

NCDs: Non-communicable diseases

NGO: Non-governmental Organization

NTA: Nepal Telecommunications Authority

NTC: Nepal Telecom Company

PCI: percutaneous coronary intervention

PHCC: Primary Health Care Centres

RHD: rheumatic heart disease

RTDF: Rural Telecommunications Development Fund

SAARC: South Asian Association for Regional Cooperation

SGNHC: Sahid Gangalal National Heart Centre

SHP: Sub Health Post

SMS: Short message Service

SPSS: Statistical Package for the Social Sciences

UTL: United Telecom Ltd

WHO: World Health Organization

Abstract

Objective: To study the willingness of the cardiac patients for tele-cardiac rehabilitation and to study the readiness of study institution for telehealth/e-health in general.

Methods: It is a cross sectional study conducted in Sahid Gangalal National Heart Centre (SGNHC) of Nepal, among 80 cardiac patients who are 18 years and above. The study in addition includes 30 health professionals. Questionnaire assessing demographic details, technology access and willingness to various forms of telehealth was used among patients while the validated 'e-health questionnaire for developing countries' was introduced among health professionals to study readiness of SGNHC on telehealth/e-health. Data were analysed using the Statistical Package for the Social Sciences (SPSS) version 23. Descriptive statistics for demographic variables and Chi-Square to examine the relationship between variables was used. Fisher exact test was used in case the assumption of chi-square test was violated. All *p* values quoted are two sided; with an alpha level set at 0.05.

Results: Among the total patients, 63% were male and majority aged 30 to 49 years. Majority of patients (61%) in this study had to travel more than 2 hours by bus to reach the hospital. 96% of the participants have access to mobile while fewer (30%) have access to internet. Substantial number of patient was willing to use telehealth in general and majority were willing to use mobile call for consultation/disease management. This study also found that the patients' willingness in using various forms of technology for telehealth were dependent on gender, presence of heart disease, income, medication, previous hospitalization access and skills in using mobiles and the Internet. In addition, the readiness score illustrates that SGNHC is progressing towards the telehealth/e-health.

Conclusion: With the rise in mobile users in the country and the substantial willingness of patients towards mobile based telehealth in this study, mhealth seems to be a promising measure to fill the gap in the existing healthcare and to increase the access of health care to rural people in Nepal.

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Chapter 1: Background

Cardiovascular diseases (CVDs)

According to the American Heart Association (AHA), cardiovascular diseases are the diseases of heart and blood vessels, many of which are related to a process called atherosclerosis. Atherosclerosis is a condition that develops when a substance called plaque builds up in the walls of the arteries. This build up narrows the arteries, making it harder for blood to flow through. The common CVDs include heart valve problems, arrhythmia, heart attack and stroke.

Overview of cardiac disease burden

Globally, more people die of cardiovascular disease than any other cause. An estimated 17.3 million people died from CVDs in 2008, representing 30% of all global deaths. In contrast to common conception, over 80% of CVD deaths took place in low- and middle-income countries among which an estimated 7.3 million were due to coronary heart disease (1). Though at global level, the age-standardized cardiovascular mortality rates per 100,000 inhabitants have decreased from 1990–2010, only high-income countries were able to reduce their CVD mortality substantially (highest by 42%). The regions sub-Saharan Africa, Southeast Asia, East Asia and Oceania, and Central Europe, Eastern Europe and Central Asia had decreased their mortality rates by 13% or less in the same period; however some of the countries within these regions for example Nepal showed no reductions in this indicator in the last 20 years (2). Besides being the leading cause of death, literature suggests that heart disease is a big economic burden in developing countries (3). Among various forms of cardiac diseases, rheumatic heart disease (RHD) is considered as a leading cause of premature death in developing nations (3) while heart failure (HF) has become a leading cause of

mortality and morbidity in Asia due to the epidemiological transition from infectious disease to lifestyle related diseases (4).

Healthcare services in Nepal

According to the Department of Health Service (DoHS) annual report 2013/2014 (5), the public service delivery outlets in the country includes 2247 Sub Health Post (SHPs), 1559 Health Post (HPs), 208 Primary Health Care Centres (PHCCs), 78 district hospitals, 10 zonal hospitals, 3 sub-regional hospitals, 3 regional hospitals and 8 central level hospitals. A Sub-health post is the first place where people come in contact for health services in rural areas. SHPs work as a referral centre of Female Community Health Volunteers (FCHVs) and community based activities by PHC outreach clinics and EPI clinics. Each level above is a referral point in a network from SHP to tertiary level hospital which is aimed at providing people health service as near to their residence as possible. This system also works as a supporting mechanism for lower level by providing necessary logistics, supervision and technical support.

The Government of Nepal recently introduced an updated National Health Policy in 2014, which includes various policies and strategies in favour of people's health. Providing basic health service for free, establishing effective health services that are accessible and equipped with essential drugs and skilled manpower and increasing private sectors involvement remains major objectives of the national health policy (6).

To promote the health through health education, information and communication, the Government of Nepal has set strategies on its national health policy (2013/2014) to develop a national health communication system to provide every citizen the access to the information related to works in health field with utmost priority to health education communication. The government also plans to

encourage all citizens to acquire information related to health with the maximum use of electronic media (6).

Since the formulation of the health policy in 1991, the Government of Nepal has been emphasising the provision of essential health services free of cost. One can find at least a health care centre, either SHP, HP or PHC, in every VDC (7). The abolition of user fees at peripheral facilities in the districts has led to a big increase in demand and a narrowing of inequity in utilisation of services (8). However, the free public health care service initiated by the public sector in 2007 covers only basic health services with 40 essential drugs, while people have to pay out of their pockets for private health facilities (8). In terms of total health expenditure, 80% comes from out-of-pocket payment (9). Along with the rise in private health sectors (10), the work force has also stagnated in the public sector, leading to an unequal distribution of skilled resources in all levels of healthcare and all regions of country. From 1995 to 2008, the private sector grew from 23% to 78% of all hospitals. Similarly, private hospitals beds are nearly double that of public hospital beds, most of which were located in central region, where the capital city Kathmandu lies. Whereas the far western development region, which is considered the least developed region, has virtually no private hospitals (11).

In terms of workforce, a majority of the doctors (60%) were working in the private sector. Of the 2,642 doctors employed in the private sector, approximately 60% were working less than 48 hours, indicating that they were working in both sectors (12).

Unfortunately, the problems in health care have not been fully resolved despite this network of healthcare initiated by government and surging increase of private sectors. Decentralization which was positively associated with increased service access and utilization and improved service delivery (13) has to be adopted throughout the country for making health service accessible to all.

Political instability, exacerbated by the economic crisis, rising food prices, constant power outages, street demonstrations and general lack of law and order, constitutes the health sector's backdrop of the recent past and, most likely, for the foreseeable future. There have been major accomplishments in a short time but there is much to be done if Nepal is to achieve its health sector goals and the Millennium Development Goals (MDGs). Failing to deploy and retain health care providers, particularly doctors and nurses in remote areas, persists and will continue to damage quality of care at Primary Health Care Centres (PHCCs) and district hospitals. Learning to partner more effectively with the private health sector and utilising its growing resources for training and expanding coverage of public programmes is expected to take more time (8).

CVD burden in Nepal

Though Nepal lacks national data on cardiac diseases, readmissions and recovery, there are evidences that have shown alarming prevalence of heart disease in Nepal (14-16). According to the estimate based on hospital reports, 38% of non- communicable diseases (NCDs) admissions in hospital are CVDs (17). Additionally, coronary disease is regarded as an emerging epidemic in Nepal (18).

There are various issues that underline the increasing burden of the cardiac diseases in Nepal. Firstly, management of CVDs in Nepal has characteristically been focused on treatment rather than education and preventive healthcare. We see a dramatic rise in the availability of interventional cardiology and cardiothoracic surgery services. Although these services are essential to save the lives of those who have heart disease, they have not helped to slow down the growing epidemic of CVDs in the country (19). The increasing annual numbers of hospital admissions with CVDs also supports that fact.

Secondly, the poor access to health care makes CVD a bigger problem. People in low- and middle-income countries often do not have the benefit of integrated primary health care programmes for early detection and treatment of people with risk factors compared to people in high-income countries (1). Though there are about 80 registered cardiologists in Nepal, 90% of them are confined to Kathmandu. The majority of the country which comprises villages lack the expertise and healthcare in these remote areas is provided mainly by auxiliary health staff who do not have the training needed to deal with CVDs in the primary healthcare that they provide (19). Moreover, along with the problem of distance and resources, work patterns, low income, lack of motivation, lack of knowledge makes people reluctant to seek healthcare on time.

Similarly, among those who get access to treatment and care, a catastrophic health spending is done especially in low income countries and the lack of health insurance shoots up the existing economic burden (20) On the other hand, the higher mortality rates related to CVD is directly a biggest developmental issue where many people die in their productive years due to late detection of disease (1). A high proportion of CVD burden occurs earlier among adults of working age in developing countries (21) and adults with cardiac disease are estimated to have lower functional capacity, quality of living and life satisfaction (22, 23). Stress of work is on the other hand expected to increase relative risk of recurrent Coronary Heart Disease (CHD) events by 65% (24).

In the same way, when we look at the evidences of higher readmission rates of cardiac patients (25, 26), an enormous time and cost is seemed to be spent because of the need to readmit a patient. In US, with substantial episodes of complications after post-mitral valve surgery, 10.2 to 19.3 day increase in hospital stay with $29,692 to $56,547 increase in cost was observed (27). Similarly substantial additional cost was estimated in a patient having complications post

Coonary Artery Bypass Graft (CABG) (28) and one receiving implantable cardioverter-defibrillators (ICD) (29). While CVD is itself an economic burden to an individual and a country, literature makes it clear that the cost of treating a cardiac related complication is higher than its treatment on first hand. Thus this very picture reflect the demand of solution not merely focused on the treatment of disease but maintenance of the cardiac function post treatment or post surgery. In other words, an effective cardiac rehabilitation could be a solution to the existing problem of increasing disease burden and health expenditure.

Cardiac rehabilitation (CR)

According to American Heart Association; 'Cardiac rehabilitation (cardiac rehab) is a professionally supervised program to help people recover from heart attacks, heart surgery and percutaneous coronary intervention (PCI) procedures such as stenting and angioplasty. Cardiac rehab programs usually provide education and counselling services to help heart patients increase physical fitness, reduce cardiac symptoms, improve health and reduce the risk of future heart problems, including heart attack'.

