INTRODUCTION

Information systems support to reduce the disparity in health care that exist in urban and rural areas. It improves the health care services and coordination at different levels. Health information systems provide the tools to capture, store, process and communicate health care information.\textsuperscript{1} Telemedicine and e-health is growing both in developed as well as in developing countries and has remained as an integral part of the health care delivery system. It includes different health activities and medical services that take place at a distance.\textsuperscript{2} In the developing countries, it supports to improve the accessibility, quality and efficiency of the healthcare services and also reduces the cost of service.\textsuperscript{2,3} It also supports to improve the administrative as well as technical aspect of healthcare system. Similarly, it also supports to connect the healthcare facilities with the healthcare professionals and reduce the geographical and physical barriers.\textsuperscript{4} The World Health Organization (WHO) has mentioned tele-medicine and e-health as a possible information system that can improve the quality and reduce the cost of health care services.\textsuperscript{5}

In developing countries there are various challenges to implement the telemedicine and e-health services. The studies show that mostly the human and organizational factors have remained as the barrier to effectively implement the telemedicine and e-health activities.\textsuperscript{6} In rural areas there is scarcity of the health workers so while they get involved in the telemedicine and e-health activities it also increases their work burden.\textsuperscript{1} Similarly, other factors such as lack of proper awareness of the technology, social and cultural environment and acceptance of service users and high staff turnover have remained as challenges.\textsuperscript{7,8} Hence, to improve the status of telemedicine and e-health programs, the involved health workers should be well prepared and educated on the new technology and about its purpose and benefits.\textsuperscript{1}

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Importance of Telemedicine and e-health in Nepal

Nepal is listed among one of the underdeveloped countries with low human development index, i.e. 0.540. Geographically, most of its area is under hilly and mountainous region and 83% of its total population is still living in the rural areas. In Nepal, both the public and private sector are involved in the delivery of health care services. However, most of the health facilities are located in the urban areas and health workers are also more willing to work in the urban areas due to the better incentives and other facilities that are more available in the urban areas as compared to rural.

In last fifteen year period (from 1995/1996 to 2010/2011) the incidence of chronic diseases has increased from 6% to 12% and the incidence of acute disease has also increased from 9% to 20% in Nepal. Similarly, the scenario of disease in rural and urban area is also different. In rural Nepal, the prevalence of infectious diseases is more, whereas in urban and semi urban areas, peoples are facing a double burden of diseases (i.e. Communicable and non-communicable). The World Bank report shows that one-third of the people in the hilly region are living more than four hours away from an all-weather road. Similarly 15 district headquarters still needs to be connected by a roadway system. So the government has a challenge to overcome the poverty and geographical barriers to reach the rural peoples and provide them effective and affordable health care services.

The health system become effective in any country when it has sufficient skilled health workers and proper flow of health information, however these both aspects are inadequate in the context of Nepal. Although health is taken as a fundamental human right, existing health indicators show that still the health services are not equitable for the peoples of all regions. National data shows that pregnant mothers who receives at least one antenatal care during their pregnancy from the skilled health worker is only 55% in the rural areas and 88% in the urban areas. Similarly, other indicators also show the status of disparity in rural and urban area.

To address such issues, use of Information and Communication Technology (ICT) could be the best solution. Use of ICT provides opportunities to overcome such barriers and increase the options to deliver the health services. So, the ICT has been taken as an integral part of the health care delivery system throughout the world. It has supported in the delivery of health care services, especially in the context where the health care providers are limited and the peoples living in communities doesn’t have easy access to the health services. With this reference Government of Nepal has also implemented the rural-telemedicine program to support the healthcare delivery system. The main purpose of the program is to increase the accessibility of health service for the peoples living in the remote areas. Since there is a large proportion of the population living in the rural areas that are deprived of the basic essential health care services, so the program will support to address their health problems. Similarly the program will also support to im-
prove the utilization of health services among the rural people by increasing the accessibility, availability and affordability of the health services.

**Rural-Telemedicine program in Nepal**

The rural-telemedicine program was initially implemented in 25 district hospitals of hilly and mountainous districts (Achham, Bajhang, Bajura, Darchula, Jajarkot, Humla, Jumla, Kalikot, Rukum, Rolpa, Pyuthan, Dolpa, Mugu, Manang, Mustang, Gorkha, Dolakha, Raskuwa, Sindhuli, Sindhupalchowk, Khotang, Okhaldhunga, Sankhuwasabha, Solukhumbu and Taplejung), of Nepal from 22nd January 2011. Similarly in the year 2012, government further extended the program in 5 more districts hospitals (i.e. Dailekh, Baitadi, Salyan, Dadeldhura and Doti). So, in the present context the rural-telemedicine program is implemented in total 30 districts out of 75 districts of the country.

Presently, the rural-telemedicine program is using store and forward method, video-conferencing and telephone based consultation (i.e. hello-health). Telephone based consultation (i.e. hello-health) and store and forward method are used in most of the program implemented districts whereas video-conferencing is only used in few districts.

