

Public Health Nursing: Identify Technological Service Interventions to Empowering Elders with Chronic Conditions

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Abstract: The world's population is getting older. Studies showed that the vast majority of older adults prefer to grow older without having to move. The concept of "Aging in place" has gained attention globally from governments and public health institutions. However, the lack of public health resources (e.g., programs and manpower) and difficulties of changing patients' behavior imposed challenges for helping elders with chronic conditions remain in their homes as they age. To address this challenge, our study attempted to identify a technological service intervention in public health nursing to empower elderly people with chronic health conditions. Our study developed a design and analytic framework for designing effective technological service interventions that assist public health nurses with health promotion events and activities. The framework integrated Zimmerman's components of empowerment with Fogg's Behavior Model for Persuasive Design to improve the likelihood of change of health behavior among elders with chronic diseases. In this study, we conducted semi-structure interviews with sixteen public health nurses who have more than one year of work experience. The focus of the interviews was to understand (1) current service practices; (2) challenges, (3) possible strategies, as well as (4) technology opportunities in helping elders manage chronic diseases. The collected data were analyzed with our developed framework for identifying adequate technological interventions for public health promotion and diseases prevention. Results of the interview showed that, when facing chronic diseases, elder people generally were lacking confidence and health awareness. Some even refused to receive health advices, health promotion activities, and visits and care by public health nurses. Results of the analysis suggested the mobile application (installed in tablet PCs carried by public health nurses) will be adequate in one-on-one health promotion activities. To improve motivations of health behavior and trigger health behavior among the elderly, the application could demonstrate graphically the consequences, the cost, as well as the crisis of family relationships if ignoring chronic diseases. To help the elderly be aware of their ability (i.e., empowering the elderly) to manage chronic health conditions, the application also contains successful diseases management stories of friends, neighbors, or known individuals. To help enhance the elders' ability to reach public health resources, the application provide nurses with graphical information on community personnel, public health nurses, hospitals, and health

institutions, etc. In addition to one-on-one health promotion activities, our study also recommended using media (e.g., TV screen banners and LED moving message displays) to deliver health information to empower the elderly and change their health behavior. Results of the study provided insight for public health professionals to conduct education to promote healthier behaviors and environments.

Key words: *Persuasive design, empowerment, chronic diseases*

1. Introduction

Public health is service that provides environment sanitation, diseases prevention, health promotion through community. The main services deal with the prevention of diseases, environment sanitation, public health problems and activities, researches of public health and execute the policy for authorities(Fogg, 2009a; Wilson, 2001).In the topic of public health, the death rate of chronic diseases was 60% of whole world death rate, and according to the prediction of WHO, it will increase 17% between 2005 to 2015. Facing the huge medical demand of chronic diseases, each country should organize related organizations and foundations in the community, conduct the service of prevention and curement from the basic level(Shen, Edwards, Courtney, McDowell, & Wu, 2012).

Improvement of quality of life and widespread of medical service, the population on earth had become an aging population. In 2012, the proportion of elder population that over 65 years old in global population had reached 22%. In Taiwan, this problem is also serious, the proportion of elders increase year by year, there are almost 2.6 million elder people in Taiwan in 2012. Furthermore, 88.7% of these elder people, had chronic diseases, and many elders had multiple chronic diseases.

So many researchers attended to improve the community chronic diseases care. For example, they connected the community and the medical foundation, and use this foundation that had more resource to do long-term service of cure and follow-up(Steiner et al., 2008). Some researchers focused on decrease the burden of the elders for caregivers, let the caregivers have good quality of care(Limpawattana, Theeranut, Chindaprasirt, Sawanyawisuth, & Pimporm, 2013). These researches focus on dealing with the medical or care problem, but not increasing the motivation and confidence of elders.

The concept of empowerment is a process to heave the ability of control(Zimmerman, Israel, Schulz, & Checkoway, 1992). There are lot empowerment applications using in different aspects. In one research, researchers designed different group activities, increased the contact of dementia patients and also their confidence(Nomura et al., 2009). There is a research use group chronic management education to reinforce the effect of medical care in the community that had insufficient medical resources(Shen et al., 2012). Previous research mentioned that the action of empowerment should reinforce the motivation first, so in this paper, we hope we can bring the concept of the persuasive design(Fogg, 2009a), exam the behavior process and motivation of people, and used this concept to discuss the personal motivation and the process of behavior.

