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## Research Article

# Development of Community Health Care Networks Utilizing Local Community Centers

## Abstract

**Objectives:** Japan is expected to become the first super-aging society in the world, and the collapse of the Japanese health care system is becoming a real possibility, due to the aging of the society combined with a significant increase in medical expenditure. In Japan, with the majority of land covered by forests, regional disparities between urban and depopulated mountainous areas are becoming greater each year. The importance of health management of the elderly living in these mountainous areas and disease-prevention measures for them has been noted.

**Methods:** In the present study, Kitanakagusuku Village and Nanjo City in Okinawa Prefecture were selected as models, and an ICT (Information and Communication Technology) -based community health care network was developed utilizing local community centers, with the aim of promoting the health of the villagers, improving the quality of their lives, and revitalizing the local communities.

**Results:** Briefings and health classes held between June 2009 and March 2010 were attended by 196 and 232 local residents, respectively. The portal website was visited by 1,200 people each month. All who had consulted physicians regarding their health and medical care were satisfied with the consultation services.

**Conclusions:** In this context, a project was introduced for the development of an ICT-based community health care network that uses local community centers as bases for regional communities, focusing on examples of activities implemented in mountain villages in Okinawa Prefecture. Although this project is still a pilot trial, it is expected to significantly help to improve health care systems in developing countries, as well as mountain villages and rural areas in Japan and other developed countries.

## Introduction

Kitanakagusuku Village is located in the central area of the main island of Okinawa, 16 kilometers to the northeast of Naha City, the prefectural capital. It is a typical mountain village, primarily consisting of hills or undulations, rather than flat land. The population of the village is 16,501, and the population aging rate is 20.2%. The village is becoming a super-aging society, just as other mountain villages in Japan are. Nanjo City is located in the south of the main island, 12 kilometers to the southeast of Naha City. The majority of its land also consists of hills, rather than flat land. The population of the city is 40,548 and rapidly aging, as reflected in its population aging rate: 21.2%. Although the elderly people living in these typical mountainous areas usually use their private vehicles to receive community health care services, because they have difficulty walking on undulating ground, some of them do not have or cannot drive vehicles. Furthermore, because there are

no railways in Okinawa, except in Naha City, people living in mountain villages have difficulty consulting health care institutions.

As increasing numbers of mountain villages across Japan are expected to face the issue of an aging society, we used the above-mentioned village and city as model areas for community health care and conducted the following activities as measures to address the issue: the installation of computer terminal equipment for a health information management system in local community centers, places that can easily be visited by the elderly living in their vicinities for interaction, by utilizing ICT (Information and Communication Technology) and the centers; simulations of remote health/medical consultations using computer terminal equipment in collaboration with the physicians of the Okinawa Research and Development Center for Health and Longevity in Uruma City, Okinawa Prefecture; and regular visits to local community centers to hold events



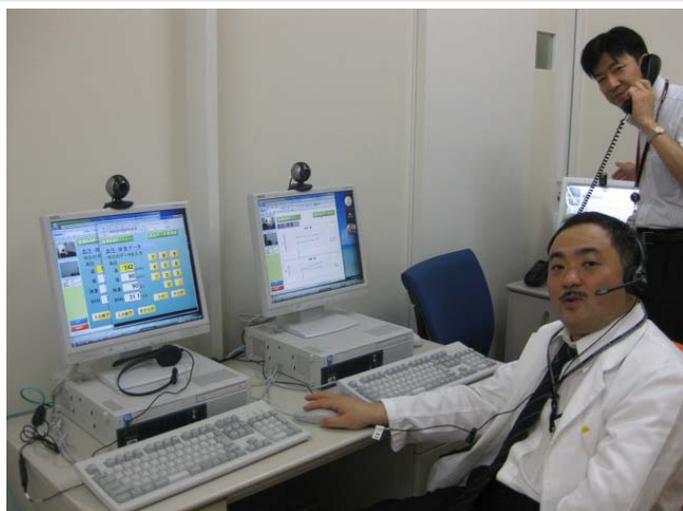


Figure 2: Doctor using ICT system at community center.

