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Community Management and Policy on Diabetes Patients in Coastal Developed Areas of China: An in-depth Analysis of Shanghai Model

GAO Tong

Doctor of Management

Supervisor:
PhD Nelson Ramalho, Associate Professor,
ISCTE University Institute of Lisbon

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BUSINESS
SCHOOL

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February, 2020

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Patients in Coastal Developed Areas of China: GAO Tong
An in-depth Analysis of Shanghai Model**

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I declare that this thesis does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any university and that to the best of my knowledge it does not contain any material previously published or written by another person except where due reference is made in the text.

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Abstract

Diabetes Mellitus is a chronic disease with a projected growth and social, human and economic consequences that cannot be overlooked in a growing economy and progressively urbanized structure such as China. It is very much a matter of urgency and systemic policymaking. Its insidious nature and everlasting outcomes highlight the importance of preventive measures, focusing on all the contributive factors, such as nutrition, life style, monitoring, diagnosing, and prescription.

Aware of this issue, the Chinese Government put forward a reform of the community health service targeting chronic diseases, such as diabetes, at an early stage. However, not all modes of managing the health infrastructure, namely the third tier healthcare system, have been articulated in the same manner and the nature of Chinese economy and society does not allow the direct importation of models in use abroad. Likewise, the primacy of prevention over treatment puts emphasis on the role community-based healthcare play and it should be targeted for a special focus in order to optimize its effectiveness, considering all the complex issues on healthcare of chronic non-infectious diseases.

Therefore, with the aim of establishing the theoretic basis to analyze diabetes healthcare management systems this study mobilizes state of art literature from home and abroad, conducts several field studies with multiple stakeholders of the system. This is therefore a macro level study intended to structure knowledge so to depict, explore, understand and offer recommendations to the improvement of the overall community-based diabetes management system in a large coastal urban area in China.

To understand the dynamics and possibilities for optimization of the community-based diabetes management the study focused on Shanghai and conducted a comparative empirical study to explore the benefit it brings for the overall purpose of upgrading the system. Likewise, the study endeavored to identify constrains and offer recommendations. Via a mixed methods approach, involving both qualitative techniques and data collection through interviewing key stakeholders (overall 51 interviews conducted) as well as a quantitative approach via a survey with 60 doctors, 60 nurses and 22 patients, and a collection of archival data from 400 patients the study does a comparative analysis to identify to which extent the Shanghai model is superior to the standard one. As an outcome,

the study structures a system to improve the effectiveness of community-based diabetes management in China and generates a body of knowledge for future reference and consideration when studying macro-level healthcare systems with a focus on preventable chronic diseases.

Keywords: diabetes; community healthcare; chronic diseases; Shanghai model

JEL: M10; I12; I18; P36

Resumo

A Diabetes Mellitus é uma doença crónica com um crescimento estimado e consequências económicas, sociais e humanas que não podem ser negligenciadas numa economia crescente e estrutura progressivamente urbanizada como a China. Trata-se de um assunto com carácter de urgência e de formulação de políticas sistémicas. A sua natureza assintomática a par das consequências duradouras sublinham a importância das medidas preventivas focadas sobre todos os fatores tributários tais como a nutrição, o estilo de vida, a monitorização, diagnóstico e prescrição.

Consciente deste problema, o Governo Chinês instituiu uma reforma dos serviços de saúde comunitários centrada nas doenças crónicas em fase inicial, tais como a diabetes. Contudo, nem todos os modos de gestão da infraestrutura de saúde, sobretudo o sistema de três níveis na saúde, tem sido articulado da mesma forma e a natureza da economia e da sociedade chinesas não permite a importação direta dos modelos utilizado internacionalmente. Do mesmo modo a primazia da prevenção sobre o tratamento enfatiza o papel que o sistema de saúde de base comunitária pode desempenhar e, por isso, deve ser alvo de estudo com um foco especial para otimizar a sua eficácia, considerando todos os problemas complexos que as doenças crónicas não infecciosas importam.

Assim, com o objetivo de estabelecer as bases teóricas para analisar os sistemas de gestão de saúde, este estudo mobiliza o estado da arte da literatura chinesa e internacional, realiza vários estudos de campo junto de vários stakeholders do sistema. Trata-se de um estudo de nível macro que pretende estruturar o conhecimento de forma a descrever, explorar, compreender e oferecer recomendações conducentes à melhoria global do sistema de saúde comunitário numa grande área urbana costeira na China.