Through understanding the service and situation of public health nowadays, we can know the service that the elder received, and problems of public health chronic care. In this paper, we analysis the service also the part we can intervene, and through the nurses, the elders can do a better self medication behavior.

2. Empowerment and chronic disease care for older people

Empowerment is a simple concept that describes the process of increase personal self-recognition, ability, realization. It includes the control of behavior, motivation, sense, leadership, skill, influence (Zimmerman, 1990). Zimmerman divided the concept into three components, intrapersonal component, interactional component, behavioral component. In the part of intrapersonal component, it means a self-perception of a person who can influence the society and political system or not (Zimmerman et al., 1992). Self-perception will influence self-confidence and the motivation of changing the external and then the will of improving the environment. Interactional component explains the aspect of a person influences the environment or the other people, and the perceive of environment and society. Behavioral component explains the actions people take to influence the social and environment through participants in group, community and foundation.

There are many studies applying the concept of empowerment to the community elderly with chronic diseases care. In this study, the researchers provide the elderly a chance to improve chronic condition and self-management ability. In this part, we will discuss three cases of empowerment to community elderly with chronic diseases. In the Huixia Shen's study, researchers empower the elderly who have type 2 diabetes through education programmes. Based on Social Cognitive Theory (Bandura 1977, 1986), the researchers choose elderly with type 2 diabetes as leaders join in this system to improve the abilities. Then, researchers let them affect other elders with chronic condition to manage self-health and community support themselves management (Shen et al., 2012).

There is a study focus on the long-term care of patient having cancer. In this study, the researchers used Chronic Care Model to analyze. In this model, the self-management support is the main part of empowering the patients. In order to enhance patients' motivations of managing the diseases, the researchers developed short-term goal and long-term goal in the different period of treat chronic condition (McCorkle et al., 2011).

In the research of empowering the elderly with chronic conditions in a community, we found that the key point of empowerment of nowadays service is to improve the motivation of the elderly in intrapersonal component. But most of the studies did not think too much about the behavioral component. Without correlative analysis or corresponding behavior, even if the previously actions had a profound impact on the motive of the elderly, the total effects of the empowerment is still limited.

3. Persuasive design and chronic disease care for older people

The persuasive design is process of persuasive technology. And the persuasive technology is kinds of technique which can help user achieve the target behavior on users' own. In order to explain the behavior mode when person was persuaded, Fogg made the Fogg Behavior Model (FBG) of persuasive design in the 2009. He divided the model into three factors; there are motivation, ability and trigger. Motivation is the desire intensity of one's behavior. Fogg had created a framework of motivation that has three core motivators, pleasure/pain, hope/fear, social acceptance/rejection. Next factor of this model is ability, the demand of capability. It includes six elements which are time, money, physical effort, brain effort, brain cycle, social deviance, and non-routine. According the people who have different level of motivation and ability, trigger divided into spark (motivation is low, but ability is high), facilitator (motivation is high, but ability is low), and signal (both motivation and ability

is high) to suit for different situation(Fogg, 2009a). InFBM, researchers can choose an appropriate trigger to motivate a behavior happened when people encounter the situation of choose.

Currently, the persuasive design has been developing in many fields. It provided an opportunity to enhance the behavior probability of the group of poorly-motivated or lack-in-ability. So the persuade design seems especially important as well in the field of public health care, namely to the people who are in need of physiological or psychological medical services.

Some studies regarding the persuasive design have focused on the Alzheimer's care. The purpose of a relevant study is to estimate whether Gentle Persuasive Approaches curriculum (GPA curriculum) will affect nurses' ability for taking care of dementia. Using the criteria of the Person-centered care and the need-driven behavior model of dementia-compromised, GPA curriculum helps nurses find more appropriate ways to deal with the emergencies of the Alzheimer. (Speziale et al., 2009).

There are some researches showing the idea of using persuasive design to help the elderly self-management for health. In this study, the researcher used the ICT technology and combined with the methods of persuasive technology and affective computing (Picard, 1997) in order to design a personal assistance robot to help the elderly take care of themselves effectively. By using motivational interviewing(Sobell, 1992), the personal assistance encourages the old people's perception and attention of their health condition by emotional chatting(Looije, Neerincx, & Cnossen, 2010).