Between December 2009 and March 2010, health classes were held in 19 local communities; this was in addition to the operation of the health management information system, implementation of the remote health care/medical consultation system, and development and use of the community/health portal website. Furthermore, a hearing survey involving people who had been provided with health care consultations was conducted to assess community residents' satisfaction.

## Results

Briefings and health classes held between June 2009 and March 2010 were attended by 196 and 232 local residents, respectively. The portal website was visited by 1,200 people each month. Twenty users (approximately 10% of the participants in the health classes) of local public centers consulted physicians regarding their health and medical care, using the link to the Okinawa Research and Development Center for Health and Longevity. According to the results of a hearing survey, all 20 people (100%) who had consulted physicians regarding their health and medical care were satisfied with the consultation services.

## Discussion

To the best of our knowledge, there have been no projects in Japan and other countries on the development of community health care network systems utilizing local community centers and involving general preventive medicine, although a few studies have been conducted on community health care networks involving some specific disorders. Therefore, the present study is of significance, although it is a pilot study.

As a pilot study, we have developed a community health care network system utilizing local community centers, and the results suggest that local residents are satisfied with the system, although some improvements should be made.

Because the issue of an aging society is expected to become increasingly serious around the world, including Japan, this project is of significance because it encourages community

residents to visit local community centers to receive health consultation services in a safe and relaxed manner, while feeling at ease, to prevent disorders. This has a significant meaning for the elderly who have difficulty walking. The number of elderly and those in need of nursing care in Japan is expected to reach tens of millions in the near future, and there has been concern over more serious shortages of physicians and nurses, as well as the collapse of the Japanese health care system. The use of a remote health care system by health care professionals allows them to become informed of the health conditions of patients, provide consultations without difficulty, and efficiently obtain information on the health of community residents. In this sense, the system plays an important role in clinical settings.

In recent years, there have been a number of reports in Japan on follow-ups by telephone after examinations, education to encourage those who withdrew from treatment to consult physicians, and the provision of medical and care support using mobile phones, email, and other ICT systems [1-13]. As advantages of these support services, only a short period of time is required to solve problems, and the recipients of the services feel a sense of security, which encourages them to speak about their personal problems and emotional condition. As another advantage, services based on visual communication allow health care professionals to observe the facial expressions of patients, their gestures, and physical condition more closely, compared with telephone interviews. In addition, community residents can easily refer to medical information in the environment of the system established by effectively using the Internet, and the environment is expected to: provide them with opportunities to improve their lifestyle habits, as well as information; support their self-care behaviors, including judgment of the need to visit the hospital; and serve as a coordinator in continuous efforts to solve problems in the community. As an advantage of the availability of ICT in communities, local areas inhabited by large numbers of the elderly, in particular, can receive many high-quality care services at local community centers in the vicinity of their homes, which is an important element for safe, secure, and comfortable lives.

Activities for the prevention of lifestyle-related diseases will not be feasible without their active promotion, such as invitations for villagers/citizens to participate in them and the provision of support to help to continue them. In Japan, these roles may be fulfilled by health insurance societies in large-scale companies located in urban areas. However, in rural mountain villages, there are no large-scale companies and most residents have national health insurance, and, as a result, these roles are not fulfilled by any organizations. To address this problem, we focused on the utilization of ICT, as well as local community centers and community associations, to promote activities for the prevention of lifestyle-related diseases.

In ICT-based health check-ups conducted at local community centers, residents were asked to read a question sheet, which is an equivalent to a "medical interview sheet," and answer the questions by inputting data into a PC installed in the center. The data inputted are stored in a server, which can

be used to create a list of villagers with a high risk of lifestyle-related diseases, and encourage them to undergo specific and special medical examinations. This system can also be used by villagers as a tool to refer to their medical histories to be informed of changes in their health conditions, and increase their motivation to participate in health-promoting activities.

