Proposal for the Methodology for Evaluation of Team Kagawa Project

Mariam SOOMRO[1]
Tomohiro HIRAO[2]
Masaaki TOKUDA[2]
Noorullah SOOMRO[3]
Najeebullah SOOMRO[4]
[1]Universiti Brunei Darussalam, [2]Kagawa University, [3]Mehran University of Engineering and Technology, [4] The University of Sydney

Abstract

Diabetes mellitus among adults is a growing epidemic worldwide. According to the World Health Organization (WHO) more than 346 million people worldwide have diabetes, which is likely to double by 2030. Currently there are more than 16 million people in Japan who are diabetic or on the verge of being diabetic.

Team Kagawa Project (TKP) is a multi-faceted project dedicated for the control of diabetes mellitus in Kagawa prefecture, Japan since 2009. The purpose of TKP was to decrease the number of diabetics in Kagawa prefecture & improve the patient's prognosis; but the effectiveness of this program has yet to be evaluated. Therefore, a study was designed to evaluate the impact and limitations of team Kagawa project. The paper describes a proposal of a methodology to evaluate the impact of TKP on controlling DM by introducing the? Logic Model to deal the information flow among inputs, outputs, outcomes, assumptions and external factors.

The study was conducted using a cross sectional design and monitoring evaluation approach. Key informants, academics & administrators from University of Kagawa provided the information about the project during the process. The most significant limitation highlighted by them was lack of proper implication of this project till now. It was found out that the project was still in its trial stage therefore, conclusive evidence showing a significant change in epidemiology of diabetics will take several years.

Keywords : Diabetes mellitus, information communication technology, telemedicine, program evaluation, logic model

Chapter 1 INTRODUCTION

Diabetes mellitus is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. It is associated with long-term damage, dysfunction, and failure of various organs, especially the eyes, kidneys, nerves, heart, and blood vessels (American Diabetes Association, 2007). Diabetes mellitus (DM) is highly prevalent disease of people aged 65 and older. Estimates from the Centers for Disease Control and Prevention indicate that, in 1998, 12.7% of persons aged 70 and older had a diagnosis of DM, up from 11.6% in 1990 (Harris et al., 1998). Older people with DM have higher rates of premature death, functional disability, coexisting illnesses such as hypertension, coronary heart disease (CHD), stroke (Schwartz et al., 2002) and other complications such as retinopathy, nephropathy, neuropathy, and atherosclerotic vascular disease. Being a chronic disease, it has both early and late complications although prevention of late complications can be achieved by a good metabolic control. To achieve these goals education of the diabetic subject and long term care is essential (Assal & Liniger, 1989).

RESEARCH BACKGROUND

In 2002, the Japanese Ministry of Health, Labour, and Welfare announced 7.4 million people were strongly suspected as being diabetic, and 8.8 million people were candidates for diabetes. These increasing rates of type 2 diabetes in Japan may be attributed to a complex of interactions between abnormal β-cell function, thrifty genotype, and change of lifestyle. More sedentary lifestyle, tendency to consume more fatty foods, and more stressful circumstances have been prominent in the Japanese population since the end of World War II. The combination of these environmental changes with the fragileβ-cell function and thrifty genotype, characteristic of many Japanese persons, may contribute significantly to the new prominence of diabetes in Japan (Hirose & Kawamori, 2005).

Kagawa prefecture is situated in the northeastern region of Japan's island of Shikoku, where it occupies an area of 1,883 square kilometers. The prefecture's capital is Takamatsu. Kagawa's main crop is rice (Levinson & Christensen, 2002). The prefecture has Kagawa Medical Association (KMA) which has a membership of 1,877 physicians,

organized in 10 municipal medical associations. While the association is engaged in diverse activities, it mainly focuses on Kagawa Medical Internet eXchange (K-MIX), which is the telemedicine network operated jointly by the Department of Medical Informatics, Kagawa University Hospital; the Prefectural Government of Kagawa; and Kagawa Medical Association.

DM in the prefecture is on a rise and according to the patient survey in 2008 by MHWL Kagawa prefecture had the 2 nd highest prevalence of DM in Japan. Figure 1 shows the results of the survey.