**Store and forward:** Medical support is provided through emails. This service is used in almost all of the involved districts. In the store and forward method, the medical officers or the health care providers working at the district hospital send the details of the patient through the email in an especial format designed for rural-telemedicine program. The sent mail is received at the Central Coordination Desk at Patan Hospital (tertiary level hospital) by the Medical Officers or by the Officers working at the desk. The e-mails are screened on the basis of the health problems and the specialist replies the concern mail with necessary suggestions and feedback.

**Video-conferencing:** This service has proven to be most effective for providing medical consultation to the patients and also for providing necessary medical assistance to the medical doctors and health workers. It is conducted only in few districts on a weekly basis. However, during emergencies and for special cases it is also conducted as needed. It is challenge to conduct video-conference in rural district hospitals- due to the slow internet service and an interruption in the electricity which causes blurry images and unclear sound during the conference.

**Telephone-based consultation “Hello-health”:** This service was started almost after two years of the initiation of rural - telemedicine program. Presently it provides 24 hour service to the peoples. “Hello-health” provides service on various health issues, but most notably cases are related to sexually transmitted diseases, medication pattern and general consultation. The service receives about 300 calls each day.

To manage the rural-telemedicine program activities at the district hospitals, government has provision to trained at least 3 health personnel to function and support the ongoing telemedicine program activities. To effectively conduct the rural-telemedicine program at the district hospitals, district telemedicine
implementation sub-committee is formed by including nine members where the Medical Superintendent of the district hospital work as the coordinator of the team.\textsuperscript{15} It is expected that the implementation of rural-telemedicine program will support to reach the un-reached population of the country to deliver the health care service by combating the specialist inaccessibility issues. Similarly, it can be also taken as a proper solution for Nepal to overcome the various challenges that exist in the health care delivery system.

**Further scope:**

In a low-income country like Nepal, it is necessary to consider about the sustainability of the Telemedicine and e-health program. Similarly, it is important to accept and adjust with the growing technology to see its effectiveness in the delivery of health services. For Nepal, it is challenge to match the standard of technology that is implanted at other part of the world. However in the context of developing countries, the low-cost telemedicine services are clinically useful, feasible, sustainable and replicable in the rural areas and underserved communities.\textsuperscript{2}

Regarding the low-cost technology, implementation of m-health (especially mobile phone based interventions) could be more effective. Mobile phones are popular in rural communities since it is portable, small sized, low weight and rechargeable, long-life battery power which can also support during the irregular electricity.\textsuperscript{17} Similarly use of m-health can also be effective for monitoring, surveillance, mass communication and for increasing access to information.\textsuperscript{18}

In the context of Nepal the use of mobile phone in the health care delivery system is limited. In present scenario mobile phone based intervention has been initiated as a pilot project by government and few non-governmental organizations has also made its limited use. One of the study shows that there is a pilot intervention of m-health in the Gulmi District of Nepal, where the mid-level health workers were provided with a free phone number to consult with General practitioners (GPs) at the district hospital.\textsuperscript{19} It has been expected that the service will support the health workers in rural areas. The study showed that the project has supported the mid-level health workers and patients mainly for consultation, in decision making while handling serious cases and for the referral of the patients.\textsuperscript{19} However, the study have shown the need to scale-up the intervention to see its effectiveness.\textsuperscript{19}

Studies have shown that, telemedicine and e-health services improve the equity of access to healthcare, decentralize the mode of health service delivery, effectively delivery of health services, improve the communication among the health personnel and improve the quality of service.\textsuperscript{3} So, in the context of Nepal telemedicine is important to address these above mentioned aspects and to improve the overall status of health care delivery system.

**CONCLUSION:**

To improve and sustain the telemedicine and e-health
activities in Nepal, it is necessary evaluate the existing ongoing services that are implemented by the government as well as other external development partners. It will support to find out the strengths and best practices of the program that can be replicated and will also support to find out the limitations which can be improved. Similarly the government should also focus on upgrading necessary infrastructure such as increase the band-width of the internet, ensure power back-up system and should also focus on the upgrading the existing equipments. Government also needs to focus on improving the motivational factors for the health workers to increase their engagement in the rural-telemedicine related activities. Similarly to increase the utilization of the existing services, it is also necessary to focus on the promotional activities and also inform the community peoples about the existing services through mass media.

To improve the existing status of rural-telemedicine program, government should focus on forming the technically competent management team which can provide necessary managerial and technical support as well as will be accountable for the program related activities. Presently, the rural-telemedicine program doesn’t have specific management team and is broadly managed under Logistic Management Division. Similarly the government should also focus on other challenges that are related with the regular fund to sustain the program activities, clear policy of government on telemedicine and e-health programs, trained and motivated human resources to get involved in the program activities, supportive infrastructure and technology, initiation for making the service interoperable at the national level and compatible with international stander and activities for increasing the community support for encouraging them to participate in the program activities.

REFERENCES:

5. WHO. What is eHealth: the World Health Organisation (WHO) definition; 2011 Available at: http://ehealthexpert.org/defehealth


