Telemedicine For Diabetes Mellitus Management in Community

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Abstract - Background, the increasing of diabetes mellitus (DM) in the community requires more effective and efficient treatment. Telemedicine is an application of electronic, computer and telecommunication technology used to exchange health information over long distances. This application aims to assist the implementation of health care procedures and improve health services to the society, both at the community health center and related health offices. Objective, to determine the effectiveness of the implementation of telemedicine systems in managing diabetes self management in the community. The method used in this writing is study of literature. The literature used is related journals that have been published by the institution Local and international journals. The stage done is collecting related journals, review of journals and discussions. Results, Telemedicine system at the Community Health Center basically only requires a set of computers connected to the internet, and a person in charge of operating it. The person is in charge of linking the telemedicine system in the Community Health Center with the Telemedicine system from the Regional Health Office. The person has a password to be able to access the PTM Portal owned by the Regional Health Office, and enter the latest findings of patients who go to the Community Health Center and diagnose diabetes mellitus. The data can be reported weekly / monthly.
Telemedicine system has the potential to be applied to the management of diabetes mellitus because it is considered effective and acceptability. The system that has been used in the Community Health Center includes: 1) Telemedicine System for management of TB control, 2) Telemedicine system for monitoring disease status & handling outbreaks 3) Telemedicine systems for electronic prescription (*e-Prescription System*), 4) Telemedicine System for Emergency Room (ER), Facility Management 5) Mobile Telemedicine System with multi communication link.

Keywords: Telemedicine, diabetes self management, community

1. Background

Indonesia is currently facing a shift of diseases pattern from infectious diseases to non-communicable diseases (NCDs). Besides, Indonesia is also faced *Triple Burden*, the prevalence of several major NCDs increases, while other infectious diseases are still high. It is aggravated by new emerging diseases and reemerging old diseases.

According to some epidemiological studies, NDCs handling problems and its risk factors actually occur in low socioeconomic societies. Death due to NDCs in developed countries actually continues to decline, whereas in developing countries, it actually increases.

The results of Basic Health Research in 2013 showed that there are top 10 causes of death in Indonesia, six of them classified as NDCs, and diabetes mellitus (DM) is at the fourth, after stroke, tuberculosis and hypertension.

Riskesdas also mentioned that the prevalence of DM was 5.7%, 1.5% was diagnosed, while 4.2% had only been diagnosed.

WHO (2006) estimates that 90% of diabetes mellitus can actually be prevented by consuming high-fiber foods, adequate exercise and not smoking. So, the effort for promotion and prevention must be encouraged and strived to reach all class, including low socioeconomic class.

DM patients spread in all provinces in Indonesia. Results of Basic Health Research (*Riskesdas*) in 2013 stated that the prevalence of DM patients tended to be higher in urban areas compared to rural areas. Semarang is an urban area, with the highest prevalence of DM among other cities in Central Java with 0.84% number of cases (Semarang Health Office, 2008).

Community Health Center as the leading health service unit has been trying to control NDCs. It has tried to create an effective and efficient network, make a comprehensive minimum service standard (holistic), provide diagnostic facilities and treatment in accordance with treatment standards in the Community Health Center . However, it turns out that it has not been able to cope with diabetes as the target set.

It is due to several factors, they are: 1) financial factors, efforts to add facilities in health services accompanied by the procurement of sophisticated equipment can only be enjoyed by a small part of the community. As a result, promotion, prevention and early detection of those who got NCDs risk factors are not implemented. 2) Geographic factors, increasing life expectancy in Indonesia causes a demographic change in the age structure of the Indonesian population moving towards an aging population. This change contributes to the epidemiological transitions; infectious diseases tend to decrease while NDCs tends to increase. 3) Demographic factors, the area of the Community Health Center that is too broad and the difficult access to reach it causing the health services cannot be delivered to all people. To deal with this disease pattern, it is necessary to change the health service strategy.