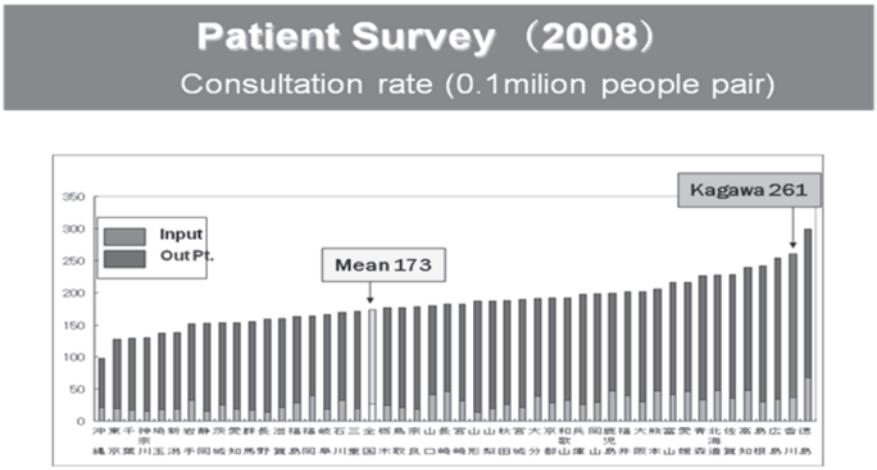

Figure 1 Patient Survey, 2008 MHLW

Team Kagawa Project (TKP) is a multi-faceted project dedicated for the control of diabetes mellitus in Kagawa prefecture, Japan since 2009. The purpose of TKP was to decrease the number of diabetics in Kagawa prefecture & improve the patient's prognosis; but the effectiveness of this program has not yet been evaluated. Therefore, a study was designed to evaluate the impact and limitations of team Kagawa project. The paper describes a proposal of a method to evaluate the impact of TKP on controlling DM by introducing the Logic Model to deal the information flow among inputs, outputs, outcomes, assumptions and external factors.

The study was conducted using a cross sectional design and monitoring evaluation approach. Key informants, academics & administrators from Kagawa University provided the information about the project during the process. The most significant limitation highlighted by them was lack of proper implication of this project till now. It was found out that the project was still in its trial stage therefore, conclusive evidence showing a significant change in epidemiology of diabetics will take several years.

Chapter 2 RELATED STUDIES

TEAM KAGAWA PROJECT

Team Kagawa is a project team to combat DM, organized on the background of medical network technology by Faculty of Medicine, Kagawa University. The aim of the project is to reduce the number of diabetic patients in the local population and improve their prognosis by coordinating efforts with Kagawa prefecture, Kagawa Prefectural Medical Association, and various other organizations in the prefecture. Its primary activity is to create the Local Medical Cooperation Critical Path system, through which clinical data such as laboratory results and images of patients can be transmitted over Kagawa Medical Internet eXchange (K-MIX) establishing a network between coordination local family doctors in clinics and specialists at large hospitals.

Many governments in the world have promoted ICT deployment in the healthcare field, especially electronic healthcare information exchange system (Burton et al., 2004; Yamakata & Nogawa, 2011). Japanese government also promotes electronic healthcare information exchange system, but few systems remain to be successful. K-MIX is an exception in the meaning of being a successful case. K-MIX has been functioning with success for more than eight years. However, K-MIX still has open issues to be solved toward a regional health information exchange system.

Team Kagawa also endeavors to "create an action model against diabetes-related diseases" with the aim to reduce the number of diabetics in the local population of Kagawa prefecture and to improve the prognosis through positive educational approaches.

COMPONENTS OF TEAM KAGAWA PROJECT

Kagawa prefecture is one of the most advanced areas for healthcare information technology. There are four medical ICT projects in Kagawa prefecture:

i. K-MIX
ii. Critical Pathway for Diabetes
iii. E-prescription
iv. Personal Health Records (PHR)

This report briefly examines all of these systems including the electronic health records.

i. K-MIX

K-MIX is an ASP(Application Service Provider) type of medical information ex-

change system. Patient's medical information is exchanged between one doctor to another electronically. K-MIX also provides ASP service to regional medical alliance, and has been running for last ten years. K-MIX stores and shares the following five information :

- Patient's basic information (name, sex, age, etc.)
- Medical image (e.g. computed tomography, magnetic resonance)
- Doctor's comment
- Laboratory data
- Files that doctors append

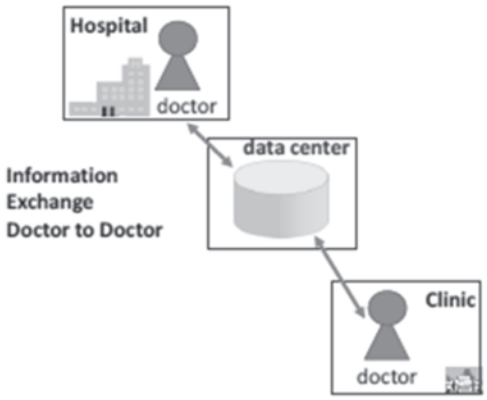

Figure 2 Information sharing scheme of K-MIX

More than 100 medical institutions have joined this network so far and many of them are in Kagawa. This network enables doctors/health care professional to communicate easily through internet infrastructure for therapy of patients by providing services like :

- Order of image interpretation
- Communication with patient referral format
- Order of special examination to an advanced hospital from a clinic
- Communication with "Critical Pathway" format

The primary functions of K-MIX are diagnostic imaging support and the electronic transmission of referral documents. This system is designed to accept the use by medical institutions outside Kagawa prefecture, and it is expected to receive proposals from outside the Prefecture (Konishi, M. H. 2009). Figure 2 shows the information sharing scheme of K-MIX respectively.

ii. CRITICAL PATHWAY

The critical pathway (also known as clinical pathway) concept appeared for the

first time at the New England Medical Center (Boston, USA) in 1985. It appeared as a result of the adaptation of the documents used in industrial quality management, the Standard Operating Procedures (SOPs). Its goals are to:

- Improve efficiency in the use of resources.
- Finish work in a set time.