We also implemented health-promoting activities based in local community centers, including health-related lectures and seminars on nutrition delivered by physicians and advice on health-promoting exercise, to facilitate direct communication between villagers and groups of physicians and to improve the environment to encourage community residents to feel free to receive ICT-based health/medical consultations following the activities. As an example of the above-mentioned approaches, efforts have been implemented to prevent “fall-related accidents,” which are one of the most important issues related to health care for the elderly in Japan and other countries, by incorporating ICT, including the introduction of PC terminals to homes and attaching watch-type sensors to the wrists of residents for monitoring. We sometimes visited local community centers to conduct “health-promoting exercises” for the elderly at risk of falls and help them to check the results of follow-ups using PC terminals. We are developing environments in which rehabilitation functions are more accessible and implemented more easily and simply, using ICT.

We not only position local community centers as places for events related to health-promoting activities but also develop them into bases for the promotion of health-related activities. We aim to help villagers “associate local community centers with health promotion” and enhance their feature as “places for health consultation” to increase the villagers’ awareness of health maintenance. Specifically, health-promoting activities conducted at present are continued to promote the following features of local community centers:

- (1) Collection of health-related data at community bases
- (2) Provision of support and programs to promote healthy lives
- (3) Consultation offices for community residents
- (4) Provision of information to community residents

Community residents input data to the “health check” system and undergo body-weight (using a weight and body fat scale) and blood pressure measurements on a regular basis, and measurement data are sent to the health information center. Data on the health of community residents are monitored by the physicians of the Okinawa Research and Development Center for Health and Longevity, including myself, who refer community residents to health care institutions for screening on an as-required basis. Medical and health care consultations using a remote consultation system are also provided, and programs to improve basic physical fitness and those related to the self-management of health conditions are implemented. Local community centers also play leading roles in informing community residents of health-related events, responding to

inquiries, and performing other clerical tasks. In addition, the centers provide information on the community/health portal website and through the public relations section, and meetings are held at the centers to provide explanations to community residents. Explanations of projects related to health promotion are provided in monthly meetings attended by ward leaders, as well as to ensure that community residents are informed of them.

The above-mentioned uses and functions provided by local community centers as bases can fulfill significantly important roles in improving community health care in mountain villages.

The health portal website consists of the following contents: “My Page”, hospital search, drug information, health/medical care-related news, useful and updated information provided by local governments, messages from physicians in the villages, search function, and contents related to companies (including advertisements and their recommendations).

### Personal (My) Data

- (1) Function to display chronological changes in graphs: Time spans can be designated to display the readings of selected items in line graphs (default: body weight).
- (2) Physical record function: The readings of the following eight items can be recorded at any time: the date of measurement (optional), height, weight, body fat, high blood pressure, low blood pressure, waist circumference, body temperature, and mean sleep time in the past week. From 1 week after the first registration, the readings can be recorded using mobile phones.
- (3) Email reminders to record physical functions: Emails to remind users to record their physical functions are sent to registered addresses for notification once a week.

Records of medical consultation: Information of when patient consulted physicians for what disorders and examination

- (1) List display function: A list of medical consultation records in chronological order is displayed at the top of the My (Data) Page. Searches can be conducted by inputting the names of families or hospitals.
- (2) Functions to display details and register consultation records: The following eight items can be recorded: date of consultation (optional), name of the health care institution (optional), name of the patient (and his/her family, optional), disorders and symptoms (within approximately 50 characters), treatment provided (within approximately 50 characters), names of prescribed drugs (within approximately 25 characters), prescription period (number of days), and the next appointment date.
- (3) Email reminder of consultation: Email is sent to registered addresses for notification as a reminder of consultation on the day before medical consultation.