For the past few years, several researches applied the persuasive design in the field of diabetes health care. In hope of promoting DM1, DM2 diabetes to use the ICT system,the researchers developed the Holistic, Interactive and Persuasive ICT model to facilitate self-care of patients with diabetes (hiPAPD) to help diabetes manage their condition. (Vargas-Lombardo et al., 2010).At the same time, in order to use this model more conveniently. It combined with local medical institutions, different stakeholders and providedthe patients' medical needs, thereby to make them better in the process of using this tool for self health care(Vargas-Lombardo et al., 2012).

We found that most above studies focus on improving the patient's motivation, but they rarely enhance the patient's ability of self-care. Therefore, based on Fogg's Persuasive Design Model, in order to achieve a better result, we want to trigger the elders to improve their ability.

4. Research framework

In this study, we use the concept of empowerment model, intrapersonal component, interactional component and behavioral component, to improvethe ability factorof persuasive model. Combining motivation factor and trigger factor, total three main factors to analysis the business of community elder chronic diseases care nowadays. We will explain the three factors in the paragraph below.

Motivation stands for the strength of one's willing, motivation is divided into three dimensions, pleasure /pain, hope/fear, and social acceptance/rejection. From these dimensions we can enhance the probability of a target behavior occur is.Ability referred to one's capability to achieve a behavior. In this part, from the public health centers, most of services are difficult to enhance the ability of the elderly. Therefore, we want to improve intrapersonal component, interactional component, and behavioral component of empowerment concept to increase their motivations and enhance their abilities. Based on the original concept, we redefined the three

components of Empowerment to suit this study. Intrapersonal component is defined as the elderly know whether they have the ability to do self-health management. Interactional component is defined as the elderly know which resources can help themselves to do health management. Behavioral component is defined as the elderly know which behavior can help them to do self-health management and affect others to do self-health management in the community. Trigger is an action that makes a behavior happen, through an appropriate trigger to raise motivation or ability, and persuade people to achieve the target behavior.

These three elements would affect the occurrence of a behavior. According to the analysis of the behavior occurred process, we will be able to find advantages and disadvantages of the services from public health center, and then propose the suggestions to improve the services.

4.1 Method

4.1.1 Participant

In this study, we have interviewed sixteen female public health nurses from the thirty-seven districts of Tainan, Taiwan. Their averages age are thirty-eight years old ($SD=7.3$) who have experienced more than one year of public health care. Before our interview, we will introduce our research purpose by phone. And we have asked the nurses whether they would like to receive our interview and whether they can accept voice recorder records interviews. Then, we interviewed with the nurses.

4.1.2 Semi-structured interview

We conducted semi-structured interviews with the public health nurses that satisfied the conditions mentioned above. In the process of interview, we use the voice recorder and notebook to record the contents of interview, and obtained the information of services which was provided to chronic elders through qualitative semi-structured interviews. This interview outline was divided into four aspects:

First, to understand the education services which were provided for elders, include the purpose, method, effect of services; second, to understand the public health nurses' experiences and difficulties of providing services for chronic elderly in the community; third, from the point of view of the public health nurses to understand the part of the elder chronic diseases services that can be improved; four, from the aspect of technological service intervention, explore the method of combining concept of empowerment and technological products to intervene elders who had chronic diseases.

4.1.3 Data analysis

Based on our framework, three subject matter experts (SMEs) analyzed the education services which were provided for the elders who had chronic diseases, from the factors of motivation, ability, and trigger. In the ability factor, the SMEs discussed the concepts of empowerment, intrapersonal component, interpersonal component and behavioral component.

The SMEs analyzed the properties of these services, and the relationship between services and elders to examine whether these services can help elders to do self-health care and achieve the effect of empowerment or not. After that, the SMEs proposed the recommendations for improvement. In next section, we will explain the results of

interviews in detail.

5. Results

The services of public health center that aim to improve the effect of chronic health care and the education service still have a lot of problems. Through the interviews, we conclude and classify the education services nowadays to find out the problems. In the part of result, we divide the interview in to four parts to discuss.

5.1 Current service practices

The education of chronic diseases is a kind of service provided by public health centers through a variety of channels, including personal health education, the sufferers' association including lectures, activities and visits in communities through mobile hospitals and community health checks. There is a traveling screening process in the mobile hospitals, which offers the opportunity of an early treatment especially for those being lack of medical resources due to their living in remote areas. The form of the community health check is similar to mobile hospitals. The patients' association provides the most diverse services which not only enable participants to learn more about caring knowledge through lectures combining with the course and game activities, but enhance their motivation of self-health management. The community health education is lectures on health diseases, organized by public health centers in their administrative communities, mainly divided in community seminars and activities. The home visit service of public health centers includes telephone visits and home visits. Generally speaking, the education services of public health center provide limited effects of providing information of diseases knowledge to elders, hardly to empower elders to do self health management.