Para compreender as dinâmicas e possibilidades de otimização do sistema de gestão de saúde de base comunitária, o estudo centra-se em Shangai e realiza uma análise empírica comparada para explorar as mais-valias que traz para o propósito geral de melhorar o sistema. Do mesmo modo, o estudo procura identificar constrangimentos e oferecer recomendações. Por via de uma abordagem metodológica híbrida, envolvendo quer a recolha de dados e técnicas qualitativas através de entrevistas junto de stakeholders-chave (um total de 51 entrevistas realizadas) bem como uma abordagem quantitativa por via de

um inquérito por questionário junto de 60 médicos, 60 enfermeiros, e 22 pacientes, bem como a recolha de dados de arquivo relativos a 400 pacientes, o estudo procede a uma análise comparada para perceber em que medida o modelo de Shangai é superior ao padrão. Como resultado, o estudo estrutura um sistema destinado a melhorar a eficácia dos serviços de saúde de base comunitária na China, com um enfoque na diabetes, e produz um corpo de conhecimentos para referência futura para efeitos de estudos centrados no nível macro dos sistemas de saúde com um foco nas doenças crónicas evitáveis.

Palavras-chave:diabetes; saúde comunitária; doença crónica; modelo de Shangai

JEL: M10; I12; I18; P36

摘要

糖尿病是一种慢性疾病，其发病率预计呈上升趋势。在像中国这类经济不断增长、逐步步入城市化的社会结构中，糖尿病对其社会、民众和经济带来的后果是不容忽视的。这是一个亟待解决并进行系统性决策的问题。糖尿病本身的潜伏性质及其带来的长远后果使得预防措施变得十分重要，需要重点关注营养、生活方式、监测、诊断和处方等各种相关因素。

中国政府意识到了这个问题，在早期就提出了针对糖尿病等慢性病的社区卫生服务改革。然而，并非所有的卫生基础设施管理模式（即三级医疗体系）都以同样的方式进行了阐述。中国的经济和社会性质不允许直接引进国外的模式。同样，预防优于治疗的重点在于强调社区医疗保健的作用，并且，考虑到慢性非传染性疾病在医疗保健上的各种复杂问题，应该将其作为特别关注的目标，以优化其有效性。

因此，为了建立分析糖尿病医疗管理体系的理论基础，本研究参考了国内外最新的文献资料，与该体系的多个利益相关者进行了多项实地研究。因此，这是一项宏观层面上的研究，旨在构建知识，以便描绘、探索、理解并提出建议，改进中国沿海大城市社区糖尿病的整体管理系统。

为了了解优化社区糖尿病管理的动态和可能性，本研究以上海市为研究对象，进行了比较实证研究，以探索其为体系升级这个整体目标所带来的益处。同时，本研究也致力于找出相关限制因素并提出相应建议。本研究采用混合方法的手段，通过访谈关键利益相关者（总共进行了 51 次访谈），结合了定性技术和数据收集的方法。同时，通过对 60 名医生、60 名护士和 22 名患者进行调查的定量方法，以及对 400 名患者的档案进行数据收集，本研究进行了比较分析，以确定上海模式在多大程度上优于标准模式。本研究的研究成果是构建了一个提高中国社区糖尿病管理有效性的体系，并为今后研究以可预防的慢性病为重点的宏观医疗系统提供了一个可供参考的知识体系。

关键词：糖尿病；社区卫生保健；慢性病；上海模式

JEL: M10; I12; I18; P36

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Chapter 1: Introduction

Diabetes Mellitus (DM) is an endocrine metabolic disease which is characterized by hyperglycemia. It is mainly caused by genetic, environmental, and behavioral factors. Type 2 Diabetes Mellitus (T2DM) is the main type of DM, and accounts for about 90%. People's lifestyle changes with the development of social economy and the acceleration of urbanization is mainly characterized by less physical labor, prolonged sitting, and high calorie intake, etc. At the same time, the gradual aging of China's population is also an important factor in increasing the prevalence of T2DM. The International Diabetes Federation (IDF) conducted the latest statistics on the number of diabetes prevalence in March 2010, China. It is found that the total number of China adults with diabetes is up to 92.4 million (Mbanya et al., 2010). According to this epidemic trend, IDF experts predict that the number of diabetics in China will reach 500 million by 2030.

China's diabetes epidemic has become a more and more serious public health problem. The population with diabetes mellitus is coupled with the complexity of the pathogenesis and treatment of diabetes itself. The prevention work is facing a hitherto unknown challenge as there are around 100 million diabetics in China with a constant annual growth of 1 million patients, making China the country with the largest population of diabetics in the world. The World Health Organization predicted that if effective measures are not taken in time, diabetes, stroke, and heart attack will cause a total loss in the Chinese revenue of around 4000 billion yuan in 2005-2015. Therefore, the impending prevention and control of diabetes are of great urgency (Wang & Peng, 2017).