- (4) Email reminders to record consultations: Email is sent to registered addresses for notification, as a reminder to record consultations to physicians the day after hospital visits.

The hospital search function allows the users to search for health care institutions and people's comments on them by selecting areas and points on the map and inputting the names of clinical departments and key words.

Users can search for prescribed drugs by inputting key words. Users wishing to read health/medical care-related news can use an RSS (really simple syndication) feed reader; a medical category on the portal website and medical information website have been established as part of the initial setting. These news articles have external links (articles published on specific news websites). Useful and updated information provided by the local governments can be displayed by selecting from the latest articles published in exclusive categories for the local governments. Websites operated by the local governments have adopted the CMS, so that the above-mentioned categorized articles will be updated. The titles are linked to the top page of the above-mentioned categories, and each RSS feed is linked to websites including corresponding news articles. Fixed link copying (updating-type) is used to introduce websites including health and nursing care-related information managed by the local governments. These copies have external links (websites including related information operated by the local governments).

Users can read messages from physicians in the villages using an RSS feed of "Blogs written by specific physicians," which are submitted in advance or on an as-required basis. If it is difficult to recruit an adequate number of physicians living in the community, consider recruiting physicians from other areas. The website has external links (articles published in physicians' blogs).

The search function of the portal website allows its users to search specific groups of websites identified in advance for information, using the search function. Search results are displayed in the search result table on the portal website.

On the website, specific categories of medical/health care-related articles of companies as partners have been established, and the users can obtain company-related information, using an RSS feed reader. These categories have external links. Companies can place advertisements in the contents of the website and banner space allocated on an as-required basis. Advertisements are linked to each partner company or distributed by their ad servers.

### Problems and future challenges

Problems faced by health care in depopulated areas overseas are becoming serious, as suggested by the above-mentioned examples of efforts to improve health care in remote areas and mountain villages. Our approach of utilizing local community centers as bases to address these problems is expected to have an impact on the issue and influences on many different countries.

Furthermore, there have also been reports on health care activities using mobile phones, wireless equipment, and other methods, such as mHealth, from many different countries [14–20]. These are important efforts to improve health care in remote areas, and developing countries expect advanced Japanese technologies to fulfill a variety of roles [21]. However, many elderly, aged 75 years or older, live in remote and depopulated areas in Japan, and it is questionable whether all of these people can make full use of mobile phones and wireless equipment.

As an example of efforts to effectively utilize local community centers in foreign countries, a study involving breast cancer patients was conducted to examine the effects of psychotherapy in community centers. The results of an RCT (Randomized Controlled Trial) were compared among patients who had received psychotherapy in person in community centers, those who had undergone remote psychotherapy at community centers, and patients of a control group. There were similar improvements in the prognosis of patients in the first two groups [20]. A dementia-prevention program involving the elderly was also conducted, and the results were acceptable and effective for both groups of patients who received the program in person at community centers and underwent it through a remote health care system [21].

Activities for mutual assistance using community centers in local communities as their bases serve to promote collaboration and communication among the elderly, as neighborhood community associations did in the past, and help local residents to efficiently provide them with support at a low cost.

However, this approach is a health management system developed in terms of preventive medicine and taking into consideration the convenience of elderly people, and the conventional health care system may provide better care services for the bed-ridden elderly and those in need of emergency care. This system based on local community centers may fulfill important roles in disaster medicine.

### Conclusion

The population of Japan is aging, and its birthrate is declining at rates unprecedented worldwide. Japan is determined to become the world's leader in promoting health and longevity as its national strategy, as well as promoting health and related industries.

In this context, the present paper has introduced a project for the development of an ICT-based community health care network utilizing local community centers or bases for regional communities, focusing on examples of activities implemented in mountain villages in Okinawa Prefecture. Although this project is still a pilot trial, it is expected to significantly help to improve health care systems in developing countries, as well as mountain villages and rural areas in Japan and other developed countries.

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