Cardiac rehabilitation is thus expected to work on those modifiable risk factors of heart disease which could be alleviated or removed. Those risk factors include (30)

Hypertension: it is regarded as the leading cause of CVD. Of nearly one billion people with hypertension around the world, 2/3 is in developing world.

Tobacco use: With nearly 1 billion smokers in the world today, tobacco is another leading cause of CVD.

Raised blood glucose: The risk of cardiovascular events is from two to three times higher in people with type 1 or type 2 diabetes. Patients with diabetes also have a poorer prognosis after cardiovascular events compared to people without diabetes.

Physical inactivity: People who are insufficiently physically active have a 20 to 30 per cent increased risk of all cause mortality compared to those who engage in at least 30 minutes of moderate intensity physical activity most days of the week

Unhealthy diet: High consumption of saturated fats and trans-fatty acids is linked to heart disease; elimination of trans-fat and replacement of saturated with polyunsaturated vegetable oils lowers coronary heart disease risk. Moreover, the amount of dietary salt consumed is an important determinant of blood pressure levels and overall cardiovascular risk. WHO recommends a population salt intake of less than 5 grams/person/day to help the prevention of CVD.

Cholesterol/lipids: Raised blood cholesterol increases the risk of heart disease and stroke. Globally, one third of ischaemic heart disease is attributable to high cholesterol. Overall, raised cholesterol is estimated to cause 2.6 million deaths (4.5 per cent of total) and 29.7 million Disability Adjusted Life Years (DALYS), or 2 per cent of total DALYS globally.

Obese/overweight: Obesity is strongly related to major cardiovascular risk factors such as raised blood pressure, glucose intolerance, type 2 diabetes and dyslipidaemia. Worldwide, at least 2.8 million people die each year as a result of being overweight or obese, and an estimated 35.8 million (2.3 per cent) of global DALYs are caused by overweight or obesity. To achieve optimal health, the median Body Mass Index (BMI) for adult populations should be in the range of 21–23 kg/m2 , while the goal for individuals should be to maintain a BMI in the range 18.5– 24.9 kg/m2

While cardiac rehabilitation (CR) or a continuous patient care is expected to improve outcome, reduce readmissions and improve mortality (31-34), various underlying factors are found to cause non-participation as well as withdrawal from the rehabilitation program for e.g. antidepressant medication, marital status and obesity (35), low gross income and single living, lack of motivation to exercise, lack of knowledge about rehabilitation, low income, and having a large extended

family (36, 37), travel distance, work patterns, physical discomfort, and dependency (38). Domestic duties in women and ill health in ethnic minority patients were also found as common reasons for non-adherence to CR program (39), Moreover lack of capacity of a hospital despite many eligible patients is another hindrance to effective CR programs (40). In Nepal, because of the limited resources is even inadequate to the acute patients, rehabilitation is thus overlooked. Knowing that cardiac rehabilitation is an important aspect of care for cardiac patients, an alternative to centre based rehabilitation should be adopted to overcome the aforementioned barriers that persist in current rehabilitation process. The alternative could be the adoption of a feasible ICT (Information Communication Technology) to reach the patients at home. Several studies in the past have hypothesized the benefit of technology-based tools in the process of cardiac rehabilitation. A need of cost-effective equitable health care innovations in CHD prevention and monitoring of the trend of CHD has already been recommended by previous study (41).

ICT status- Global vs. national

According to the report from International Telecommunications Union (ITU), there has been a tremendous growth in ICT access and connectivity to people because of progress in technology, infrastructure deployment and falling prices. The mobile cellular subscribers reached to 7 billion in 2015 from 1 billion in 2000 while internet penetration increased 7 fold from 6.5% to 43%. Worldwide, 3.2 billion people are using internet among which 2 billion are from developing countries. However, 2/3 of the population in the developing countries is still offline. The proportion of households with Internet access at home increased from 18% in 2005 to 46% globally in 2015.By end 2015, while 34% of households in developing countries have Internet access, compared with more than 80% in developed countries (42).

Mobile broadband is regarded as the most dynamic market segment which reached 47% in 2015, increasing 12 times since 2007, and the highest being in Europe and the Americas, at around 78

active subscriptions per 100 inhabitants. The average monthly price for fixed broadband is 3 times higher than in developing countries than in developed countries; while mobile broadband prices are twice as expensive as in developed countries. Though the prices of fixed broadband plans dropped sharply between 2008 and 2011 in developing countries, there has been no change lately (42) .

In the context of Nepal, the mountainous topography along with political turmoil and economic instability has made it extremely difficult to develop its telecommunications infrastructure. The Nepal Telecom Company (NTC) which held monopoly for several years has been the major builder and operator. With the licensing of United Telecom Ltd (UTL), Nepal Telecom lost its monopoly on basic telecom services a little more than a decade ago. It subsequently surrendered its monopoly on mobile services with the licensing of Spice Nepal Pvt Ltd, later known as Ncell, in 2004. The period after 2006 saw notable growth in subscriber raising the mobile penetration from 5% in 2007 to 95% in 2015. However the disparity in the coverage between rural and urban region still persist. Mobile penetration was set to pass 100% in second half of 2015. While broadband represents a high proportion of total fixed Internet connections, fixed Internet subscriptions remain low overall. In just 4 years mobile broadband subscriber numbers had hit 5 million (penetration of 17%) (43). Based on an objective assessment of needs and priority, the Federal Democratic Republic of Nepal was one of four countries selected by the ITU (the others being, Myanmar, Samoa, and Viet Nam) to develop a national pilot wireless broadband masterplan. Nepal presents itself as an ideal candidate for the wireless broadband masterplan given its topology and relatively underdeveloped fixed-line infrastructure. Broadband networks allow a country to deliver various important services including telemedicine/telehealth. Improving broadband is now an international focus of development work including and broadband targets being incorporated within the UN Millennium Development Goals (44).

Along with the formal adoption of the National Broadband Policy in April 2015, the NTA is continuing to use the Rural Telecommunications Development Fund (RTDF) to help build a national optical fibre network. The government was moving slowly in preparing the way for the auction of 4G wireless spectrum and it has planned to spend NPR1.48 billion (US$14 million) from the RTDF in the fiscal year to July 2016 (43).

Definition of Tele-health/Telemedicine

According to the American Telemecine Association, "*Telemedicine is the use of medical information exchanged from one site to another via electronic communications to improve a patient's clinical health status. Telemedicine includes a growing variety of applications and services using two-way video, email, smart phones, wireless tools and other forms of telecommunications technology" (45).*

Telemedicine, telehealth and e-health, however, been used interchangeably used in the literature and evidence suggests that these terms are ambiguous and lack clarity (46, 47). According to Centre for Connected Health Policy (48), telemedicine is often used when referring to traditional clinical diagnosis and monitoring that is delivered by technology while telehealth is more commonly used to describe the wide range of diagnoses, management, education and other related fields of health care.

According to CCHP, *"Telehealth is a collection of means or methods for enhancing health care, public health and health education delivery and support using telecommunications technologies." (48)*

Telehealth could be understood as a way of increasing the contact between a patient and the medical system which can bring additional expertise to consult on a case, reach out to patients when they're at home or save travel time and expense for both practitioners and patients (49).

Types of telehealth

Four main types/modes of telehealth are commonly found; Teleconsultation, Teleeducation, Telemonitoring and Telesurgery (50).

Teleconsultation: A negotiation about health and disease that occurs between carers with or without patient involvement is basically teleconsultation, a telephone conversation being the simplest example. It is a real time approach of consultation despite the fact that the two parties are not face-to-face. Teleconsultation in other words is a synchronous telehealth approach which is live, bi-directional, video-based encounter between patient and provider for consultations, health exams, health education and training, and patient observation – even monitoring patients in an intensive care unit (50-52)

Telemonitoring: This approach of telehealth allows one to repeatedly collect data on patient's condition. The transmission of data could either be manual where a person communicates the data through telephone or computer or it could be entirely automated allowing the continuous transmission of data on real time. Cardiac patients who demand a continuous monitoring of their blood pressure, medication and blood values could be especially benefited by telemonitoring (50, 51) .

Teleeducation: whenever teleconsultation takes place involving a health care professional and an expert consultant, there is an opportunity for education to occur. Teleeducation provides an opportunity to exchange health and disease related information at low cost (50, 51).

Telesurgery: it includes two approaches: telementoring; which refers to the use of video and audio connections by specialist to assists surgeons carrying out a surgery in a remote location and telepresence surgery; which guides robots to carry out remote surgery (51).

Technology in cardiac rehabilitation

While there are various technological innovations (mobile, internet, mobile Apps, videoconferencing etc), not all methods could be appropriate for certain service and its users.

Mobile phones are becoming increasingly important in the delivery of health information and health care, especially in developing countries, where a general lack of infrastructure may be conducive to a rapid adoption of mhealth solutions (53, 54). Using mobile phones for health purposes is often referred to as 'mhealth'(54, 55). Mobile phones may be used in different ways for health purposes. The simplest use implies calling or texting (i.e. using SMS), while more advanced solutions demand Internet connectivity.

Mobile phones have proven important also for cardiac patients (56). For e.g.: studies on 'mhealth' based CR program concluded that mhealth has potential to improve the delivery of CR (57, 58). Similarly, a cardiac rehabilitation program delivered exclusively through the Internet to patients in small urban and rural locations was found safe and effective at providing sustainable improvements in exercise capacity and reductions in CVD risk, suggesting that a low-cost technology such as the Internet can be used safely and effectively in remotely delivering cardiac rehabilitation (59). Another study shows a promising results of a web-based nursing intervention to influence patient's involvement in postoperative pain management (60). Similarly, over half of patients with heart failure in an urban, largely African American community showed an interest in participating in a text-messaging program following discharge (61). As the introduction of telehealth in CR process means few resources, less time and a low cost technology, it is expected to encourage people to participate more and also lower the cost involved. A review done on task shifting interventions for cardiovascular risk reduction in low-income and middle-income countries also came up with a

conclusion that telephone follow-up after hospital could be one of the interventions in reducing cardiovascular risk (62). Therefore, it can be assumed that telehealth could provide patients an easy access to care and to replace the shortage of human resources.