Clinical pathways can be seen as an application of process management thinking to the improvement of patient healthcare. An aim is to re-center the focus on the patient's overall journey, rather than the contribution of each specialty or caring function independently (Murphy & Johnson, 2003).

In case of Team Kagawa's Regional Cooperative Critical Pathway for DM, the purpose is to improve medical treatment for patients with DM. This system stores and shares the following four types of information:

1. patient basic information
2. diagnosis
3. treatment plan
4. laboratory data

The shared data is accessible to medical staffs (nurse, nutritionist, etc.) who were allowed to use this system, as well as doctors. Figure 3 displays information sharing scheme of this critical pathway system (Yamakata et al., 2011).

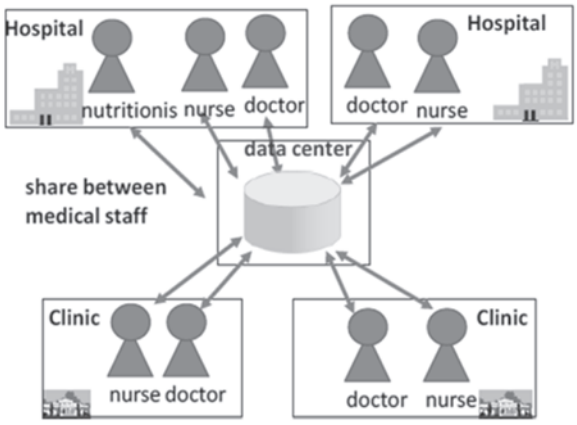

Figure 3 Information sharing scheme of critical pathway system

iii. E-PRESCRIPTION

E-prescription system is an electronic prescription data sharing system between hospital and pharmacy. E-prescription system in Kagawa prefecture is demonstration experiment. In usual medical consultation, patients receive medicine in pharmacies after they consult doctors in hospitals. Patient receives prescription from doctor in hospital,

and the patient goes to the pharmacy with this prescription. E-prescription system makes this process electronic, and transmits information via network. This system shares seven type of information: four types are from doctors to pharmacists, and the remaining three types are from pharmacists to doctors. The four types of information from doctors to pharmacists are:

- patient basic information
- prescription data
- disease name (not diagnosis)
- laboratory data

The three types of information from pharmacists to doctors are:

- Medicine change information
- Doubt inquiry information
- Pharmacist comment

Figure 4 depicts information sharing of this e-prescription. E-prescription system is a data sharing system between doctors and pharmacists. Doctors send electronic prescription to pharmacists. Pharmacists receive prescription and is able to send comment to doctor.

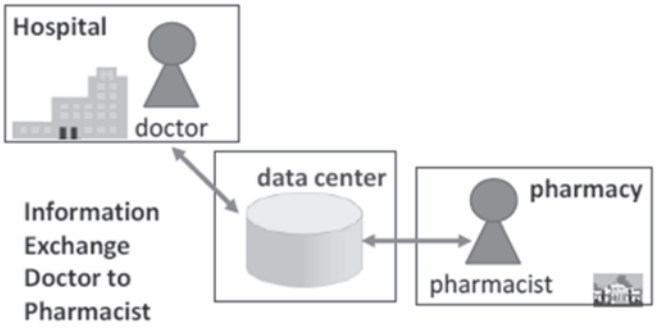

Figure 4 E- prescriptions

iv. ELECTRONIC HEALTH RECORDS/ PERSONAL HEALTH RECORDS

The term Electronic Health Record (EHR) describes the concept of a comprehensive, cross-institutional, longitudinal collection of a patient's health and healthcare data. It includes data that is not only particularly relevant to a subject's medical treatment but also to a subject's health in general. EHRs have the potential to improve the delivery of health care services. However, the physicians have been slow to adopt such systems (DesRoches et al., 2008). Health-information technology, such as sophisticated electronic health records, has the potential to improve health care (Shekelle et al., 2006). The use

of EHR has been promoted by the Ministry of Health and Welfare and the Japanese Medical Information Science Association for the past three years with considerable progress. Figure 5 shows the EMR system used in Kagawa University Hospital.