5.2 Challenges

There are several challenges of current service: (1) due to the difference of the economic and education in different regions, elders have different attitudes toward the chronic diseases; (2) the nurses spend energy on the education because many elders do not recognize how serious the diseases could be; (3) many elders not only refuse to gain new information, but unconcern about their conditions; (4) the nurses' have huge workload, cannot visit each case as usual, which requires a large amount of human resource. Under this circumstance, the nurses provide poor education services for the elderly with chronic diseases.

5.3 Technological interventions suggested by the participants

Just as mentioned above, every elderly has different attitude toward the chronic diseases. Some elderly think chronic diseases cannot be cured or controlled, so they ignore the importance of managing their diet, exercising and drugs habits. They are even unwilling to receive the screening services of public health center. According to the result of our interview, some methods could be provided to improve the elderly self-health management.

In the part of enhancing the motivation and efficiency of self management, at first the nurses should teach the elders more knowledge and information. Also, the nurses and family numbers can use some tools to improve the positivity of self-health care, such as medical box which can arrange the schedule of medicines.

We have summarized the requirement of nurses, and most nurses think that they need a technology system which is a hand-held educational technological system, it concludes two main functions:(1) it can search and arrange the elders' information. Nurses can understand the problem of the diseases that the elder has and what should be paid attention. This technology also can screen out the elder whose diseases condition is not so stable, or they did not take cure, to warn the nurses that this case might have problem; (2) through this technology, the nurses can also show the results of the examination with pictures that easily understand the elder can realize the situation of his body and what can he do. Also it will show the results of expense, or the crises of family relationships that if the elder does not do well in the health management.

6. Discussion and recommendations

6.1 Discussion

By using the analytic framework that mentioned before, we could analyze the services that provided by public health center (table 1). From Table 1, we find the services that public health center can improve, and we provide the recommendation to reinforce these services. Currently, majority of education services of public health center are centered on how to raise elder's motivation of managing their self-health. But these services which can motivate elder self-health care are not perfect. For example, some elders have realized their conditions, but they still unwilling to do self-health care or be disabled to look after themselves. There are a lot of elders participate in mobile hospital or the community public health exams. So the nurses have no time to provide enough diseases information to improve the motivation of self-health care.

In the part of trigger, the nurses should tell the elderly the importance of self-care, even when they know their own diseases condition and understand that there is a way to control. However, it may not motivate the elderly to carry on self-health care to control the diseases, because they don't want to do or don't know how to do it for their lack of ability.

The services of public health centers are relatively lacked in the intrapersonal component. It means to help the elderly to have certain cognition of their own ability. Most of the time, the nurses tell the elderly some advices without understanding their abilities of self-health caring. In the community education, the nurses of public health centers provide some diseases information under the situation of misunderstanding the chronic diseases information and precautions.

In the interactional component, it is mainly enabled the elderly to know where to find medical resources for self-health caring. In this part, the work of public health centers' education is almost always involved to help the elderly find medical resources or the place to obtain assistance. The mobile hospitals, community health check, sufferers' association and the visiting activities will directly transfer the elderly referrals to hospitals or clinics for treatment. In the process of community education, the action of transferring does not exist while the relevant medical information will be referred so that the senior citizens can ask for help.

Table 1. The analysis of elderly community chronic care service using our research framework

| Current services | | Mobile Hospital | Community health check | Patients' Association | Community health education | Home visit service |
|-------------------|--------------------------------|--|--|---|--|--|
| Analysis elements | | | | | | |
| Motivation | | ▲:Only tell elders their disease condition and information, not sure if it can raise motivation | ▲:Only tell the elders their disease condition and information, not sure if it can raise motivation | ●: Use peer influence, concern, and detail information to raise motivation | ▲:Only tell the elders their disease condition, not sure if it can raise motivation | ●: Use continuously educate and concern to raise motivation |
| Trigger | | ▲: Only tell elders their disease condition and information, not sure if it can trigger health management. | ▲: Only tell elders their disease condition and information, not sure if it can trigger health management. | ●: Use peer influence, concern, and health education to trigger self health management | ▲: Only tell elders their disease condition and information, not sure if it can trigger health management. | ●: Use continuously educate and concern trigger health management. |
| Ability | Intrapersonal component | X:There is no explanation for elders' ability , the elders do not know their ability | X:There is no explanation for elders' ability , the elders do not know their ability | ●:Explain elders' ability to elders | X:There is no explanation for elders' ability , the elders do not know their ability | ●: Explain elders' ability to elders |
| | Interactional component | ●:Provide the medical resources information to elders | ●:Provide the medical resources information to elders | ●:Provide the medical resources information to elders | ●:Provide the medical resources information to elders | ●:Provide the medical resources information to elders |
| | Behavioral Component | ▲:Provide elders the actions they can take, but the elders do not know why | ▲: Provide elders the actions they can take, but the elders do not know why | ●:Provide other elders' experiences, let the elders know the effective way of health management | ▲: Provide elders the actions they can take, but the elders do not know why | ●:Educate elders doing self management and continuously track them to know their situation |