Telemedicine status in Nepal

According to WHO, the established telemedicine services ranges 20-60% in high income countries, while it ranges only 10-20% in upper-middle, lower-middle and low-income countries. According to the report this disparity itself explains how the constrained resources and money have hindered uptake of telemedicine in poor countries (63).

The history of Telemedicine in Nepal dates back only couples of years with few pilot projects and very few sustained projects. Therefore we find minimal literatures on telemedicine in Nepal. According to the available literature, the concept of 'technology' in the field of health might have been introduced in Nepal with the establishment of HealthNet in 1995 (64). HealthNet Nepal is a non-governmental organization (NGO) that provides affordable Internet services to the Nepalese health community, access to health information and technical support for various regional information-sharing initiatives. It has developed its own software, called Hnet telemedicine (65). Because of poor economic status, difficult geographical terrain and information poverty as mentioned in many literatures, telemedicine in Nepal is considered something challenging. In Nepal, the real time telemedicine is not yet in practice, it is only the store and forward method that has been tested in various pilot projects. According to Pradhan MR, the Swinfen Charitable Trust helped establish a link to send high-resolution digital image in Patan Hospital Kathmandu, Nepal in March 2000. Over 12 months of using this link, 42 telemedicine referrals were sent to specialists throughout the world including 36% respiratory medicine; 21% neurology, 21% dermatology; 14% cardiology; 5% nephrology; and 3% radiology-28 had digital pictures attached, of which 96% were of high enough quality on which specialists were able to comment. With 39 respondents, the

average time for a specialist reply was 2 days, and 45% were answered within 24 hours. All replies were judged by independent assessors to be helpful or very helpful for diagnosis, management and education. The assessors decided that in 50% of cases the advice if acted upon would have shortened hospital stay. This pilot study thus concluded that a low-cost telemedicine link is technically feasible and can be of significant benefit for diagnosis, management and education in a developing nation (64).

As mentioned in the book 'Telehealth in the developing world' (65), a pilot telemedicine network was later implemented from July 2004 to December 2006, financed by the PAN Asia programme of the IDRC, Canada. The following hospitals referred cases for telemedicine:

• AMDA Hospital, Damak (eastern region)

• Siddhartha Children's and Women Hospital, Butwal (western region)

• Siddhi Memorial Hospital, Bhaktapur (central region).

Specialist expertise was provided from the following central-level hospitals located in Kathmandu:

Teaching Hospital, Tribhuvan University (Department of Radiology and Dermatology)

• Kathmandu Medical College (Department of Pathology and Department of Dermatology)

• Sahid Ganga Lal National Heart Centre. (Study Site)

Experts were chosen based on the physician's willingness to participate in the project and better knowledge of IT, while the local hospitals were chosen based on the size and location.

According to the source, the availability of telemedicine increased the volume of teleconsultation and provided exposure to a rural community for the medical interns of medical colleges. It also provided continuing education and reduced the professional isolation of health professionals working in rural areas. All these factors improved the quality and efficiency of the health service.

With the use of telemedicine, access to the literature through the HINARI system of the World Health Organization was also increased.

The study done to assess whether telemedicine based on store-and forward technology would be satisfactory for the diagnosis of cases sent from remote rural areas resulted into 218 cases in total in the specialties of dermatology, radiology, pathology and cardiology. There was no difference in the diagnosis among primary care physicians and expert doctors, which supports the view that textual information supplemented by images is sufficient for diagnosis. It further helped primary care physicians to interact with medical experts and thus helped to reduce the professional isolation of health care staff working in rural areas. The study also mentioned that technophobia which was present among health professionals in rural areas were able to overcome the fear with IT training courses and further encouraged to use IT. The adoption of videoconferencing and hospital information system was further suggested by the users in this study.

Though, few attempts to bring telemedicine into healthcare system were tried ahead, the effort from government level was made lately in 2011 by inauguration of SAARC telemedicine project with the help of government of India. The telemedicine centre was inaugurated at Patan Hospital and is aimed at receiving consultation and continuous medical education services from two specialized hospitals of India. At present, the Government of Nepal has started the rural telemedicine program in 30 remote district hospitals with the aim of providing access to specialized health care services including emails, telephone and videoconferencing facilities for consultation and supply of materials. The response to the program from different districts and its effectiveness is yet to be seen. Besides this, some attempts have been made from individual level to build health apps in Nepal lately. Though such apps seem to attract the new generations and are slowly in a phase of

using them, the uptake until now is very less possibly because of expensive cellular networks and people's perception.

Though many attempts have been made to bring technology into health system, no projects have been sustainable so far.

Barriers to telehealth/telemedicine

The reasons for not effectively adopting technologies in health care are not alike when it comes to different countries. According to the survey made by (63), low- and lower-middle income countries were generally more likely to consider the perceived high costs of telemedicine solutions, an underdeveloped infrastructure, and a lack of technical expertise and support for telemedicine systems to be barriers to its implementation than developed countries. They were also more likely than upper-middle and high-income countries to report that not having a national policy or strategy that included telemedicine solutions as a viable solution to health issues, was a barrier to implementation. Low-income countries were more likely to identify a lack of knowledge of telemedicine applications available for patient treatment as a barrier. Moreover, developing countries were more likely to report a lack of legal policies or guidelines on privacy and confidentiality of patient information in telemedicine, and competing priorities within their health systems, and a perceived lack of demand for telemedicine solutions by health professionals to be barriers to telemedicine (63).

Particularly, in the context of Nepal, a lack of continuous electricity supply, inaccessible geographical terrain, non-uniformity in the construction of infrastructure, a lack of knowledge and a lack of motivation seem to be barriers to telemedicine (66). According to the personnel from the

government level, the low budget of government and poor governmental coordination is a barrier to implementing the latest technologies (67).

Besides the above mentioned barriers, lack of readiness studies could be one of the reasons behind the failure of multiple pilot projects and the poor acceptance of any programs. Issues like standardization and integration have been considered important in order to interconnect both human and non-human heterogeneous actors in the network (68). Regarding challenges to changing large scale information systems, a study mentions that infrastructures are developed as an extension to an already existing one, new layers connected to existing ones, and it is a continuous process (68).

Importance of readiness studies

For any project, a prior study of readiness in terms of users and infrastructure is determined as an important precursor to the success of the related project. It is also assumed to save time and money. For an integration of telehealth especially into any clinical practice and health organisation, it is deemed necessary that decision makers take account of the conditions that could influence the integration process. Strategies addressing the underlined conditions are therefore expected to facilitate the uptake of the planned project or technology (69). A study by Jennett et al discusses various models used in telehealth readiness studies and concludes three themes common to those studies i.e. 1) an appreciation of practice context 2) strong leadership 3) a perceived need to improve practice. Acording to the author, practice involves a clear awareness of both the benefits and risk of telehealth in particular setting for eg resistance to change, demands on time, inefficient technology and funding. Similarly, the strong leadership theme referred to ownership, early adopters, innovators and champions who are enthusiastic in promoting telehealth within their organisation (70). In an organization level, readiness for change refers to organizational members'

commitment to change and shared belief in their collective capability to do so. Organizational readiness for change varies as a function of how much organizational members value the change and how favourably they appraise three key determinants of implementation capability: task demands, resource availability, and situational factors. Members are more likely to initiate change, exert greater effort, exhibit greater persistence, and display more cooperative behaviour when organizational readiness for change is high resulting into an effective implementation of the planned project (71).

Objectives of the study

General

To study the willingness of the cardiac patients for tele-cardiac rehabilitation and to study the readiness of study institution for telehealth/e-health in general.

Specific

- To study the willingness of cardiac patients in using telehealth for consultations/disease management
- To study the patient's willingness in using various forms of telehealth
- To assess the readiness of Sahid Gangalal National Heart Centre (SGNHC) for telehealth/e-health in general.

Chapter 2: Methods

Settings and Subjects

In this cross sectional study, a survey was conducted in Shahid Gangalal National Heart Centre, the busiest heart centre of Nepal, established in 1995, providing specialist care in the field of cardiology and cardiac surgery.

A convenience sample of 80 patients was selected from the outpatient department of 'Sahid Gangalal Heart Centre' to participate in this survey. The study mainly includes a heart patient coming to OPD on his/her follow up visit. Patients below 18 and those with cognitive impairment were not included in the study. A written consent was obtained and the participants were given a brief explanation about the questionnaire in a group before they answered the questionnaire. Some of the older candidates were helped either by their family members or the researcher in filling out the questionnaire. This study also includes 30 managerial level health professionals from the same institution in an attempt to explore institutional readiness to telehealth in general.

Measurement instrument

This study basically includes two questionnaires; one for patients and one for health professionals (see Appendix). The questionnaire for patients was prepared based on various literatures on readiness and it is therefore used for the first time. The questionnaire includes demographic details, and the information on respondent's access to technology like mobile phones and Internet, and their willingness to use various forms of telehealth for consultation/disease management. Most of the

questions were Yes/No questions with the possibility to put their other opinion regarding telehealth at the end of the questionnaire. Likewise the second questionnaire introduced among health professionals was a structured e-health readiness questionnaire for developing nations that was developed and validated by Khoja (72) . It consisted of 60 statements about the preparedness of a health institution for telehealth, which has been used in previous e-health readiness studies and has a good reliability (Chronbach's alpha = 0.94). The questionnaire assesses five e-health readiness domains; core, technical, learning, societal and policy readiness. The respondents were supposed to rate each statement on a five point likert scale. Responses ranging from strongly disagree to strongly agree were coded from 0 to 5 resulting in a max score of 300. The higher the score, the more institution was supposed to be ready for telehealth. Scores above 150 were considered to represent moving towards e-health readiness while lower scores mean a lack of readiness. There had been confusion in inclusion of 'don't know' response in earlier studies. A score of three, as a neutral response is given in this study as suggested in Jennifer Chips 2012 (73).

Research approval

The research approval was granted by Sahid Gangalal National Heart Centre (SGNHC) and National Health Research Council of Nepal (NHRC) (see Appendix). The project proposal was approved by the review committee of NHRC after several revisions. The topic of the study was hence slightly modified after the review keeping intact the objectives and measurement tools.