Since T2DM is usually concealed from 9 to 12 years' prior clinical diagnosis, many patients are already attacked by complications of certain organs before being diagnosed with T2DM (Xie, 2009). This not only affects the patient's physical and mental health along with their life quality, but also becomes a burden on the patients, families, and society. The medical expenses of diabetes are large, and the payment ability of middle and high age patients is higher. According to the IDF report, 11.6% of global healthcare spending reached US\$173.4 billion in diabetes care in 2015. China's direct medical expenses of diabetes accounted for 13% of the country's total medical expenses, and it reached 173.4 billion yuan 8 years ago (Mbanya et al., 2010). The use of medical services

in patients with diabetes is three to four times fold higher than in non-diabetics. The inpatient and outpatient number is higher, while the average annual growth rate is higher than the national total health expenditure. The direct medical costs of diabetes were ranked second amongst all the chronic diseases (Hu et al., 2008). The World Health Organization (WHO) introduced nine global common goals to slow disease control, and it will be achieved in 2025. Three goals are associated with diabetes. Due to chronic diseases, the diabetes mortality rate decreased by 25%. To prevent diabetes, the obesity continues increase. It is suitable for at least 50% of the treated drug. It is controlled to prevent heart disease and stroke, especially glucose control. The goal of prevention and control has become a priority for diabetes taken as one of the world's most epidemic diseases. The separation of measures and behaviors also results in a series of complications of diabetes that cause further damage to the patient. Diabetes and its complications consume a large amount of funds and cause serious financial burden and pressure on China's society.

The intervention of risk factors in the community prevents and controls the chronic diseases. It is the best method which is recommended by WHO in the comprehensive prevention and control strategy for chronic diseases. WHO recognizes community health service as an effective measure to control chronic diseases such as diabetes mellitus (Li & Huang, 2008). Finland gradually explored a new model of health management since the beginning of the 1970s (Jin, 2007). The main method is to change the mode of people living habits, reduce the risk factors for the disease through exerting preventive function in community health service organizations, so as to achieve the purpose of disease prevention and control. The United States also have similar research. It is conducive to develop a healthy lifestyle and social, political and economic system, mobilize the community in all aspects of the resources, requirements and measures through the organization of community residents. The results confirmed that this can promote the health of residents (Anderson et al., 2003). Therefore, the Ministry of Health began to establish a management system of chronic disease in the last century in 90s. The management system and the development of management system involved all health systems, especially the grassroots health institutions (community based) according to the actual situation. The positive transformation of service mode is in the scope of work in community management of chronic diseases. In 2009, the State Council of the People's Republic of China (PRC) issued *China Health System Reform in Recent Key Implementation Plan (2009-2011)* (State Council of China, 2009), listing hypertension, diabetes prevention and management

into basic public health services. The Ministry of Health of the PRC issued a *Chinese Diabetes Health Management Service Specification (2012)* (China's Ministry of Health, 2012) and *Hypertension Health Management Service Specification (2017)* (China's Ministry of Health, 2017). It will promote the management of chronic disease. Diabetes and hypertension have been effectively implemented at the grassroots level.

From the perspective of prevention and treatment of global diseases, chronic disease is a problem that deserves attention from all over the world, including China. Since 2009, China's health departments have changed the original healthcare service mode into community service mode in order to improve the service level of medical institutions and reduce the medical expenditure of residents. The intent was to change from a late diagnosis and poor prognosis to an early diagnosis and prevention, ultimately aiming to improve the health of residents. The hospital community integrated diabetes management on the basic mode of community health service centers. It is linking the community and hospital via the Centers for disease control thus constructing a diabetes management platform. It is establishing a standardized procedure of diagnosis and treatment of diabetes and standard management mode, to improve the level of diagnosis and treatment of diabetes. From domestic and international experience in China and abroad, people are using three levels of hospital medical equipment, clinical thinking and technology advantages. They are relying on the community service center at low level and wide coverage of the medical security system. The construction of hospital community integrated diabetes management is in line with the status quo of China's medical and health. It is effective to prevent and control chronic diseases. The Diabetes Hospital Community's integrated management has certain effects on the comprehensive prevention and treatment of diabetes. It can provide experience for the integration of hospital community diabetes management in economically developed areas. At present, the number of beneficiaries in our study is still less than 1 million in Shanghai. We should explore the promotion of the management mode in a wider range further, making full use of community health resources, establishing a two-way referral network community and three hospitals and realizing the integrated management of diabetic patients in Shanghai City to improve the efficiency of control (Yang et al., 2010).