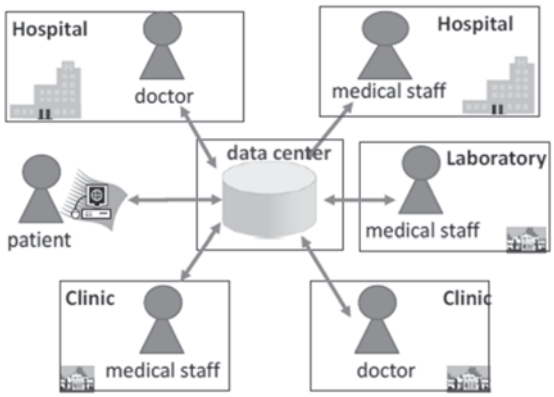

Figure 5 Information sharing scheme of PHR

PROGRAM EVALUATION

Effective program evaluation is a systematic way to improve and account for public health actions by involving procedures that are useful, feasible, ethical, and accurate. There are many frameworks that can be used for program evaluation in public health. For instance, the Centers for Disease Control and Prevention's (CDC's) Framework for Program Evaluation in Public Health provides public health practitioners and evaluators with a practical, six-step approach for effective evaluation ("Framework for program evaluation in public health," 1999). The framework helps public health programs address increased accountability requirements, program improvement processes, and public health decision making. The two initial steps in the CDC's evaluation framework are describing the program and engaging stakeholders. The program description step includes developing a logic model that visually depicts the hypothesized relationships among program resources. It uses program activities and the results to evaluate the program's underlying theory of change. The logic model is an integral part of CDC evaluation framework and has been effectively used for evaluation (Sundra et al., 2006). Keeping this evidence into perspective the logic model can be used for program evaluation.

Many organizations have supported the use of logic model in public health practice. For instance, The National Institute for Occupational Safety and Health has long promoted the logic model as a useful tool in an evaluator's portfolio. Because a logic model supports a systematic approach to designing interventions, it is equally useful for program planners. Undertaken with community stakeholders, a logic model process articu-

lates the underlying foundations of a particular programmatic effort and enhances program design and evaluation. Most often presented as sequenced diagrams or flow charts, logic models demonstrate relationships among the following components: statement of a problem, various causal and mitigating factors related to that problem, available resources to address the problem, theoretical foundations of the selected intervention, intervention goals and planned activities, and anticipated short- and long-term outcome (Helitzer et al., 2009).

The inputs in LM include human and financial resources as well as other inputs required to support the program such as partnerships. Information on customer needs is an essential resource to the program. Activities include all those action steps necessary to produce program outputs. Outputs are the products, goods and services provided to the programs direct customers. For example, conducting research is an activity and the reports generated for other researchers and technology developers could be thought of as outputs of the activity (McLaughlin & Jordan, 1999).

ICT IN HEALTHCARE

Developments in information and communication technologies (ICT) have resulted in an increasing use of these technologies in the practice of medicine and in the provision of medical care (Collste et al., 2006). With the growing ability of modern computers and communication technology to capture and quickly transmit textual, audio and video information, many have advocated its use to improve the health care in rural areas. This can also be applied for treatment at home and in places where medical personnel are not readily available. A systematic review on clinical outcomes resulting from telemedicine interventions found that despite the widespread use of telemedicine in virtually all major areas of health care, evidence concerning the benefits of its use exists in only a small number of them. One reason for the lack of coverage of telemedicine has been an uncertainty about its efficacy and cost. There have been a number of previous systematic reviews assessing the efficacy of telemedicine and related technologies which noted that although the technology showed promise in certain areas; the overall methodological quality of the evaluative studies was low and the plan for the most appropriate and cost-effective use of telemedicine was unclear. (Hersh et al., 2001). According to a systematic review of cost effectiveness studies of telemedicine interventions, there is no good evidence that telemedicine is a cost effective means of delivering health care (Whitten et al., 2002).

Chapter 3 RESEARCH DESIGN AND METHODS

The paper describes a proposal of a method to evaluate the impact of TKP on controlling DM by introducing the Logic Model to deal the information flow among inputs, outputs, outcomes, assumptions and external factors. By evaluating this project, important recommendations towards the use of ICT and telemedicine in treating lifestyle related disease like DM can be deduced. Also a critical evaluation towards finding the strengths and limitations of this project can benefit its implications in the future. This study will help to fill the gap in the literature that exists due to the language barrier and give a formation evaluation of the program.

A cross sectional research design was selected to get information on various outcomes and predictors of the project due to strict timeline of the researchers. This design allowed the study to be conducted only at one point in time. The population sub set were the members of team Kagawa who served as key informants to help to answer the research question.

The evaluation was conducted in order to analyze and investigate the effectiveness of TKP during its implementation. This study relied on multiple sources of evidences including:

- Literature review: A brief literature review of various articles by using Kagawa University database, Pub Med, Google scholar, Science direct, Medline and Japanese Medical Association Journal (JMAJ).
- Key informants: Discussions with the various key informants of TKP who had specialist knowledge about the project. They served particularly valuable sources of information it was difficult to obtain articles in English on this project. The purpose of discussion was to collect information from a wide range of people involved in TKP who have firsthand knowledge on TKP. These experts, with their particular knowledge and understanding, provided insight on the nature of the project to the researcher.
- Field experience: Visits to meetings, conferences, and the seminars related to TKP also provided the details about the project.