Pretest

A pretest of a questionnaire was done among the patients to verify the patients understanding of the items on the one hand and in an attempt to check the validity and reliability of the tool on the other hand. Some small corrections were made afterwards for clarity.

Statistical Analysis

Data were coded and analysed using the Statistical Package for the Social Sciences (SPSS) version 23 for Windows. Data were analysed using descriptive statistics for demographic variables and Chi-Square to examine the relationship between certain demographic variables and patients' willingness to use various modes of telehealth. Fisher exact test was used in case the assumptions of chi-square test was violated. All *p* values quoted are two sided; with an alpha level set at 0.05.

Chapter 3: Results

From questionnaire to patients

Table 1: Demographic characteristics of the participants

Characteristics	Frequency	Percent
Gender		
Male	50	62.5
Female	30	37.5
Age		
18 to 29	15	18.8
30 to 49	30	37.5
50 to 64	19	23.8
65+	16	20.0
Educational Level		
No schooling	7	8.8
Primary school	21	26.3
Higher secondary	32	40.0
university level	20	25
Monthly Income		
Below 20,000	53	66.3
20000 to 50,000	21	26.3
50,000+	6	7.5
Residence		
Within Kathmandu	23	28.7
Outside Kathmandu	57	71.3
Distance to hospital		
Walking distance	4	5.0
1-2 hours in a bus	27	33.8
>2 hours in a bus	49	61.3

As seen in Table 1, there were more male patients participating in this study than females with the age ranging from 18 to 65 over. The majority of the participants had high school education. Most of them have income less than 20,000 per month. Though 10,000-20,000 is regarded as an average monthly income in Nepal, it is no longer enough for a better living due to price hikes. 71% of the participants were residing out of Kathmandu and 61% had to travel by bus more than 2 hours to reach the hospital.

Table 2: Health status and health habits of the participants

Variable	Frequency	Percent
Heart disease		
Yes	56	70.0
No	24	30.0
Duration of disease		
Less than 1 year	11	13.8
1 to 5 years	20	25
Above 5 years	25	31.5
Hospitalization		
Yes	36	45
No	44	55
Heart surgery		
Yes	22	27.5
No	58	72.5
Rehospitalisation		
Yes	6	7.5
No	74	92.5
Smoking		
Yes	2	2.5
No	57	71.3
Previous smoker	21	26.3

Variable	Frequency	Percent
Alcohol		
Yes	7	8.8
No	56	70.0
Previous user	17	21.3
Under medication for heart dz		
Yes	53	66.3
No	27	33.8
Medication regularity		
Quite regular	56	70.0
Forget sometimes	5	6.3
Daily exercise		
Yes	31	38.8
No	49	61.3
Knowledge on diet restriction		
Yes	52	65.0
No	28	35
Multiple diseases		
Yes	31	38.8
No	49	61.3

Table 2 illustrates that among the respondents, 70% were old cases of heart disease while 30% were in the OPD because they were either referred by general physicians or just came for screening. Among the diagnosed cases, 39% had had heart surgery and the rest were medical cases. Majority of the cases had been living with heart disease for more than 5 years. Among the total respondents, 45% had been hospitalized before and 66% were currently under medication for heart disease. Most of the participants were regular in medication intake with a few (6.3%) being forgetful. There were, however, very few cases of re-hospitalization. Surprisingly, the majority of the total number of participants were non-smokers (71%) and did not drink alcohol (70%). Only

39% of participants said that they do exercises daily. However, 65% said that they have knowledge on diet restriction.

Table 3: Access to technology

Variable	Frequency	Percent
Do you have a mobile phone?		
Yes	77	96.3
No	3	3.8
Do you have a landline phone?	30	37.5
Yes	30	37.5
No	50	62.5
Can you send messages from your mobile?		
Yes	52	65.0
No	28	35.0
Do you have access to the Internet at home?		
Yes	24	30.0
No	56	70.0
Can you use the Internet?		
Yes	30	37.5
No	50	62.5
Have you heard about health apps?		
Yes	5	6.3
No	69	86.3
Do you currently use any health apps?		
Yes	5	6.3
No	75	93.8
Do you use any electronic health devices?		
Yes	32	40.0
No	48	60.0
If yes, what devices		
Blood sugar measuring device	11	13.8
Blood pressure measuring device	15	18.8
Both blood sugar and blood pressure device	6	7.5

As shown in Table 3, 96% of the participants owned a mobile phone among which 65% were able to send a message from their mobiles. Only 30% had Internet access at home while 37% had skills using the Internet. Few participants had heard about health applications (6.3%) and very few were currently using one or other health apps. 40% of the participants were using electronic health devices, most of them using either a blood pressure device or a blood sugar device or both.

Chart 1: Barriers to hospital visits

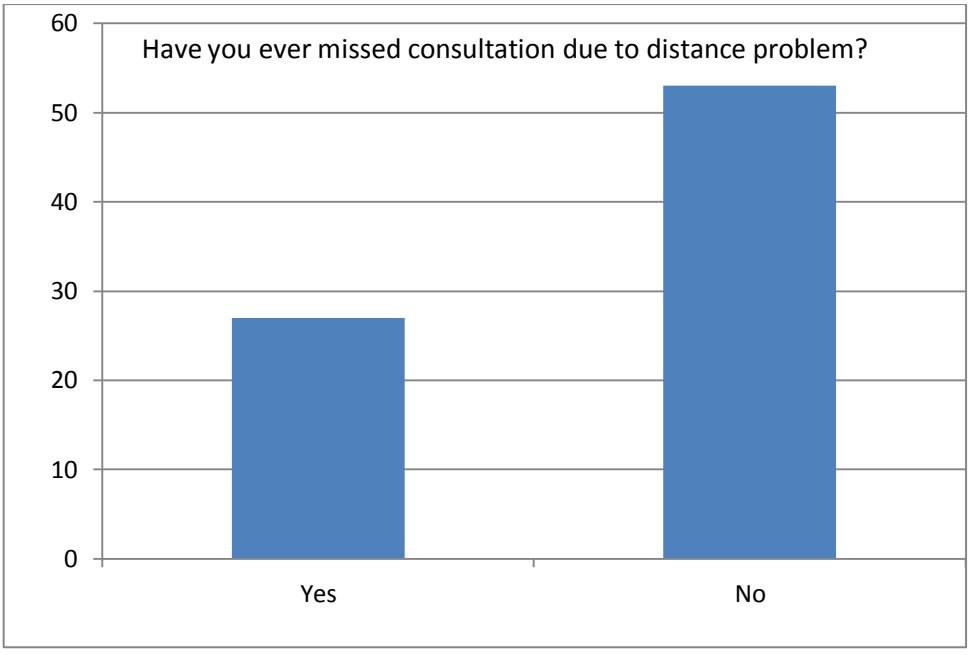
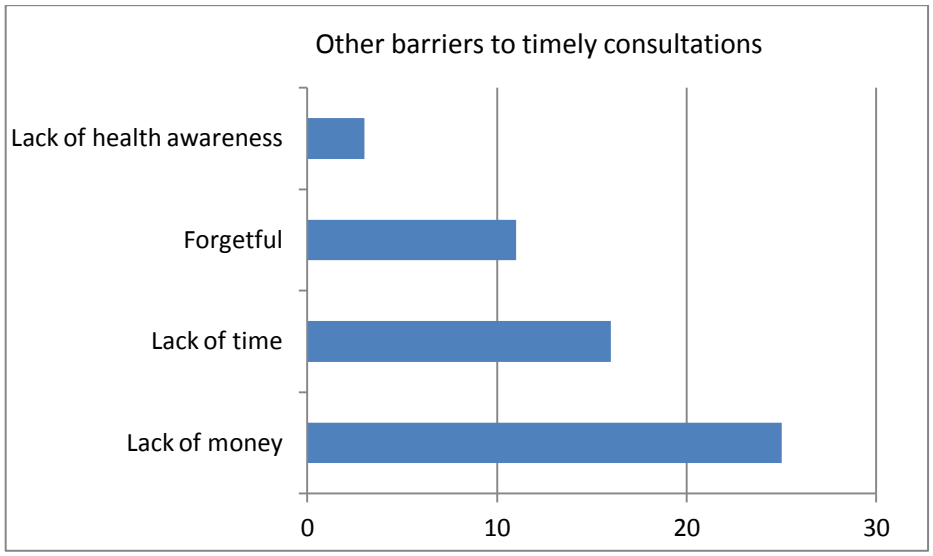


Chart 2: other barriers to timely consultations



According to Chart 1, 27 out of 80 participants (33.8%) had missed consultations because of long distance. Other potential barriers mentioned by participants were (see chart 2): lack of money (25 out of 55), lack of time (16 out of 55), forgetful (11 out of 55) and lack of health awareness (3 out of 55).

Table 4: Willingness to use telemedicine in general and various approaches

Variable	Frequency	Percent
Are you willing to use telemedicine?		
Yes	77	96.3
No	3	3.8
Are you willing to use mobile-SMS for consultation/disease management?		
Yes	17	21.3
No	63	78.8
Are you willing to use mobile calls for consultation/disease management?		
Yes	52	65.0
No	27	33.8
Are you willing to use mobile apps for consultation/disease management?		
Yes	7	8.8
No	73	91.3
Are you willing to use email for consultation/disease management?		
Yes	3	3.8
No	77	96.3
Are you willing to use videoconferencing for consultation/disease management?		
Yes	13	16.3
No	67	83.8

According to Table 4, substantial number of patient was willing to use telemedicine in general (77 out of 80) for consultation/disease management. While there have been varying responses on willingness to use various forms of tele-health. For example: A majority of the participants were willing to use mobiles calls (65%), fewer were interested in using SMS (21%), and

videoconferencing (16%) and very few were willing to use mobile apps (8.8%) and email (3.8%). When participants were asked what telehealth would be appropriate to use for, a majority (62.5%) responded that it would be appropriate for gaining information on diseases, 63% thought it would be appropriate for daily consultations, 55% voted for counselling on diet, and 40% for medication counselling and only 32.5% thought it would be appropriate for booking appointments.