Promoting the equalization of public service is one of the top priorities of the service industry reform in China, with focus on the prevention and treatment of various chronic diseases. In order to materialize the policy of equalization of public services, we should

firmly rely on the urban and rural grassroots health departments to strengthen the management and prevention of chronic diseases, improve the management methods, and raise the residents' awareness of the scientific and healthy lifestyle and health concept. Therefore, further research on the community based healthcare of diabetes is focused on understanding the construction and operation situation of China community health service institutions, analyzing the current situation of diabetes in Shanghai community health service management and operation mechanism. This will help people to find out the influence of the deep-seated problems and causes of diabetes in Shanghai community health service. This research will sum up the valuable experience and management measures to offer policy suggestions for promoting the sustainable development of community management and policy China diabetes and other chronic diseases. It has very important practical significance to realize the China basic health service equalization.

The attack and progress of diabetes not only significantly affect people's health and quality of life, but also cause serious waste in medical and health care resources, leading to skyrocketing medical expenses and major issues in public health and society. Solutions in the present medical and healthcare field are in urgent need, including effective control of diabetes, improvement of disease management and life quality of diabetics, and cutting off medical expenses. Since China's medical and healthcare system reform has been advancing and the development of hierarchical medical system, this research aims to explore how emerging technologies, the Internet of Things (IoT) technology, can build a health management strategy for diabetes community, which is an effective exploration to solve the management problems of diabetes at present. This research adopts a patient-orientation focus and aims at the independent health management of the patients, combining medical techniques, equipment and IoT technology. Based on the above elements, we explore how to make intelligent decisions and break the limitations of time, space, and technology in the traditional medical and healthcare system, so as to provide convenient, economical, and sustainable individualized medical services.

To achieve this, we have structured the thesis in seven chapters as follows. It will start with the first chapter, Introduction, that focuses on the research background and significance, research contents and methods, the status quo of research from home and abroad, and the innovations of this research.

Chapter 2 (literature review) mainly analyzes the following aspects: the overview, and theoretical basis and necessity of diabetes and community management, along with

experience of community management of diabetes.

Chapter 3 (methods) depicts all methodological options made to collect data, analyze it and extract meaningful results both of a qualitative and quantitative nature.

Chapter 4 (the status quo of the community management of diabetics in Shanghai) lays emphasis in the research and analysis of the following contents: the screening of diabetes in the community, health lectures on diabetes and the number of attendees, health education of diabetics, present management and training on diabetes, the resources allocation, supporting system, and satisfaction with community management of diabetes.

Chapter 5 (management problems and causes) analyzes and discusses the existing problems in the management of diabetes by community health centers in Shanghai, and the root causes of these problems.

Chapter 6 (proposals) puts forward targeted solutions to specific issues mentioned in Chapter 4 to provide suggestions for the community management of diabetes in Shanghai.

Chapter 7 (value of the Shanghai model) is the empirical analysis on community management of diabetes in two districts in Shanghai. Then we analyze and evaluate the effect of the management.

The last chapter concerns the research conclusions and prospects of the thesis. In this chapter, we summarize the main contents and shortages of this research and put forward the prospects for future research.

1.1 Status quo of research from home and abroad

1.1.1 Research progress on the prevention, treatment, and management of diabetes in foreign countries

Modern medical standards have been developing along with the advancement of the society. Management of chronic diseases has been transformed from the traditional management depending on the medical institutions to an integrated management cooperated by medical institutions, communities, patients, and their families. In the reform of management of chronic diseases, the treatment and management of diabetes has always been a major concern (Griffin, 2001). However, although the prevention, treatment, and management pattern of diabetes have been innovative constantly, there are many diabetics not receiving full treatment and management. Meanwhile, there are large gaps between the

actual management and the recommended standards of diabetics in certain hospitals in some regions and countries. Statistics show that in the diagnosed diabetics in the US, less than 50% of them can be treated and managed based on the recommended schemes strictly (Saaddine et al., 2002; Casalino et al., 2003). In 1970s, western countries have realized that the treatment and management of diabetes requires the cooperation between health care service centers in the community and their affiliated medical institutions (Malins & Stuart, 1971). This is because diabetes, as a chronic disease is caused by various factors with complicated syndromes, and should be treated and managed constantly and systematically for a long time. In 1997, Bower and other researchers in the US chose people whose blindness were mainly caused by hyperglycemia in native Americans, black people, and Hispanic Americans. Primary medical and health care teams carried out and monitored the pilot management programs of diabetes based on the principles of priorities and selection criteria. Results of the experiment showed that ocular complications of diabetes can be effectively prevented (Bowyer, 1997). It has been proved by various facts that the comprehensive measures focusing on health education and community management can effectively prevent and treat chronic diseases such as diabetes (Li, 2007). Health education is a low-cost and effective strategy for the prevention and treatment of chronic diseases (Li, 2006). Some countries attach great importance to the important role of health education as a preventive measure. Medical students in these countries are bestowed with scholarships so as to be strongly encouraged to participate in the health education of diabetes in the community (Ramal, 2009). Hiss et al. (2007) designed a model in which care managers and community doctors work together to manage T2DM. The result shows that the model can significantly improve the level of care for T2DM patients and it indicates that management can benefit diabetic patients. All the achievements of various studies have been summarized to confirm a fact that the use of comprehensive management measures such as health education, risk factor management, behavioral intervention, and drug guidance for diabetics at the community level can effectively control diabetes and its complications (Han & Chen, 2008).