●: Public health center provides the service and the outcome is notable.

▲: Public health center provides the service, but the outcome is unremarkable.

X: Public health center does not provides the service or the outcome is bad

6.2 Recommendations

In the part of recommendation, we divided into two parts of technology systems in our proposal. One is the technology system which based advocating single elder, and another is based on the group education.

On the individual level, we suggest that the public health nurses should use an education application system of tablet PC to empower elders to manage their health. In this system, it can record and search patients' medical data to provide appropriate information which includes resources and the methods of improving self-health care.

- In the part of **motivation**, the nurses can use this system to explain the problems of health management which was ignored by elders, such as lifestyle, dietary habit, drug habit and exercise habit.
- In the part of **trigger**, this application system allows the nurses to pick up a good example of well health management and near around the elder. Also the nurses can demonstrate the consequence of the diseases and the cost or the crisis of family relationships if the elder's disease condition goes badly.
- In the **intrapersonal component**, the nurses can use this system to analyze the elderly's situation of self-management, and can explain which part should be improved in lifestyle, diet control, medication habits and exercising for the elder.
- In the **interactional component**, through this application system the nurses can provide the medical information of human resources, hospital, foundations that show the elders can understand easily.
- The point of **behavioral component** is to let the elders know the ways to solve problems. Through the system, nurses can provide the information of lifestyle, diet habits, drug habits and exercise habits.

On the group level, from interview, we know that the effects of community health education lecture courses are not doing well, so we recommend that nurses should use different and constantly media to provide the information to elders, make them to execute self health management.

- In the part of **motivation**, nurses can use situation comedy on TV to provide the concept of self health management, constantly to upgrade their concept of self health management to boost their motivation.
- In the part of **trigger**, nurses can use scrolling text marquee in the community provide the information to elders.
- In the **intrapersonal component**, the nurses can use posters to introduce different stages of a disease, and make the elders think what they can do, and evaluate their ability, improve their health.
- In the **interactional component**, the nurses can use posters, stickers with big pictures, which could be delivered in the community. The information could be simple with picture.
- To improve **behavioral component**, nurses can post posters contain lots of pictures about self health management and could be understood easily.

According to the insufficient services we analysis, we bring up this two recommendation that use technological service Intervention to empower elders. We also use model to analysis these two recommendations to achieve the result of empowering elders.

7. Conclusion

The purpose of this study aims to create a model combines the concept of empowerment and persuasive design. Based on this model, we summarize the shortcoming of the service provided by the public health center,

put forward the suggestions to improve the services, and wish this could help elders execute good health management.

We interview the nurses of public health center who have care experience of the elders with chronic diseases in the community. We have summarized the problems of services, situation of chronic diseases in the community, and nurses' views of improving current services. In the discussion, we found that the education services provided for elders do not focus on the intrapersonal component. According to our model, we put forward some suggestions that can improve the ability through technological public health nursing service intervention to empower elders. Through integrate patients' medical data and provide appropriate services that we wish it can enhance patients' cognition and ability of health management. In this way, it can improve educational services and provide a better health caring system.

In our research, there are some limitations, for example we just interviewed nurse not elders because the lack of time. Base on nursing's point of views rather than elders, it could influence the result. Meanwhile, we cannot test the suggested model of technology systems. Based on our model, we just analyze the data of interview and put forward some suggestions. In the future, we will interview elderly patients with chronic diseases and propose more integrated suggestions. After that, we will do the prototype and test the final technology system. We believe this system could apply the service of chronic diseases caring in the community, and could help nurses provide a better service for patients.

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