One strategy that can be used by Community Health Center in managing diabetes is the implementation of Telemedicine System. This system is a combination of technology to manage NCDs that is already available with trained personnel and an organized referral system, allowing most NCDs cases being handled and managed at basic health services.

2. Implementation Methodology

The implementation of telemedicine systems for the prevention of diabetics in Community Health Center has a high potential to be done, although it is still simple and the program is limited only to record, report, tele-consultation, simple tele-coordination and simple tele-diagnosis.

The telemedicine system at the Community Health Center basically only requires a computer connected to the internet, and requires a person as an admin in charge of its operation. The admin is in charge of linking the telemedicine system in the Community Health Center with the Telemedicine system from the Regional Health Office. The admin has a password to be able to access the PTM Portal owned by the Regional Health Office, and enter the latest findings from patients who go to the Community Health Center and diagnose DM. The data entered can be weekly / monthly.

In addition to case finding data, the admin can also include any posts related to the activities that have been held and also other important information,

such as cadre training activities, diabetes counseling activities, and health information about DM etc. Information or posts from Community Health Center will be on the PTM portal owned by the Ministry of Health and will be accessible to the public. It can be used by people who live in Community Health Center target area to obtain health information, health services and health consultations through telemedicine.

Based on the research conducted by Palmas, et. al (2008), it is stated that the telemedicine system was accepted by the community as the latest system that helped in the treatment of diabetes mellitus cases in the countryside and was able to provide satisfaction to the community.

Toledo et al (2012), stated that the community experienced satisfaction with the existence of a consultation telemedicine system. This satisfaction occurs when people ask / consult and they get the answers or responses from professional endocrinologist.

3. Result and Discussion

Telemedicine can be interpreted as the use of information and communication technologies (including electronics, tele-communication, computers, informatics) to transfer (send and / or receive) health information to improve clinical services (diagnosis and therapy) and education. The word "tele" in Greek means: far away, at a distance, so it can be interpreted as a health service through a distance (Soegijoko, 2010).

Telemedicine is an application of electronic, computer and telecommunication technology to exchange health information over long distances. This application aims to assist the implementation of health service procedures and improve health services to the public. Today, Telemedicine has been applied to Community Health Center and health services. It is due to the fact that the Community Health Center is the spearhead of health services for all Indonesian people, especially in remote areas and societies with middle to lower economic levels (Handian and Soegijoko, 2002).

The concept of Telemedicine in managing public health problems in the past few years has been developed and conducted by the Biomedical Engineering Expertise of Bandung Institute of Technology (KK BME ITB) (Santoso, et. al., 2015), in accordance with its scope, developing an ICT-based telemedicine system for managing public health issues that prioritize effectiveness, acceptability and continuity of the actual system implementation. The developed system is designed using appropriate, available and technically and economically capable technologies that can be operated independently. The community telemedicine system that has been developed is for antenatal services, mobile telemedicine systems with multiple telecommunication links, tele ophthalmology, and Disaster Telemedicine System (Suhadi, 2010)

Telemedicine in its implementation or realization forms a system called telemedicine system. This system is a multi-disciplinary field that requires synergistic collaboration and combines various applications from various fields. Simply, Community Health Center telemedicine system consists of a number of Community Health Centers as medical devices and other related health agencies such as health offices, referral hospitals and several Community Health Centers located in remote area ('remote' units). All agencies in this telemedicine system are interconnected through a particular telecommunications network that is formed in such a way that it becomes a telemedicine network.

In general, each unit in the telemedicine system consists of several elements, they are: 1) Medical devices based on PC (Personal Computers), 2) Health information consist of text, physiological signals, images (static and dynamic), sound or combination, 3) Telecommunication system, 4) Patient interface unit, and 5) Telecommunication interface unit.