In many countries in the world, chronic diseases are prevented and controlled through community health services, which can improve the overall health of the population. Community health services can not only provide economic and convenient basic health-care services to residents, but also can reasonably control patients. Community health services play an important role in controlling unreasonable medical costs and

making full use of health resources. The prevention and management of diabetes at the community level has become a recognized effective prevention and treatment model (Tao, Xie, & Liu, 2006).

1.1.1.1 The United Kingdom

The UK is one of the earliest countries in the world to implement community health services. The UK implements the National Health Service (NHS) and also establishes Primary Care Trusts (PCTs). NHS signs contracts with General Practitioners (GPs) through PCTs and then checks and distributes the state-funded health service expenditure through PCTs in the form of government-purchased services. Since the control of PCTs in terms of health services funding is fixed, PCTs will emphasize the effectiveness of preventive services, health education, and unit usage fees while focusing on reducing unreasonable expenses. This mechanism promotes the community health services to make more use of health education, community-based management, and other methods that are effective and inexpensive for prevention and treatment of chronic diseases (Giaino, 2002; Wilkin, 2002; Zhang, 2006).

According to statistical data from the UK health sector and WHO, the number of people with diabetes in the UK increased from 1.76 million in 2000 to nearly 2.27 million in 2030. In response to the significant increase of diabetic patients, the UK government has put forward a program for the prevention and treatment of chronic diseases. This program, which elaborates the self-management of patients with chronic diseases, aims to improve patients' compliance to treatment through doctors' treatment coupled with patients' own knowledge and experience, so that the patient can understand the doctor's therapies, thus achieving the overall control of the number of diabetic patients.

1.1.1.2 The United States

According to the statistics of US health sector, the number of diabetic patients increased from 1980 to nearly 21 million in 2005. It is predicted that by 2050, the total number of patients with diabetes will be eight million more than that in 2005. The huge number of diabetic patients has significantly increased the health expenditure in diabetes treatment, which not only puts extra burden on families but puts pressure on national finance. Faced with this situation, effective measures must be taken to curb the growth of the number of diabetic patients. Community hospitals in the United States mainly provide primary health care and disease prevention but are less involved in the public health

services. Therefore, the general practitioners in community hospitals should advise patients to participate in health care activities to reduce the incidence of diabetes, thereby controlling the medical expenditure. The U.S. government should extend the prevention and treatment of diabetes to all over the country.

1.1.2 Research progress on the prevention, treatment, and management of diabetes in China

So far, the number of patients with diabetes in China has exceeded 20 million, which saw a sharp increase compared with that in 1986. It is estimated that there will be 42.3 million diabetics in China by 2030 (Wild et al., 2004). Statistics also show that there are around 90,000 deaths caused by diabetes. Each death would lead to an early death of 14.4 years, which has direct influence on the average life-span of people in China. Because of the late diagnosis in China and various chronic complications, about 80% of medical expenses would be spent on these complications, among which, 50% are spent on the prevention and treatment of angiocardopathy (Xu, Wang, & Liu, 2006). Statistics from 2002 also show that direct economic burden caused by diabetes was RMB 10.7 billion, which accounted for 1.88% of the total medical expense of China in 2002 (Wang, 2009). Furthermore, the large population of diabetics and large-cost chronic complications in China has laid huge economic pressure to the society, which has greatly challenged the prevention and treatment of diabetes in China (Huang & Chen, 2005).

According to the statistics of WHO, more than half of the global deaths are basically caused by inappropriate lifestyle. Diabetes is a disease caused by poor living habits, mainly due to more food intake, less exercise, obesity and other reasons. Therefore, the WHO recommends that the prevention and treatments strategies for diabetes should be changed from a simple biological control model to a comprehensive prevention and treatment model that integrates social, psychological factors, and medical medicine, that is, a “biological-psychological-social medical model”.

Relevant research suggests that the lifestyle can be greatly improved through lifestyle modifications, proper nutrition and more exercise according to doctor’s advice. Data indicated that weight loss, prevention of obesity, and promotion of a healthy lifestyle are necessary measures to prevent T2DM (Holst-Schumacher et al., 2008). In addition, health education plays an important role in the prevention and treatment of diabetes for it can train and improve the self-management capabilities of diabetic patients (Albisser et al.,

2001). Self-management can not only strengthen the control of diabetes treatment indicators, but also reduce medical costs (Garrett & Bluml, 2005). The implementation of an intervention program focusing on promoting healthy behaviors of people with diabetes can achieve effective control of blood glucose (Mendelson et al., 2008).