Table 5: What the participants think telemedicine is appropriate to use for

Variable	Frequency	Percent
Counselling on medication		
Yes	32	40
No	48	60
Counselling on diet		
Yes	38	47.5
No	42	52.5
Information on diseases		
Yes	50	62.5
No	30	37.5
Booking an appointment		
Yes	26	32.5
No	54	67.5
Daily consultations		
Yes	44	55.0
No	36	45.0

Table 5 presents the response of participants on which aspect they think telehealth is appropriate to use for. The majority (62.5%) of the participants responded that telehealth is appropriate to obtain information on disease, 55% agreed that it is appropriate to use for daily consultations, 47.5% agreed on counselling on diet, 40% agreed on counselling on medicine and 32.5% on booking an appointment.

Table 6: Chi-square test results

Table 6.1: Relationship between demographic variables and willingness to use telehealth in general and various forms of telehealth

Characteristics	Willingness to use telehealth in general for consultation/disease management				Total		Test of significance
	Yes		No				P value
	N	%	N	%	N	%	
Knowledge on diet							
Yes	52	100%	0	0	52	100%	0.04
No	3	10.7%	25	27.9%	28	100%	
Multiple disease							
Yes	28	90.3%	3	9.7%	31	100%	0.055
No	49	100%	0	0.0%	49	100%	
Can you text from mobile?							
Yes	52	100%	0	0.0%	52	100%	0.040
No	25	89.3%	3	10.7%	28	100%	

Table 6.2: Relationship between demographic variables and willingness to use mobile-SMS for consultation/disease management

Characteristics	Willingness to use mobile-SMS for consultation/disease management				Total		Test of significance
	Yes		No				P value
	N	%	N	%	N	%	
Gender							
Male	15	30%	35	70.0%	50	100%	0.014
Female	2	6.7%	28	93.3%	30	100%	
Income per month							
Below 20,000	7	13.2%	46	86.8%	53	100%	0.018
20-50,000	9	42.9%	12	57.1%	21	100%	
50,000+	1	16.7%	5	83.3%	6	100%	
Previous hospitalization							
Yes	3	8.3%	33	91.7%	36	100%	0.011
No	14	31.6%	30	68.2%	44	100%	
Can you text from your mobile?							
Yes	17	32.7%	35	67.3%	52	100%	0.001
No	0	0.0%	28	100%	28	100%	
Internet skills?							
Yes	10	33.3%	20	66.7%	30	100%	0.041
No	7	14.0%	43	86.0%	50	100%	

Table 6.3: Relationship between demographic variables and willingness to use mobile call for consultation/disease management

Characteristics	Willingness to use mobile call for consultation/disease management?				Total		Test of significance
	Yes		No				P value
	N	%	N	%	N	%	
Age							
18 to 29	7	46.7%	8	53.3%	15	100%	0.033
30 to 49	16	55.2%	13	44.8%	29	100%	
50 to 64	15	78.9%	4	21.1%	19	100%	
65+	14	78.9%	2	12.5%	16	100%	
Income per month							
Below 20,000	41	77.4%	12	22.6%	53	100%	0.003
20-50,000	7	35.0%	13	65.0%	20	100%	
50,000+	4	66.7%	2	33.3%	6	100%	
Heart disease							
Yes	41	74.5%	14	25.5%	55	100%	0.013
No	11	45.8%	13	54.2%	24	100%	
Under medication							
Yes	40	76.9%	12	23.1%	52	100%	0.004
No	12	44.4%	15	55.6%	27	100%	
Do you have mobile?							
Yes	52	68.4%	24	31.6%	76	100%	0.037
No	0	0.0%	3	100%	3	100%	
Can you text from your mobile?							
Yes	28	54.9%	23	45.1%	51	100%	0.006
No	24	85.7%	4	14.3%	28	100%	
Do you have access to the Internet at home?							
Yes	7	30.4%	16	69.6%	23	100%	0.000
No	45	80.4%	11	19.6%	56	100%	
Internet skills?							
Yes	9	31.0%	20	69.0%	29	100%	0.000
No	43	86.0%	7	14.0%	50	100%	

Table 6.4: Relationship between demographic variables and willingness to use mobile-App for consultation/disease management

Characteristics	Willingness to use mobile App for consultation/disease management?				Total		Test of significance
	Yes		No				P value
	N	%	N	%	N	%	
Heart disease							
Yes	2	3.6%	54	96.4%	56	100%	0.23
No	5	20.8%	19	79.2%	24	100%	
Previous hospitalization							
Yes	0	0.0%	36	100%	36	100%	0.015
No	7	15.9%	37	84.1%	44	100%	
Under medication							
Yes	1	1.9%	52	98.1%	53	100%	0.005
No	6	22.2%	21	77.8%	27	100%	
Do you have access to the Internet at home?							
Yes	5	20.8%	19	79.2%	24	100%	0.023
No	2	3.6%	54	96.4%	56	100%	
Heard about health apps?							
Yes	3	27.3%	8	72.7%	11	100%	0.051
No	4	5.8%	65	94.2%	69	100%	

Table 6.5: Relationship between demographic variables and willingness to use email for consultation/disease management

Characteristics	Willingness to use email for consultation/disease management?				Total		Test of significance
	Yes		No				P value
	N	%	N	%	N	%	
Gender							
Male	0	0.0%	50	100%	50	100%	0.049
Female	3	10.0%	27	90.0%	30	100%	
Heart disease							
Yes	3	9.7%	28	90.3%	31	100%	0.055
No	0	0.0%	49	100%	49	100%	
Do you have access to the Internet at home?							
Yes	3	12.5%	21	87.5%	24	100%	0.025
No	0	0.0%	56	1005	56	100%	
Internet skills?							
Yes	3	10.0%	27	90.0%	30	100%	0.049
No	0	0.0%	50	100%	50	100%	

Table 6.6: Relationship between demographic variables and willingness to use video-conferencing for consultation/disease management

Characteristics	Willingness to use video- conferencing for consultation/ disease management?				Total		Test of significance
	Yes		No				P value
	N	%	N	%	N	%	
Gender							
Male	0	0.0%	50	100%	50	100%	0.049
Female	3	10.0%	27	90.0%	30	100%	
Multiple disease							
Yes	3	9.7%	28	90.3%	31	100%	0.055
No	0	0.0%	49	100%	49	100%	
Do you have access to the Internet at home?							
Yes	3	12.5%	21	87.5%	24	100%	0.025
No	0	0.0%	56	100%	56	100%	
Internet skills?							
Yes	3	10.0%	27	90.0%	30	100%	0.049
No	0	0.0%	50	100%	50	100%	

Table 6 presents the relation between various demographic variables and respondent's willingness on using telehealth in general and its various forms for consultation/disease management. According to the table, there is evidence of a relationship between the 'patients willingness to use telehealth in general' and the variables; 'previous knowledge on diet' (0.04), 'multiple disease' (0.05) and 'ability to text' (0.04). The result further suggests that having knowledge on using technology; ability to text is important in terms of being willing to use telehealth. Similarly there is a significant association between 'willingness to use mobile SMS' and the variables 'gender' (0.014), 'monthly income' (0.018), 'previous hospitalization' (0.011), 'ability to text' (0.001) and 'Internet skill' (0.041). Moreover, the 'willingness to use mobile call' is dependent on the variables 'age' (0.033), 'income' (0.033), 'heart disease' (0.013), 'under medication' (0.004), 'access to mobile' (0.037), 'ability to text' (0.006), 'Internet access' (0.000) and 'Internet skill' (0.000) . Likewise, patients 'willingness to use mobile app' was significantly associated to variables like 'heart disease' (0.023), 'previous hospitalization' (0.015), 'under medication' (0.005), 'access to Internet' (0.023), 'familiarity to health app' (0.051). In the same way, patients 'willingness to use email' was significantly associated with variables 'gender' (0.049), 'presence of heart disease'(0.055), 'access to Internet' (0.025) and 'Internet skill' (0.049). Lastly, there was evidence of relation between 'willingness to use video conferencing' and variables 'gender' (0.049), 'multiple disease' (0.055), 'access to Internet' (0.025) and 'Internet skills' (0.049).

Some of the views and statements of the patients during the interview is mentioned below

'I am not sure if consulting a doctor through telecommunication media would be a better alternative to face to face, I feel safer to meet a doctor in person.'

-Anonymous

'I am here because I am out of my medicine (blood thinner). I lost my prescription to buy it from nearby store and I am not confident about the name and dose to buy from nearby store. So, I had to come here to ask again. It would have been great to be able to talk to doctor or nurse from home and get hold of medicine from nearby store.'

-Anonymous

'Talking to doctor and nurse in a phone or SMS about the patient condition and suggestions does not sound so appealing to me. May be it is because we have never used it. '

-Anonymous

'I have to travel often to Kathmandu from Butwal with my father because he wants to come and talk to his cardiologist just to hear from him that everything is in control'.

-Anonymous

'I would feel more secured to see the person I am talking to than talking in a phone. Video-conferencing could be a good replacement for people like me who have to travel so long just for follow up visits'.

-Anonymous

'I am not good at using mobile and internet, consulting with health professionals by the use of telecommunication media would be more stressful'.

-Anonymous

'It sounds good but I am afraid it cost more than what I have to spend to come to hospital'

-Anonymous

Results from e-health readiness questionnaire

The e-health readiness questionnaire consisting of 60 elements related to preparedness of institution for telehealth was adopted in this study to assess the readiness of the study site, Sahid Gangalal Heart Centre, Kathmandu. As the questionnaire demanded the knowledge on existing infrastructure of the institution and technical aspects, only managerial level staffs were asked to participate.

30 managerial level staffs including staffs from administration, doctors and nurses completed the questionnaire. A thorough explanation about the questionnaire was given to each participant. Written consent was taken. The questionnaire was difficult for most of them to understand as participants were not in a position to comment on all the sections of questionnaire especially on government policies. The use of a word 'proposed telehealth project' was particularly misleading to participants as neither any particular project existed at the time of study nor it was discussed beforehand. Participants thus had to be clarified during the study that the comment for each question should be made on the basis of telehealth/e-health use in general but not for any particular project. Many misunderstandings had to be clarified during the process and the participants corrected their comments with each clarification.

Table 7: Score from e-health readiness questionnaire

	N	Minimum	Maximum	Mean	Std. Deviation
Total score	30	165.00	239.00	201.8333	24.66337
Core readiness	30	57.00	88.00	73.2333	11.44306
Technological readiness	30	26.00	46.00	33.5667	6.48438
Learning readiness	30	10.00	29.00	20.3667	5.48027
Societal readiness	30	26.00	48.00	37.9333	6.30781
Policy readiness	30	29.00	48.00	36.7333	5.99387

The e-health readiness scores in this study ranged 165-239 (mean 202, SD 25) out of 300. According to the set standard, the score above 150 were considered to be institutional progress towards e-health readiness.