METHOD OF DATA COLLECTION

Most of the data collection was done by discussion with the key informants, on site

observations in case of seminars and meetings, analysis of various documents and reviewing articles available. Following key words were used during the article/information search :

- Team Kagawa Project
- Telemedicine
- "Health care" AND "Japan"
- "Diabetes" AND "Japan"
- "Prevention" AND "treatment" AND "diabetes" AND "Japan"
- "Health+guidance"
- "Health+checkups"
- "Critical+pathway"
- "Electronic+medical+records"
- "ICT+projects" AND "Japan"

Following search engines were used :

- Kagawa University database
- Pub Med
- Google Scholar
- Science Direct
- Medline
- Japanese Medical Association Journal (JMAJ)

DATA ANALYSIS

All the information mentioned above was analyzed using the 'Logic Model Framework' in order to evaluate this project. Program evaluation is a systematic method for collecting, analyzing, and using information to answer questions about projects, policies and programs. Evaluation is a systematic collection of information about the activities, characteristics, and outcomes of programs. Worthen, Sanders, and Fitzpatrick (1997) defined evaluation as "the identification, clarification, and application of criteria to determine an evaluation object's value [worth or merit], quality, utility, effectiveness, or significance in relation to those criteria". They further delineated evaluation into the categories of formative evaluation and summative evaluation. The current study may be considered as a formative evaluation because the information gathered can be used to improve a program initiative and to determine the next steps in its implementation. While some initial outcomes of the initiative have been examined, the goal of the evaluation was not to determine the overall worth of the program based on these outcomes ;

therefore, this study did not fall into the category of summative evaluation.

Chapter 4 THE LOGIC MODEL

The Logic Model (LM) displays the sequence of actions that describe what the program is about. The model presents a plausible and sensible model of how the program will work under certain conditions to solve identified problems (Bickman, 1987).The elements of the LM are resources, activities, outputs, and the relevant external influences (Wholey, 1983). Following are the five main components of the LM:

1. INPUTS: resources, contributions, investments that go into the program
2. OUTPUTS: activities, services, events and products that reach people who participate or who are targeted
3. OUTCOMES: results or changes for individuals, groups, communities, organizations, communities, or systems
4. ASSUMPTIONS: the beliefs we have about the program, the people involved, and the context and the way we think the program will work
5. EXTERNAL FACTORS: the environment in which the program exists includes a variety of external factors that interact with and influence the program action.

To evaluate TKP, logic model was used as it supports a systematic approach to understand the impact of interventions within a program. This aids in evaluation of relationships among the various components of a project that could range from statement of a problem to evaluate the impact of causal or mitigating factors related to that problem. The use of logic model has been evaluated in several community based interventional studies and it has given a foresight on monitoring the anticipated short- and long-term outcomes of the projects (Helitzer et al., 2009).

The first step in creating a LM for a program is to state the problem that frames a particular challenge for the population your program will serve. In the case of TKP the problem statement was:

"A growing number of diabetic patients in Kagawa prefecture and poor disease prognosis"

Next is to set up the goal which serves as a frame for all elements of the LM that follow. The goals reflect organizational priorities and help you steer a clear direction for future action. The goals of TKP are:

"Decrease the number of diabetics in Kagawa prefecture and improve the patient's prognosis"

The input activities of the project along with the possible outcomes were identified after discussions with key informants and stakeholders of the TKP. Based on their feedback several inputs activities were identified.

Table 1 shows the progression of LM for TKP project. The table was construted using key activities of TKP and assuming their outcomes. The outcomes have been more meticulously described by dividing them into short, medium and long term outcomes which would depict the progression of the project.

The LM also considered some key assumptions and external factors that could affect the outcomes of the project, Table 2 (appendix). The major assumptions were that all health personnel make efforts to contact TK and use the ICT technology provided also all patients contacted during the project give their consent. The evaluator made a list of potential outputs and outcomes related to project activities Table 3 (appendix). These possible outputs recommended an inclusion of community enlightenment through education and health support, the potential outcomes through this would be change in behavior and practice that would lead to a healthier life-style.

Table 1 Logic model for TKP with key inputs, outputs and anticipated outcomes.

SITUATION	INPUTS	OUTPUT		OUTCOMES		
		Activities	Participation	Short-term Knowledge	Medium-term Actions	Long-term Conditions
Growing number of diabetic patients in Kagawa prefecture and their poor disease prognosis	Members of TKP Funding - Ministry of Education (50 million yen/ yr) Partners/ Related-organizations	Enlightenment for community medical facilities & residents Development of K-MIX & Electronic Health Records (EHR) Promotion of Critical Pathway for DM Health Support for residents Clinical research for the analysis of pathology education	Residents of Kagawa prefecture, Medical personnel (Olive & Kitagun Diabetes Cooperation Society)	Improvement in awareness and knowledge on diabetes Improved skills on exercise Improved motivation of all participants	Improved behaviour and practice towards prevention of diabetes Improved decision making by medical personnel	Decreased no. of diabetic patients in Kagawa prefecture and improvement in their disease prognosis

Chapter 5 RESULTS AND DISCUSSIONS

As mentioned earlier, TKP is a long term project that is in the starting phase and will continue to proceed in future. At this stage the main results of the project are the initiation of the following activities:

- Enlightenment for community medical facilities & residents
- Development of K-MIX & Electronic Health Records (EHR)
- Promotion of Critical Pathway for DM
- Health Support for residents
- Clinical research for the analysis of pathology
- Education