Among the research on the prevention and management of diabetes patients in China, studies on glycemic control at the hospital level take up a large proportion, while there are few studies on the utilization of community health services and disease control in diabetic patients. Community health services is an important means of chronic disease control such as diabetes, and more relevant research needs to be carried out in this regard. According to the survey, 25.9% of diabetes patients managed by hospitals in the city center have ideal glycemic control, while among community-managed diabetes patients, only 2.96% of patients received all the physical examinations in a period of a year. This shows that in the prevention and treatment of chronic diseases such as diabetes, the use of community health services needs to be greatly strengthened. The primary medical organizations need to prevent diabetes from the source. For example, we should strengthen health education and guide residents to adopt healthy lifestyle, which is an effective way to reduce the incidence of diabetes. In the process of prevention and treatment of diabetes, the primary prevention is the most important. Therefore, targeted preventive measures should be taken for patients with diabetes. The prevention and treatment of chronic diseases provided by primary medical organizations proves very effective. With the maturity of this model, health services all over the country will cover the prevention and treatment of chronic diseases. However, the lack of general practitioners has weakened the capability of basic medical organizations to provide prevention and treatment of chronic diseases. With the increase of people's living standards, the impact of diabetes on human life expectancy is gradually increasing.

According to relevant survey, the number of high-income diabetic patients is nearly three times that of the low income ones. The number of the diabetic patients in economically-developed cities is far greater than that in the areas with poor economy, and the number of the patients in the rural areas is lower than that in the cities. However, in terms of prevention and control measures, the economically developed areas perform better than the underdeveloped areas.

The prominent reasons for this problem are that the basic community medical and health resources allocation in developed areas is significantly better than that in

underdeveloped areas and at the same time, the advantages of advanced medical equipment and excellent medical talents are more significant in the developed areas concerning community management of diabetes. Meanwhile, in the underdeveloped areas, patients have a weaker awareness of community management of diabetes. As a city with developed economy and a large number of aging population, Shanghai is in very urgent need to strengthen diabetes prevention and treatment.

1.2 Research innovative points

In this study, the prevention and treatment of diabetes and other chronic diseases in the primary medical organizations in Shanghai is discussed. Through the analysis of the prevention and treatment of diabetes in the primary medical organizations, the management suggestions are put forward to improve the prevention and treatment ability of the primary medical organizations. The study has certain innovation points in China by adopting theories such as the system theory and resource allocation and exploring the diabetes prevention and control capabilities of primary health service institutions in Shanghai from a macro perspective.

Chapter 2: Literature Review

2.1 Overview of diabetes and community management

According to Global Report on Diabetes (World Health Organization, 2016), the number of people with diabetes in the world has nearly tripled compared with 1976, and most of them are from economically underdeveloped areas. Statistics from the International Diabetes Association showed that there were about 400 million diabetics around the world in 2015, among which, about 100 million of them lived in China. In 2012, 1.5 million deaths were directly caused by diabetes and 2.2 million people died of other Hyperglycemia-related chronic diseases. In a study published in the Journal of the American Medical Association, compared with other diseases, the lifespan of diabetic patients in China would be shortened by an average of ten years. In addition, diabetes is closely associated with increased mortality from stroke, chronic kidney disease, chronic liver disease, ischemic heart disease, and liver and pancreatic cancer (Bragg et al., 2017). At this growth rate, the medical expenditure on diabetes will increase to nearly \$200 million. Apart from cardiovascular diseases and malignant tumor, diabetes has become the third most harmful diseases for humankind. Especially diabetic foot, nervous lesion, and cardiovascular as well as ocular complications that have been caused by diabetes, have serious impacts on the life quality of human beings.

Community-based management first appeared in the insurance industry in the United States. The insurance company signs a cooperation agreement with the medical institution and finances the service costs incurred in community-based management. Generally, the cost of community-based management is paid from the applicant's insured costs. The health institution conducts health inspections on applicants to have risk assessments by using various health assessment methods, and instructs patients to perform self-care, so as to achieve the purpose of preventing diseases and reducing insurance compensation. In the United States, the concept of community-based management has been deeply rooted in people's minds. Government, enterprises or individuals are involved in various forms of community-based management projects. Among these health programs, the management model for the lifestyle of patients with chronic diseases, chronic disease management and

other critical diseases management has become increasingly mature. The primary medical organizations began to provide some basic prevention and treatment services, such as diabetes prevention and treatment for the elderly, which has greatly helped the disease control. Besides, the promotion of the above-mentioned health programs has also popularized the healthcare knowledge among the local residents and reduced the medical expenditure. Meanwhile, they have also help reduce US government spending on Medicare and Medicaid (Cutler et al., 2006), alleviating the pressure on the US government's huge medical bills.