Core readiness:

The questions on this section included the importance of need assessment, key aspects of planning and determinants of accessibility such as technology, and integration of technology with existing services. The present study scores mean 73 out of the total 105. The maximum score was 88.

Technological readiness:

This section addressed the availability and affordability of technology needed to implement telehealth. In the present study, technological readiness scored 34 as a mean score out of total 60, which was quite lower.

Learning readiness:

This category dealt with provision of training, inclusion of healthcare providers in planning process and determinants of accessibility such as capacity building. In the study, learning readiness scored 20 out of 30, which was indeed a good score.

Societal readiness:

This involved any existing interaction of the study institution with other healthcare institutions in the same region or beyond. It dealt with socio-cultural factors, and addressed the issue of inequity in gender and social classes. In the present study, the score on societal readiness is 38 out of 55, which seems like a satisfactory score.

Policy readiness:

This section dealt with the existent policies at the government and institutional level including issues of licensing, liability and reimbursement. It included questions on legal framework and political will. Many of the respondents unaware of policies ended with ‘don’t know’ response in this study. The score for policy readiness was 37 out of out of 60, which is the lowest score among the 5 categories of readiness.

Some of the views shared by health professionals from SGNHC are listed below

'We had tried to use the concept of telemedicine long ago. I used to receive the ECG reports from the districts through the emails and help them in diagnosis but this process stopped suddenly. Firstly, we became too busy in our routines to give time and the internet was also not so reliable. The establishment of separate telemedicine department and recruitment of specific personnel for that job might have probably made it sustainable'.

- *Anonymous*

'Introducing telemedicine in the context of Nepal is not as easy as we think. We are very few who are confident in using technology. Most of our staffs are not confident even in using basic features in computer. They prefer the traditional way of working and majority do not welcome change'.

-Anonymous

Chapter 4: Discussion

The present study is basically focused on studying the willingness of cardiac patients in telehealth for consultation/disease management post cardiac events and hospital discharge. This study also explores in general the readiness of the study institution for telehealth in general. Previous studies have been more focused on willingness to use telemedicine/telehealh in general population or general patients (74), not a specific disease group. Therefore this study is expected to closely access the view of patient with cardiac disease taking into consideration the burden of cardiac diseases and the need of follow up and rehabilitation among cardiac patients.

The present study involves patients with known heart disease (70%), the rest being the referral cases or provisionally diagnosed cases of heart disease. The majority of the participants were male (62.5%) which is in line with the literature suggesting that men are more likely to have heart disease than women (75). The majority (37.5%) of the participant were between 30-49 years of age and most of them (40%) had a higher education. However, 66.3% responded that they had a monthly income below 20,000. A large number of participants (57 out of 80) were residing out of Kathmandu city and 49 out of 80 participants were obliged to travel for more than 2 hours in a bus to reach the hospital. The current study also shows that a considerable number of participants had been missing consultations because of a long distance to reach the hospital, which is an important precursor in relation to the need of telehealth (76). Previous studies have observed significant reduction in travel time for both residents and clinicians, with an increase in number of patient reviewed (77, 78).

In the present study, a considerable number of the participants (66.3%) were under medication for heart disease, a good number of the participants (31 out of 80) had multiple diseases and many were found to be not engaged in daily exercise (61.3%), which again suggests that a measure that

allow a constant motivation and guidance is of vital importance. Though majority of the respondents in this study were regular in medication, assuring that each patient has medication related knowledge could be made to maintain medication adherence (79). Although there is a controversy in the effectiveness of technology with regard to medication adherence (80, 81), successful use of technology is expected to reduce the number of medication errors, including missed doses, taking extra doses, and taking the wrong drug (82). However the poor engagement of patients on daily exercise demands constant motivation for adherence to healthy lifestyle as suggested by a multi centre study done among coronary heart disease patient after PCI (83).

Another important finding of this study was the percentage of mobile users (96.3%), which showed a possibility for the adoption of mhealth. Similarly, two thirds of the participants could send texts from mobile phone, while fewer had Internet access and Internet skills. Access to the Internet is increasing fast, and more and more people are now able to get access (42, 52). This also applies to much of the developing world (42), although this study shows that access to the Internet still is a major concern in Nepal. The poor access to the Internet and the poor Internet skills in this study were in line with the findings from a study done in Australia, which found technical competence and technology availability to be barriers to technology use, despite the existing interest of patients and health workers to use the technology (84). In this study, 40% were using electronic devices, blood pressure device being the mostly used (18.8%).

In the present study, a significant number of participants showed willingness towards telehealth in general. Similar positive responses were found in previous study in terms of willingness to use technology to monitor their disease (85). Majority were more willing to use mobile call (65%) instead of SMS (21.3%) for consultation/disease management while very few showed interest in health apps, video conferencing and use of email.

Looking at the factors associated to the willingness of participants towards telehealth, the present study found that participant's willingness to use telehealth in general is dependent on their existing knowledge of diet, presence of multiple diseases and their ability to text from mobiles. According to Table 6, 100% of respondents who were able to text were willing to use telehealth in general, which gives a message that having some knowledge on technology is important in accepting technology (86). Surprisingly, despite two thirds of participants being able to send text from mobiles, majority were more willing to use mobile call (65%) instead of SMS (21.3%) for consultation/disease management. Perhaps people think SMS might not be as reliable as a calling or that they would not be able to give and receive the information they need by SMS. The preference to use mobile call over SMS and the reluctance to use the other forms like health apps and video-conferencing could be also related to technophobia as mentioned earlier (65) and the perception of people on usefulness, advantage, compatibility and complexity of telehealth (87) in this study as well.

Similarly, the current study found that the respondent's willingness to use mobile-SMS was dependent on gender, income, previous hospitalization, ability to text from mobile and Internet skills. In line with this study, rural people with an access to mobile phones were found willing to use mobile-based pharmacy and other health care services (88). Similarly, the current study found that the respondent's willingness to use mobile calls is dependent on age, income, presence of heart disease, medication, and access to mobiles, ability to text, access to the Internet and Internet skills. Similar to our finding, heterogeneity in preference patterns of various telemedicine attributes among different demographic and socioeconomic groups was shown previously in South Korea, but at the same time it claimed that the preference towards telemedicine is not strictly proportional to the prevalence of certain diseases but to the perception about the usefulness of managing certain diseases through telemedicine services (89). A similar issue was put forward in another study,

which found that being diseased lowered the willingness to use telemonitoring. It further suggest that people need to understand better how telemonitoring can help to improve controlling their health status and coping with the disease (90). The effect of 'perception' seems quite relevant to this study too as people expressed hesitation and doubt if sending text would allow proper communication and if they could even manage to use these technology and if the technology would really work as it is purported to. Similarly, in one study, cancer patients advocated the use of Internet-based technology, and the usage and attitude towards the technology was again dependent on age and socioeconomic factors (91). Normally, younger generations who are confident in using technology seem less hesitant and more willing to try any new technology, including using the Internet for health purposes (86). However, the literature also claims that acceptance and the willingness to use technical devices is increasing despite the still prevalent reservations of elderly people in using technology (92).

Further, in the present study, the patients willingness to use health apps were associated with factors like presence of heart disease, previous hospitalization, medication, Internet access, and familiarity with health apps. There were indeed very few health app users in this study; given few available health apps in the country and lack of knowledge and awareness of people about health Apps. The reason for very few app users in this study also could be because there are no such specific apps available for cardiac patients in Nepal. Similarly, in this study, there were fewer patients willing to use email service for consultation and the willingness was dependent on gender, presence of heart disease, access to Internet, and Internet skills. The reason could again be the disparity in the access of Internet and skills of rural and urban people. And lastly the willingness to use video-conferencing was dependent on gender, presence of multiple diseases, access to Internet, and Internet skill. While we find in this that access to and knowledge of technology matters in willingness to use technology, in contrast, a substantial number of people seemed interested in

using web cam for consultations with their health care provider despite few people actually owning broadband and web cam facilities (74, 93). Thus, patients' willingness in using various forms of technology for telehealth were dependent on gender, presence of heart disease, income, medication, previous hospitalization access and skills in using mobiles and the Internet. Though in this study, we do not know the effect size of each variable on patients' willingness, the significant association found between these variables is not new.

Looking at the majority of participants owning mobiles and the fact that a majority of them are willing to use mobile calls for consultations and disease management, mhealth could be promising in the context of Nepal. This might be the case not only for patients with cardiac illness. One of the studies among patients with chronic pain have provided evidence for the feasibility, acceptability, and preliminary efficacy of mobile health interventions including motivational interviews, and data showed a reduction in the mean depression score (by 2.2) from pre-test to two-week post-test (94). Moreover, mhealth is recommended for its cheaper, affordable and good network coverage in the rural-communities so it can be helpful to address the health needs (67).

In line with present study, many previous studies have documented substantial willingness of people towards telehealth. For example: In a study with participant already involved in home telehealth care for 3 months, participants were found to favour the service to control their chronic conditions because of its convenience and accessibility despite users' concerns regarding utility of service and its quality. Telehealth was moreover assumed to allow users to determine and understand changes in their condition and improve medical regimen compliance, and empower them to revise their lifestyles for better disease self-management (95). In one of the previous studies, patient introduced to self monitoring of blood pressure and anti-hypertensives by the use of automated sphygmomanometer were not only able to reduce blood pressure, compared with usual

care, but also represented a cost-effective use of health care resources (96). In a pilot study done among diabetic patients in Nepal, willingness to use telehealth was observed as the majority considered it as cheaper than the regular service in terms of time and travel cost. However no difference was observed in terms of glucose parameters among intervention and control group, which could be due to small sample size (97). Further, one interesting case study of a rural woman suffering from wasp and hornet stings proves how a simple telephone communication was able to save her life (98). Though most of the studies have shown the substantial willingness of participants in using ICT or technology to monitor their health or disease, not all studies have shown equally positive responses in terms of health outcomes and costs (99, 100). Still, in the context of the trend of shorter hospital stays, technological solutions are expected to provide an opportunity for better support and care at home to reduce health risks and improve the care giving quality care after hospital discharge. Above all, in the case of Nepal, while previous studies have shown the potential of teledermatology (101) and telemedicine for epilepsy support (102), this study demonstrates another potential field for telehealth in Nepal, that of telecardiac rehabilitation.