Table 4 Possible outcomes and assumptions of TKP

OUTCOMES AND ASSUMPTIONS		
Short-term Knowledge	Medium-term Actions	Long-term Conditions
Improvement in awareness and knowledge on diabetes for both patients and medical personnel Increase in coordination between institutes and MDs Improved skills on exercise Improved motivation of all participants	Improved behaviour and practice towards prevention of diabetes Improved decision making by medical personnel	(Assumption) Decreased no. of diabetic patients in Kagawa prefecture and improvement in their disease prognosis Decrease mortality and morbidity caused by the disease

Table 4 shows the potential outcomes from the TKP. The findings suggested that TKP is a project that makes use of telemedicine for the aim of improving the overall control over DM in the Kagawa prefecture. Reflecting the use of telemedicine for information exchange as one of its tool for treating DM in the best possible way, but at the same time also involves other strategies like providing education to the community, performing clinical research for the analysis of pathology, promoting critical pathway for DM, providing health support to the community residents. The activities of the TKP improve the awareness of diabetes amongst the community in the short term and in the long term it is expected that the project will reduce the number of diabetics subsequently decreasing the disease burden.

Telemedicine is an innovation that is changing the geography of medical care provision.Telemedicine is regarded as a blueprint for futuristic medical innovation that can

greatly improve accessibility to and utilization of medical institutions and the transfer of medical information (Cutchin, 2002).

Kagawa prefecture is one of the most advanced areas for healthcare information technology. There are many ICT projects in Kagawa prefecture one of which is K-MIX as discussed earlier in the report. Having more than one hundred islands and some under populated mountainous areas, the prefecture has struggled with shortage of medical practitioners. With some governmental actions, minimal numbers of physicians are located in the areas. Though the physicians can cure common diseases, they have limitations to refer their patients to specialists for treatment of DM. Kagawa university hospital has been developing the telemedicine network system to make breakthrough this problem. The feature of this system K-MIX is a structure which have a center server in the network. All communications (e.g. patient referral, order of image interpretation) are performed through the center server, using Web technology (HTTP, Java).

K-MIX was developed as the system for the Internet transmission of patient data[1], to support the diagnosis, treatment, and the process of informed consent with the aid of specialists. The system started operation in June 2003 as a network of medical institutions in Kagawa prefecture; it was constructed with the expectation of access from facilities outside the Prefecture. According to a paper published in Japan Medical Association Journal (JMAJ), as of February 29, 2008, the participants of the system include 59 medical institutions in Kagawa prefecture, 2 in Okayama Prefecture, 1 in Hyogo Prefecture, and 1 in Hiroshima Prefecture.

K-MIX is an internet-based transmission system; it can be accessed from any facility at any place, provided that there is a personal computer with an internet connection. In contrast to the benefit, the use of the internet raises security concerns. For this reason, the network has been designed carefully with elaborate protective measures including multiple barriers to achieve a high level of security.

Chapter 6 CONCLUSION AND RECOMMENDATIONS

A successful project is more than a quick fix of problems and the same implies to TKP. TKP is expected to be successful and effective in decreasing the prevalence and improving the prognosis of DM. An effective project weighs the below aspects in detail:

- Responds to real issues
- Improves community members' lives

- Incorporates the abilities of those who are served
- Recognizes the contributions of all participants as important and necessary
- Is based on a realistic assessment of available resources
- Aims for specific goals and objectives with measurable results
- Builds effective networks
- Empowers people and communities

Most of these qualities were there in TKP but since some of the components of the project are still in its infancy and are not completed yet. Hence there is not enough evidence available that can be used to back up these qualities. A detailed assessment of community living in Kagawa prefecture should be done for determining their strengths and weaknesses by using community assessment tools.[2]

Having a multidisciplinary team, most of the members were only aware of their part of work but did not have an overall picture of the project and its activities. Many discussions with various key informants of the project were conducted, but they were not able to provide information regarding the various activities and their outcomes in TKP. It was also noted that there should be a list of assets that TKP has for its disposal needs to be made public and shared with the evaluation team to see the cost benefit effects of this intervention[3].

Currently TKP has a very general approach, having broad goals and not specific time frame to achieve those goals. Setting effective and realistic goals are important for defining the scope and measuring project's success[4]. This also ensures that the project can be completed effectively. Most of the indicators for determining the success and the effectiveness of the TKP are still unknown. Although TKP carried out many activities but most of these activities are not quantified. Together with this the activities are neither tracked nor monitored.

Many seminars are carried out as a part of activities of TKP in Kagawa prefecture community education on DM by visiting community centers. During the evaluation two such activities were done at Sanuki Tsuda Community Center (no. of participants 84) and Sanuki Nagao Public Hall (no. of participants 120). A seminar on strategies of preventing and improving DM was conducted followed by a simple sitting exercise for audience. The seminars were professionally conducted and audience seemed satisfied. Audience was also given a chance to ask questions regarding their health and was given free handouts of the lecture. Some of these activities are documented on Kagawa University's webpage. For improving such activities further, questionnaires should be distributed among the audience to evaluate seminar. These questionnaires can help to

evaluate the activity and improve the future seminars. They may also provide a quantitative evaluation of the change in the knowledge, attitude and practices of the participants which would in turn be used as a feedback mechanism for future improvements.