In order to reduce the national health expenditure and improve the health level and quality of life of the entire population, many countries have followed the example of the United States and formed distinctive patterns in the process of implementing community-based management.

The community-based management in Finland (Puska et al., 1995) is to reduce the potential risks of diseases by changing the living habits of the population based on the concept of prevention through community health service organizations. This model has not only improved the health of the population but also enhanced the efficiency of the use of health resources.

The United Kingdom also conducts community-based training of general practitioners and nurses to improve medical service ability of general practices and to promote effective disease monitoring and treatment for diabetic patients (Johnson, 2006). A diabetes handbook is also provided (Sturt, 2006). Dietary education for diabetes is carried out (De Kleijn, 2007) to enhance the knowledge of diabetes for patients and improve their ability to manage their health so that their physiological and psychological states can be improved.

Since 1971, Israel, a country in the Middle East, has also developed a health program aimed at controlling chronic diseases such as diabetes and reducing their incidence. Based on the grass-roots medical organizations, the program aims to correct the bad lifestyles of residents through the coordination between family and community hospitals. After the implementation of the program, the incidence of hypertension and obesity in Israeli decreased by 20% and 13% respectively.

Japan's health departments developed and implemented the "Healthy Japan in the 21st century" program in the early 21st century, and put forward 70 specific goals from the aspects of residents' daily diet, physical exercise, smoking and drinking, so as to guide the healthy lifestyle of citizens. Japan passed the medical and health system reform program

and established a plan to shorten the number of hospitalization stays and reduce the number of patients with lifestyle diseases, thereby reducing medical expenses, in which the “National Chronic Disease Prevention Project” is an important part. The new reform program stipulates that the chronic disease prevention project must include the action goal, target population, the way of carrying out the physical examination, the method of population stratification, the intervention method, and the evaluation of the intervention results, etc. The program is divided into three levels: the first is the five-year plan; the second is the annual plan (including planning based on data analysis, screening target population, setting a year plan), identifying and stratifying dangerous groups, conducting health instruction and prevention through health examinations and annual assessments; and the third is personal intervention program. The program also stipulates that Japanese citizens should establish their own health brochure from the age of 40 and take part in physical examination regularly. The contents of physical examination include life style and physique. In the later stage of intervention program, the situation of chronic diseases and daily life style, as well as height, weight, body mass index, abdominal circumference, blood pressure, triglyceride, high-density lipoprotein, low-density lipoprotein, alanine aminotransferase, blood glucose level, and urine test are also included in the physical examination. After the physical examination, people who have symptoms of disease need health intervention, which takes up to six months, and the medical personnel who carries out intervention needs to be certified by the Japanese health department.

The community-based management started relatively late in China. As China's economic and social development is still at the primary stage of socialism and national conditions are different from European countries and the United States, and there is no fixed community-based management model in the world that can be copied and applied, it takes a long time to explore and research before we can find a suitable development model of community-based management.

With continuous improvement of the six-in-one function of China's community health services, community-based diabetes screening has been conducted, health documents of patients with diabetes been established, doctor team responsible for community been set up, and the “five drives”- exercise therapy (Sun, Hu, & Wu, 2002; Shen & Wu, 2009), diet control (Wang, Zhang, & Yu, 2009; Xie, 2009), drug therapy (Lin, 2010), glucose monitoring (Ma, 2011; Yan, 2011) and health education (Lu, 2011) have been applied to control the glucose level of patients and correct the unhealthy lifestyles of patients. Besides,

follow-ups have been implemented through phone, clinic, services on call, etc., and the condition of patients has also been monitored through information management platform (Li, Zhang, & An, 2007; Hou, 2010). These are the main channels of diabetes management in China.

From the perspective of the intensity of health resources, hospitals have obvious advantages in terms of talents, technology and equipment, etc. compared with the community. Based on the health examination, hospitals collect basic information about patients with diabetes, carry out intensive intervention during the patients' hospitalization stays (Yuan, Lin, & Hu, 2007), and educate them to form basic disease knowledge, master correct medication methods, correct bad lifestyles, and conduct timely screening for complications, which are conducive to regulating the treatment of diabetes and improving the health of patients.