Apart from patients' willingness, looking at the readiness of institution, the considerable telehealth/ e-health readiness score of the study institution; Sahid Gangalal National Heart Centre is a good sign to kick start any telehealth project. Though the lower technological readiness score suggest the lack in the integration of technology in the institution at present, the considerable learning readiness is a good sign of the institution's approach towards telehealth/telemedicine. The need for training of health workers as well as people in general on IT to overcome technophobia and hesitation in using new technology has already been mentioned (66, 67) and the perceived usefulness of health worker is considered as an important factor for accepting new technology(103, 104). Therefore, besides the need of technological infrastructure in SGNHC as suggested by the readiness score in

this study, the effort to make the health workers aware on existing technology would possibly make positive impact on institutions readiness towards telehealth in future.

Conclusion

The present study showed the considerable willingness of cardiac patient in telehealth for cardiac rehabilitation, with the majority of patients willing to use mobile phones for consultation. With the rise in mobile users in the country and the substantial willingness of patients towards mobile based telehealth, mhealth seems to be a promising measure to fill the gap in the existing healthcare, to increase the access to healthcare to rural people in Nepal and allow effective disease control and self management among people with chronic disease. This study might be helpful to plan a telehealth project with a target to cardiac patients and to most of the chronic patients requiring continous monitoring. Because of the limited sample and because the study is based on only one heart centre, this study might not be applicable to wide region or nationwide. The study however has been able to incorporate the patients from rural areas despite the study was done in Kathmandu. Nevertheless, a bigger study is recommended to assess the view of wider population and to study the effect size of each variable on the willingness. In addition, this study recommends the concerned authority to focus on creating awareness about the availability and benefits of technology among both public and health workers through educational programs to resolve their hesitation and doubt towards technology, to achieve better acceptance and participation in telehealth projects and to make the projects sustainable.

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Appendices

Appendix 1: Consent form for patients

You are most welcome to take participation in this survey

Cardiac rehabilitation is a comprehensive behavioural modification program including health education, exercises and monitoring of health status which is designed to improve the physical and emotional condition of patient with heart disease.

If you are a heart patient, you are in need of continuous counseling and suggestions regarding the maintenance of your health. Because of various problems existing in our daily life for example from long distance and lack of time, it might not always be possible to come for consultations and follow ups and this might result into recurrence of illness and various complications. Because of availability of technology like mobile and Internet, today it is possible to consult a health professional and get answer to the queries from home, without coming to the health institution. In many parts of the world the use of technology has increased the access to healthcare among their people. Keeping this fact into consideration, it is also necessary that we seek some alternatives to our existing institution based health care. For this reason, we would like to know about your opinion regarding the use of technology for cardiac rehabilitation. Your participation would be a great contribution to this study and for further plans. I would also like to mention, none of your personal information will be disclosed in the process of this study and you could chose not to participate in this survey. This project is a part of master study of a student studying in Norway. If you would like to receive a copy of a final work, you could notify the researcher about it.

If you want to participate, please sign on the consent form before you proceed with the questionnaire.

Thank you

…….

Participant's signature

Appendix 2: Questionnaire for patients

Demographic data

1. Gender
   Male
   Female

2. Age
   18-29
   30-49
   50-64
   65+

3. Education
   Primary school
   Higher secondary school
   University level

4. Monthly income
   Below 20,000
   20,000-50,000
   50,000+

5. Do you have any heart disease?
   Yes
   No

6. Duration of illness
   Less than 1 year
   1-5 years
   5 years and above

7. Have you ever been hospitalized for heart disease?
   Yes
   No

8. Have you ever had heart surgery?
   Yes
   No

9. Have you ever been re-hospitalized because of complications?
   Ye

No

10. Do you smoke?
    Yes
    No
    Previous smoker

11. Do you drink alcohol?
    Yes
    No
    Previous user

12. Are you under medication for heart disease?
    Yes
    No

13. How regular are you in taking medicines?
    Quite regular
    Forget sometimes
    Forget often

14. Do you exercise regularly?
    Yes
    No

15. Do you have knowledge about your diet restrictions?
    Yes
    No

16. Do you have any disease other than heart disease?
    Yes
    No

17. Where do you live?
    Within Kathmandu
    Outside Kathmandu

18. How long is the distance from your residence to hospital?
    Walking distance
    1-2 hours by bus
    More than 2 hours by bus

19. Have you ever missed your consultations because of long distance?
    Yes
    No

20. What are the other barriers for timely consultations?
    Lack of time
    Lack of money
    Forgetfulness
    Lack of awareness

Access to technology

21. Do you have landline phone at home?
    Yes
    No

22. Do you have mobile phone?
    Yes
    No

23. Can you send text message from mobile?
    Yes
    No

24. Do you have Internet at home?
    Yes
    No

25. Do you have Internet skills?
    Yes
    No

26. Have you ever heard about Health App?
    Yes
    No

27. Are you currently using any health Apps?
    Yes
    No

28. Do you use any electronic health device?

Yes
No

29. If yes, which device?
    Blood sugar monitoring device
    Blood pressure monitoring device
    Both

Willingness to telehealth

30. Are you willing to use telehealth for consultations/disease management?
    Yes
    No

31. Are you willing to use following telehealth attributes for consultation /disease management

31.1.
    Mobile SMS
        Yes
        No
31.2.
    Mobile call
        Yes
        No
31.3.
    Mobile App
        Yes
        No
31.4.
    Emails
        Yes
        No
31.5.
    Video conferencing
        Yes
        No

32. What do you think telehealth would be appropriate to use for?
32.1.
    Counselling on medicines
    Yes

No

32.2.

Counselling on diet

Yes

No

32.3.

Information on disease

Yes

No

32.4.

Booking an appointment

Yes

No

32.5.

Daily consultations

Yes

No

33. 6

If you would like to share more about your experience and opinion on telehealth, Please use the field below:

.....

.....

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Appendix 3: Consent Form for health professionals

Dear Sir/Madam,

You are being asked to participate in a research titled ¨ patient-provider readiness and willingness in Tele-cardiac rehabilitation in Nepal. You are selected as a possible participant because you are affiliated to the field of cardiology and your insight in each components of this study is valuable. The primary objective of this study is to explore the readiness and willingness of patient and providers to adopt telemedicine in the field of cardiac rehabilitation in Nepal. This research may be published in a journal or presented as a paper. This study is completely anonymous and we will not be collecting or retaining any information about your identity. The decision to participate in this study is entirely up to you. However, it is to be noted that your few minutes of contributions could help to formulate plans and strategies in the field of telemedicine in cardiology. Further, you have the right to ask questions about this research study before, during or after the research. If you have any further questions about the study, at any time feel free to contact the primary investigator Ms Anita Bhandari at avid.anita.bhandari@gmail.com or by telephone at 9803015692. Anita Bhandari is doing her Masters in telemedicine in University of Tromsø and this study is a part of her Masters project. If you want, a summary of the results of the study can be sent to you.

Your signature below indicates that you have decided to volunteer as a research participant for this study, and that you have read and understood the information provided above.

Subject's position

- ☐ Physician
- ☐ Nurse
- ☐ Administrator
- ☐ Others

Signature……

Date ……..

Thank you so much for your participation.

Appendix 4: E-health readiness questionnaire for developing countries (72)

TABLE 1. COMPOSITION AND FORMAT OF CATEGORY OF CORE-READINESS

(For all participants)

	Score					
Statements:	*1*	*2*	*3*	*4*	*5*	*D/K*
Identification of Needs for future changes, which the proposed telehealth/ e-health project will address:						
1. Organization has properly identified its needs	1	2	3	4	5	D/K
2. Organization has properly prioritized its needs	1	2	3	4	5	D/K
Dissatisfaction with status quo on the prioritized needs (related to the proposed project- tele cardiac rehabilitation):						
1. There is general dissatisfaction with current handling of issues that could be addressed through telehealth/e-health	1	2	3	4	5	D/K
2. Solutions other than telehealth/e-health have been explored.	1	2	3	4	5	D/K
Awareness about telehealth/e-health in the organization:						
1. Awareness of ICT and Internet's role in healthcare exists among the planners	1	2	3	4	5	D/K
2. Awareness of ICT and Internet's role in addressing the prioritized needs exists among the planners.	1	2	3	4	5	D/K
Comfort with technology:						
1. There is general comfort in using ICT/Internet among users of the proposed telehealth/e-health project.	1	2	3	4	5	D/K
2. There is general comfort among staff in using ICT/Internet for storing patient information.	1	2	3	4	5	D/K
3. There is general comfort among staff in using ICT/Internet for the purpose of patient care and education.	1	2	3	4	5	D/K
Trust on the use of ICT:						
1. All the policymakers and senior administrators trust new technology as a solution to the identified problems	1	2	3	4	5	D/K
2. All the staff members trust new technology as a solution to the identified problems	1	2	3	4	5	D/K
3. There are plans in place to increase staff's trust and confidence in the new technology	1	2	3	4	5	D/K
Planning for the new telehealth/e-health project:						
1. An individual or a group has taken responsibility for planning.	1	2	3	4	5	D/K
2. All the user groups among staff and other stakeholders have been involved in planning	1	2	3	4	5	D/K
3. There is an appropriate plan for implementation of telehealth/e-health initiative	1	2	3	4	5	D/K
4. The implementation plan includes proper budgeting and identification of	1	2	3	4	5	D/K

resources.						
5. There is an appropriate plan for evaluation of telehealth/e-health initiative, including option for external evaluation	1	2	3	4	5	D/K
Overall satisfaction and willingness:						
1. The proposed technology is appropriate according to the conditions within the organization	1	2	3	4	5	D/K
2. There is a willingness among staff to implement the technology for its intended purpose	1	2	3	4	5	D/K
Integration of technology:						
1. Integration of technology with the current services has been considered in the planning process	1	2	3	4	5	D/K
2. There is a plan in place to integrate telehealth/e-health with the current services	1	2	3	4	5	D/K

TABLE 2. COMPOSITION AND FORMAT OF CATEGORY OF TECHNOLOGICAL READINESS

(For managers/ administrators only)