After setting up of the goals, a work plan[5] should be drafted. A simple, easy-to-understand schedule that documents each task involved in reaching the project's objectives is important to construct. The TKP should appoint an individual or a subcommittee to monitor the project's progress and encourage, remind, and reward those working on each task. There should also be a budget allocation for an annual progress evaluation by an independent project monitoring team. This type of fund allocation will mean that the strengths and weaknesses of the project will be monitored and recommendations to steer the project towards achieving its goals will be easier.

TKP was still in its trial stage and not fully functional at the time of the evaluation, a complete evaluation could not be made at this stage. Timely evaluation plays an important role in ensuring the long-term effectiveness of project. To improve TKP's functionality, the projects needs to document what worked and what didn't and whether the project achieved its objectives. The evaluation process need not be expensive or time consuming but should be done bi-annually. The greatest difficulty during the project evaluation was the language barrier and time limitation. Most of the literature about the project and activities was documented in Japanese language. Therefore considerable time and effort was needed to understand and comprehend the various processes involved in the research. Due to this reason the researcher was unable to analyze the collected data available and also translate the documentation at present that could be made use of for the evaluation.

The project is sophisticated and technologically advanced, but this comes with disadvantages like some doctors may not be comfortable using IT systems. Some may want to use this technology but they don't know how to use it and perhaps they need access to an IT training facility. To solve this issue, Team Kagawa must undertake training programs for such doctors, nurses etc in order to improve their skills as well to promote such kind of technology. With technology comes some shortcomings, like this system can easily be misapplied or misestimated （over and underestimation of system's performance）. Moreover some doctors still prefer to use hard copies and fear such systems due to the sophistications which come with it and it may deter them to get involved.

Being a very secure system, it has quite strict security system and one has to go through many steps in order to enter this system. This might be a nuisance for many

users specially the health staff who have limited time and a greater patient burden. Another important requirement to use such a system for treatment of DM is it requires high technology, man power and specialist equipment. These require continuous maintenance and may not be useful in low resource setting.

The team was very open to the comments and remarks made by the evaluator and were positive about them. During the evaluation it was found that the team was welcoming and inclusive. Despite the fact that the evaluation was being done by a foreign researcher; the team always gave value to the comments and anticipated the researcher to come in future and evaluate the project again.

---

[1] X-ray, CT, MRI, digitally captured images of skin lesions, fundus photography, referral documents, and laboratory test results

[2] Survey, asset inventory, community mapping, focus group, daily activities schedule, seasonal calendar, community cafe, focus group and panel discussion

[3] Human assets, organizational assets, physical assets and club assets

[4] Effective goals are shared, challenging, achievable, measurable and time specific.

[5] The work plan should list: Specific tasks , Individual responsibilities , Resources , Budget , Project timing and deadlines, Anticipated task outcomes

LIST OF ABBREVIATIONS

ASP	APPLICATION SERVICE PROVIDER
DM	DIABETES MELLITUS
EHR/EMR	ELECTRONIC HEALTH RECORD/ ELECTRONIC MEDICAL RECORD
GDP	GROSS DOMESTIC PRODUCT
HC&G	HEALTH CHECKUPS AND GUIDANCE
ICT	INFORMATION AND COMMUNICATION TECHNOLOGY
IT	INFORMATION TECHNOLOGY
K-MIX	KAGAWA MEDICAL INFORMATION EXCHANGE
NIDDM	NON INSULIN DEPENDENT DIABETES MELLITUS
OECD	ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT
TK	TEAM KAGAWA
TKP	TEAM KAGAWA PROJECT
TLM/LM	THE LOGIC MODEL/ LOGIC MODEL

REFERENCES

American Diabetes Association, A. D. (2007). Diagnosis and Classification of Diabetes Mellitus. *Diabetes Care, 30* (suppl 1), S 42-S 47. doi: 10.2337/dc 07-S 042

Assal, J. P., & Liniger, C. (1989). [Long-term complications in diabetes mellitus]. *Acta Med Port, Suppl 1*, 33 s-37 s.

Bickman, L. (1987). The functions of program theory. *New Directions for Program Evaluation, 1987* (33), 5-18. doi: 10.1002/ev.1443

Burton, L. C., Anderson, G. F., & Kues, I. W. (2004). Using Electronic Health Records to Help Coordinate Care. *Milbank Quarterly, 82* (3), 457-481. doi: 10.1111/j.0887-378 X.2004.00318.x

Collste, G., Duquenoy, P., George, C., Hedström, K., Kimppa, K., & Mordini, E. (2006). ICT in Medicine and Health Care: Assessing Social, Ethical and Legal Issues. In J. Berleur, M. Nurminen & J. Impagliazzo (Eds.), *Social Informatics: An Information Society for all? In Remembrance of Rob Kling* (Vol. 223, pp. 297-308): Springer US.

Cutchin, M. P. (2002). Virtual medical geographies: conceptualizing telemedicine and regionalization. *Progress in Human Geography, 26* (1), 19-39.