Following the "Proceedings of APEC e-Health Seminar 2008", there were 10 benefits expected from the use of telemedicine systems, namely: 1) Increased efficiency, reduced costs, 2) Improved quality of health services, 3) evidence based, 4) Empowerment patients and consumers, 5) Encourage better relationships between patients and health workers, 6) Education for health worker and society, 7) Encourage the growth of communication and exchange information between health care institutions, 8) Expansion the scope of health services, 9) Ethics problems (practice, informed consent, privacy, equity), and 10) Equality issue (health services for the whole community).

However, the benefits that are the reason for the use of telemedicine systems can be very different between developed countries and developing countries. Telemedicine systems can also enable the implementation of health services which is impossible to be implemented without the availability of a telemedicine system. In addition to the benefits or advantages of the telemedicine system, it is also necessary to pay attention to the problems (or potential problems) that must be overcome by the system can be implemented. Some important things that need to be noted are as follow: 1) Readiness of the human resources, 2) Readiness of the organizations involved, 3) Working culture, 4) Ethics, legal issues, remuneration problems, 5) Relationship between patients and health care workers, 6) Relationships among fellow officers, 7) Bureaucratic problems, 8) Technological development and availability of infrastructure and 9) Costs (Soegijoko, 2010).

Problems and challenges of health services in Indonesia are numerous and varied. However, telemedicine applications have prospects in overcoming community health problems in Indonesia. Some telemedicine applications used in Community Health Center are: 1) Telemedicine System for management of TB control, 2) Telemedicine system for status monitoring diseases & prevention of outbreaks, 3) e-Prescription System, 4) Telemedicine systems for emergency room (ER), management facilities 5) Mobile telemedicine systems with multi communication links (Soegijoko).

Some limitations of the telemedicine system are: 1) Telemedicine systems require high costs, 2) Hilly or mountainous demographics sometimes disturb internet signals, causing difficulties in accessing information, 3) Requires competent personnel in program management, admin and health personnel consultants who are ready every time, 4) Rural communities (villages) cannot all use computers or the internet, 5) Need free time, patience, and high comprehension information capacity of the community.

Alternative solutions to problems that can be done are stated as follow: 1) Costs, given the cost of a telemedicine system that can be expensive, it is necessary to develop a system using Free and Open Source Software (FOSS, FLOSS). With the aim of producing relatively inexpensive telemedicine systems, the trend of developing and using free and open source software based telemedicine systems is increasing. It can use a computer connected to the internet / using a mobile (Android). 2) Conducting training for the admin on the concept of telemedicine systems, so that they are proficient in their operations, 3)

Conducting regular schedules for health workers to consult the community through a tele-consultation system.

Miyamoto, S., Henderson, S., Young, H., Ward, D., & Santilan, V. (2013), in "Recruiting Rural Participants for a Tele-health Intervention on Diabetes Self-Management" stated that to overcome people in the village who have not been able to use the telemedicine system, it is necessary to recruit participants / cadres who are then trained and involved in telemedicine access. The community can make a schedule to access information together (every week / every month / at the time of the meeting in one place (school / village office etc.).

4. Conclusion

Telemedicine is an application of electronic, computer and telecommunication technology to exchange health information over long distances (from one place to another). This application aims to assist the implementation of health service procedures and improve health services to the public. Telemedicine can now be applied at Community Health Center s and related health services. It is because Community Health Center is the spearhead of health services for all Indonesian, especially in remote areas and communities with middle to lower economic levels.

The development and use of telemedicine in the health sector has many opportunities to solve the problems and challenges in the health field. Working in synergy with various parties from diverse disciplines is a key requirement for the successful use of telemedicine.

5. Suggestion/Recommendation

The development of the public telemedicine system must be further improved in line with the infrastructure availability. It is also considering the impact on the community in improving the public health status will be very meaningful.

Support from the Ministry of Health and Telecommunications System Operators for public health service agencies is expected to implement the designed telemedicine system. For the Community Health Center, it is expected to use this Telemedicine system application in developing health services in the community.

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