	Score					
Statements:	*1*	*2*	*3*	*4*	*5*	*D/K*
Speed and quality of ICT/Internet at the institution:						
1. Speed of connections is appropriate for the proposed use	1	2	3	4	5	D/K
2. Quality of connections is appropriate for the proposed use	1	2	3	4	5	D/K
Service/Support for ICT:						
1. Service/support is available within a reasonable time frame for the proposed use.	1	2	3	4	5	D/K
2. Local support is proficient to address most of the problems related to the proposed use.	1	2	3	4	5	D/K
Hardware and software:						
1. Hardware and software required for the proposed project are readily available.	1	2	3	4	5	D/K
2. Hardware and software required for the proposed project are readily affordable.	1	2	3	4	5	D/K
Availability and affordability of the desired ICT						
1. Required ICT (telephone/Internet/bandwidth) is easily available for the institution.	1	2	3	4	5	D/K
2. Required ICT (telephone/Internet/bandwidth) is easily available for the institutions involved.	1	2	3	4	5	D/K
Institutional access to ICT/Internet training:						
1. Programs are in place to train the users for proposed project.	1	2	3	4	5	D/K
2. Manpower is in place to train the users for proposed project.	1	2	3	4	5	D/K

TABLE 3. COMPOSITION AND FORMAT OF CATEGORY OF LEARNING READINESS

(For health care providers only)

	Score					
Statements:	*1*	*2*	*3*	*4*	*5*	*D/K*
ICT/Internet training for healthcare providers:						
1. Personnel and programs are in place for training	1	2	3	4	5	D/K
Use of ICT/Internet to enhance education of care providers:						
1. Programs exist for continuous education	1	2	3	4	5	D/K
2. ICT/Internet is readily used in continuous education	1	2	3	4	5	D/K
3. Programs are in place to use ICT/Internet for continuous education	1	2	3	4	5	D/K
Involvement of healthcare providers in telehealth/e-health projects:						
1. There is a plan in place to involve healthcare providers in the planning of new telehealth/e-health interventions.	1	2	3	4	5	D/K
2. There is a plan in place to involve healthcare providers in the implementation of new telehealth/e-health interventions.	1	2	3	4	5	D/K

TABLE 4. COMPOSITION AND FORMAT OF CATEGORY OF SOCIETAL READINESS

(For all participants)

	Score					
Statements:	*1*	*2*	*3*	*4*	*5*	*D/K*
Communication with other organizations:						
1. Staff regularly uses ICT/Internet to communicate with staff at the other health institutions of the region	1	2	3	4	5	D/K
2. Staff regularly uses ICT/Internet to communicate with local community and clients	1	2	3	4	5	D/K
3. Other institutions involved in the telehealth/e-health project have also planned to go through e-readiness assessment.	1	2	3	4	5	D/K
[For e-learning projects] Sharing of locally relevant content between healthcare institutions:	1	2	3	4	5	D/K
1. Material on locally relevant health issues is shared between this institution and other institutions.	1	2	3	4	5	D/K
2. The relevant material is available in language(s) easily understood by all the concerned staff and other users of information						
[For service related projects] Providing care to patients and communities in collaboration with other healthcare institutions:						
1. A referral system is available between this institution and other healthcare institutions to provide patient care in certain specialities.	1	2	3	4	5	D/K
2. ICT is currently used for referrals between this institution and other healthcare institutions.	1	2	3	4	5	D/K
Considering sociocultural factors among staff:						
1. Both the genders have equal and unrestricted access to the technology.	1	2	3	4	5	D/K
2. Staff from all levels get direct benefit from the use of technology.	1	2	3	4	5	D/K
Considering sociocultural factors among clients and communities:						
1. Use of ICT will benefit men and women equally in the society.	1	2	3	4	5	D/K

TABLE 5. COMPOSITION AND FORMAT OF CATEGORY OF POLICY READINESS
(For all Participants)

	Score					
Statements:	*1*	*2*	*3*	*4*	*5*	*D/K*
ICT related regulations:						
1. Government policies are in place to promote and manage use of telehealth/e-health	1	2	3	4	5	D/K
in healthcare institutions.						
in your institution.						
Policies regarding licensure and liability:						
1. Government policies are in place to allow care provision in other jurisdictions through telehealth.	1	2	3	4	5	D/K
2. Institutional policies are in place to allow care provision in other jurisdictions through telehealth.	1	2	3	4	5	D/K
3. Government policies are in place to deal with liability issues.	1	2	3	4	5	D/K
4. Institutional policies are in place to deal with liability issues.	1	2	3	4	5	D/K
Policies regarding reimbursement:						
1. Government policies are in place to ensure proper reimbursement to the healthcare providers in your institution.	1	2	3	4	5	D/K
2. Institutional policies are in place to ensure proper reimbursement to the healthcare providers in your institution.	1	2	3	4	5	D/K
Awareness and support of ICT among politicians:						
1. Politicians are generally aware of the benefits of ICT use in healthcare.	1	2	3	4	5	D/K
2. Politicians generally support the use of ICT use in healthcare.	1	2	3	4	5	D/K
Awareness and support of ICT among policymakers at the institutional level:						
1. Policy makers are aware of the benefits of ICT in healthcare institutions.	1	2	3	4	5	D/K
2. Policy makers support the use of ICT in healthcare institutions.	1	2	3	4	5	D/K

Appendix 5: Approval letters

UiT
NORGES
ARKTISKE
UNIVERSITET

Department of Clinical Medicine

Our ref.: 2015/3791-2

Date: 17.08.2015

Anita Bhandari
Email: abh000@post.uit.no

Approval of Contract of Supervision for Master's Thesis in Telemedicine and E-health (Health) - Anita Bhandari

According to the regulations of the University, the board of the department offering the Master Program must approve the credits and other conditions governing the thesis.

The Case IKM F8-15 is handled by authority at the Department of Clinical Medicine with the following result:

"Institutt for klinisk medisin godkjenner den fremlagte veiledningskontrakten for TLM-3902 Closing Master's Thesis for Anita Bhandari under forutsetning at det ikke er behov for innkjøp av utstyr utover det som er tilgjengelig. Det henvises for øvrig til de utfyllende bestemmelsene for mastergradsutdanningen for telemedisin og e-helse ved fakultetet.

Hovedveileder:	*Prof. Rolf Wynn, Institutt for klinisk medisin, UiT*
Studieprogram:	*Master of Science in Telemedicine and e-health*
Studieretning:	*Health field of study*
Foreløpig tittel:	*Patients' and providers' readiness and willingness for web-based Cardiac Rehabilitation*
Antall studiepoeng:	*60*
Arbeidssted:	*Forskningsparken*
Eksamensform:	*Sensur av skriftlig innlevering*
Evalueringsform:	*Bokstavkarakter A-F*
Utleveringsdato:	*1.9.2015*
Innleveringsdato:	*15.5.2016"*

Your Master's Thesis has the preliminary title, "Patients' and providers' readiness and willingness for web-based Cardiac Rehabilitation", and is supervised by Professor Rolf Wynn. The number of credits for this thesis is 60 ECTs/studiepoeng and the deadline for delivery is the 15th May, 2016. It will be graded from A-F by an appointed examination board that composes of internal and external examiners. The grading of Master's Theses in Mathematics, Science and Technology (MNT) subjects will also be applied.

The Master's Thesis must be submitted electronically in MUNIN (www.ub.uit.no/munin/).

Yours sincerely,

Judy Yu Ying Au
Advisor

judy.au@uit.no
Tel: 77 62 08 89

Copy: Prof. Rolf Wynn (supervisor)

Dokumentet er elektronisk godkjent og krever ikke signatur

SHAHID GANGALAL NATIONAL HEART CENTRE

(Established Under Shahid Gangalal National Heart Centre Act 2057)

Bansbari, Kathmandu, Nepal

P.O.Box: 11360, Kathmandu, Nepal
Phone: 4371322, 4371374, 4370622
Fax No : 977-1-4371123
E-mail: sgnhc@sgnhc.org.np

Ref. No.:
Dispatch No.:

19.Nov.2015

To Whom it May Concern

This is to notify that Ms. Anita Bhandari, who is doing Masters of Science in Telemedicine and E – Health from University of Tromso, Norway is carrying out a research with the topic "Patient - Provider Readiness and Willingness of Tele – Cardiac Rehabilitation in Nepal".

She would be interviewing patients as well as nursing and administrative staff working in Shahid Gangalal National Heart Centre. I hope that the concerned people provide the necessary help in this.

Dr. Sujeeb Rajbhandari

Consultant Cardiologist &

Member Secretary of Institutional Review Board

All nursing incharge
Please help her to
Conduct the study

Government of Nepal

Nepal Health Research Council (NHRC)

Ref. No.: 901

11 December 2015

Ms. Anita Bhandari
Principal Investigator
University of Tromso
Norway

Ref: **Approval of Research Proposal** entitled **Patients and provider's readiness and willingness for Tele-cardiac Rehabilitation in Sahid Gangalal Heart Centre, Nepal**

Dear Ms. Bhandari,

It is my pleasure to inform you that the above-mentioned proposal submitted on 06 November 2015 (**Reg.no. 290/2015** please use this Reg. No. during further correspondence) has been approved by NHRC Ethical Review Board on 09 December 2015.

As per NHRC rules and regulations, the investigator has to strictly follow the protocol stipulated in the proposal. Any change in objective(s), problem statement, research question or hypothesis, methodology, implementation procedure, data management and budget that may be necessary in course of the implementation of the research proposal can only be made so and implemented after prior approval from this council. Thus, it is compulsory to submit the detail of such changes intended or desired with justification prior to actual change in the protocol.

If the researcher requires transfer of the bio samples to other countries, the investigator should apply to the NHRC for the permission.

Further, the researchers are directed to strictly abide by the National Ethical Guidelines published by NHRC during the implementation of their research proposal and submit progress report and full or summary report upon completion.

As per your research proposal, the total research amount is **US$ 800.00** and accordingly the processing fee amount to **NRs. 10,545.00**. It is acknowledged that the above-mentioned processing fee has been received at NHRC.

If you have any questions, please contact the Ethical Review M & E section of NHRC.

Thanking you,

.....

Dr. Khem Bahadur Karki
Member-Secretary