DesRoches C.M., Cambell E.G., Rao S.R., Donelan K, Ferris T.G., Jha A, Kaushal R, Levy D.E., Rosenbaum S, Shields AE, Blumenthal D. (2008). Electronic health records in ambulatory care—a national survey of physicians. *N Eng J Med*, *359* (1): 50－60

Framework for program evaluation in public health. (1999). *MMWR Recomm Rep, 48* (RR-11), 1-40.

Harris, M. I., Flegal, K. M., Cowie, C. C., Eberhardt, M. S., Goldstein, D. E., Little, R. R., . . . Byrd-Holt, D. D. (1998). Prevalence of diabetes, impaired fasting glucose, and impaired glucose tolerance in U.S. adults. The Third National Health and Nutrition Examination Survey, 1988-1994. *Diabetes Care, 21* (4), 518-524.

Helitzer, D., Willging, C., Hathorn, G., & Benally, J. (2009). Using logic models in a community-based agricultural injury prevention project. *Public Health Reports, 124* (Suppl 1), 63.

Hersh, W. R., Helfand, M., Wallace, J., Kraemer, D., Patterson, P., Shapiro, S., & Greenlick, M. (2001). Clinical outcomes resulting from telemedicine interventions: a systematic review. *BMC Medical Informatics and Decision Making, 1* (1), 5.

Hirose, T., & Kawamori, R. (2005). Diabetes in Japan. *Current Diabetes Reports*, 5, 226-229.

Konishi, M. H. (2009). New Electronic Transmission System in Health Care Using the K-MIX; Kagawa Medical Internet eXchange. *Japan Medical Association Journal*

(*JMAJ*), *Vol.52 No.4* (July-August 2009), 269-270.

Levinson, D., & Christensen, K. (2002). *Encyclopedia of Modern Asia* (Vol. 5): Charles Scribner's Sons.

McLaughlin, J. A., & Jordan, G. B. (1999). Logic models: a tool for telling your programs performance story. *Evaluation and Program Planning, 22* (1), 65-72.

Murphy, S. P., & Johnson, R. K. (2003). The scientific basis of recent US guidance on sugars intake. *The American Journal of Clinical Nutrition, 78* (4), 827 S-833 S.

Schwartz, A. V., Hillier, T. A., Sellmeyer, D. E., Resnick, H. E., Gregg, E., Ensrud, K. E., . . . Cummings, S. R. (2002). Older women with diabetes have a higher risk of falls: a prospective study. *Diabetes Care, 25* (10), 1749-1754.

Sundra, D. L., Anderson, L. A., Gwaltney, M. K., Brownson, R. C., Kane, M., Cross, A. W., . . . White, C. R. (2006). Using Concept Mapping to Develop a Logic Model for the Prevention Research Centers Program. *Preventing Chronic Disease 3 A, 6*.

Whitten, P. S., Mair, F. S., Haycox, A., May, C. R., Williams, T. L., & Hellmich, S. (2002). Systematic review of cost effectiveness studies of telemedicine interventions. *BMJ: British Medical Journal, 324* (7351), 1434.

Wholey, J. S. (1983). Evaluation and effective public management, *American Journal of Evaluation*, vol.6 (1), 40-50

Yamakata, D., & Nogawa, H. (2011, 18-21 July 2011). Open Issues toward Successful Deployment of Electronic Health Information Exchange in Japan - Analysis of Regional Health Information Network in Kagawa Prefecture. *2011 IEEE/IPSJ 11 th International Symposium on Applications and the Internet,* 583-586

Yamakata, D., Nogawa, H., & Ueda, M. (2011). A successful model of regional healthcare information exchange in Japan: Case Study in Kagawa Prefecture. *8 th International Telecommunications Society (ITS) Asia-Pacific Regional Conference, Taiwan: Convergence in the Digital Age*

APPENDICES:

Table 2 Assumptions and external factors that may affect logic model evaluation

Assumptions		External Factors
- All health personnel specially physicians makes an effort to contact Team Kagawa - Patient give their consent		-Re-entry of data in the system -Equipment -Training required to use this system -Public policy (government policy) -Economy

Table 3 Possible outputs and outcomes of Team Kagawa Project

OUTPUTS	OUTCOMES
Enlightenment for community medical facilities & residents through education & Health Support for residents (Seminars on 'Strategy of preventing and improving DM'	Participants who attended this seminar might have increased knowledge and awareness on DM, its prevention, and suitable exercise that can be performed. The behaviour and practice towards their health was may have improved. Hence, affecting the long term outcome of this project that is 'Decrease in number of diabetic patients and improving their disease prognosis' There may be an increase in coordination between health care personnel. Common medical records No double prescription Increased equality Increased coverage
Development of K-MIX & Electronic Health Records (EHR) & promotion of Critical Pathway for DM	Residents that are living in outskirts of Kagawa and who usually use regional hospitals have may have a better access to treatment and consultations After taking patient's consent the doctor working in regional healthcare centre sends the patient's information to the specialist (endocrinologist), who reviews the information and provides useful information to the doctor which helps him making best decision for the patient using specialist knowledge Doctor's knowledge on the treatment protocol improves and now more aware of newer treatment options, also the patients are satisfied by receiving specialist consultation without any difficulty Improved skills of doctor and his decision making Cost benefit for both doctor and patient