In recent years, a large number of hospitals in China have conducted a preliminary study on the management model of chronic diseases such as diabetes. By copying the diabetes management model of the medical center of Loma Linda University in the United States, Sir Run Run Shaw Hospital in Shanghai carried out the research of diabetes management mode. For this purpose, the hospital established a diabetes committee comprising endocrinologists, diabetes specialist nurses and nutritionists, with foreign doctors as senior consultant. Each post has its clear responsibilities and requirements. For example, endocrinologists are responsible for the health assessment (physical, psychological) of patients with diabetes and the formulation of treatment programs, the specialist nurses are responsible for the patients' health education and daily care, and the nutritionist's responsibility is to be responsible for the patients' daily diet. Under the joint effort of the team, the patients' disease can be effectively controlled and cured after scientific treatment.

Large hospitals and grass-roots medical organizations are complementary each other in resources. Therefore, some hospitals and community health centers have explored the mode of joint management of diabetic patients through cooperation and established the community-hospital two-way referral system. Based on the medical level of the hospital and the establishment of patients' health records and regular follow-up of disease conditions in the community hospital, diabetic patients can enjoy a full package of treatment. This system also guarantees the information exchange and sharing between big hospitals and community health centers, improving the efficiency of diabetes prevention

and treatment.

Songjiang City of Shanghai, as a pilot region to explore the model of diabetes prevention and treatment in China, spent three years on researching the integrated management of diabetes in community hospitals, which include the information integration (establishing patient information management software to share information among communities, hospitals and disease prevention and control systems), institutional integration (formulating project management systems and operational guidelines), and service integration (defining the respective responsibilities of community health services and hospitals, and achieving two-way referral). The glycemic control, occurrence of complications and utilization of medical services after integrated management of diabetic patients have been significantly improved compared with those before management.

In Shanghai, the joint disease control center of the Sixth People's Hospital Affiliated to Shanghai Jiaotong University, the municipal hospitals and the grass-roots medical institutions (such as community hospitals) jointly studied the prevention and management of diabetes, forming an "integrated" and "seamless" hospital-community diabetes management pattern. In addition, diabetes training base for diabetes medical talents has been established to provide relevant knowledge training and conduct health education for local residents. Establishing a two-way referral system and continuously monitoring the patient's health conditions have helped 25% of diabetic patients stabilize their glucose levels. So far, this mode has been implemented in five provinces nationwide to improve the efficiency of diabetes prevention and treatment.

In addition to the community, hospital and hospital-community joint community-based management model, a large number of physical examination centers focused on physical examinations and community-based management companies offering medical green channels as their core, also provide related services about community-based management, showing a trend of diversity in development (Wang, Li, & Liu, 2010).

These explorations are conducive to summarizing management methods according with certain regions and specific groups of people. They have positive significance in improving the utilization rate of health resources, enhancing people's health awareness and community-based management capabilities. However, they only focus on the research of intervention measures, lacking a comprehensive review of the existing work from the perspective of community-based management, especially from a management perspective as well as neglecting the conditions necessary for the community-based management. This

results in a lack of universality in the results of the study, which is not conducive to promotion and application.

Community hospitals and rural clinics are the core departments of the grassroots medical institutions in China, responsible for the daily health care of residents and disease prevention. The objective of promoting equalization of basic public health services has put higher demand for primary medical organizations. Its main responsibilities include the establishment of residents' physical examination records, chronic disease detection and prevention, family visits and health education, which defines the work objectives of medical institutions and decides whether the equalization of basic public health services can be fully realized.

2.2 Theoretical basis of community management of diabetes

As the disease-stricken area is enlarging and the number of diabetics is increasing rapidly, the prevention and treatment of diabetes became long ago a major concern in public health services (U.S. Department of Health & Human Services, 1960). Public health refers to medical measures targeting the community or society, which is different from measures and medical institutions targeting patients (Kang & Chi, 1990). In addition, public health is a science designed to formulate and predict relevant policies or plans. Its main role is to prevent and control diseases and guarantee people's health. The Specifications for Zhang (2012) stipulates 11 basic public health services, which includes the prevention and treatment of chronic diseases such as diabetes, and establishment of health records. From the perspective of research in public health service, we mainly focus on the system management of diabetes, analyzing the prevention and treatment capacity on diabetes in the national health service system. In this research, we have applied theories in community management and development, system, and resources allocation from a macro perspective. It has been acknowledged that mass prevention and treatment is the most effective approach in the community (Qian, 1998). As part of the national health service system, the coordination and medical resources allocation are decisive to the overall prevention and treatment of diabetes in the country from a macro perspective.

2.2.1 Community development theory

A famous inference in social development is that community development is essential

for society's development. Since "social development" does not specify its concepts of space, the advanced connotation of the phase cannot be fully implemented. If we target social development into a certain region, then it becomes community development. Therefore, if every community has been fully developed, the whole society would be fully developed. Meanwhile, community services are significant to develop a community. Community refers to the supporter of the all-round development of the humankind. According to Fei, a renowned sociologist in China, community is a large life collective composing of certain social groups (families or clans) or social organizations (institutions and communities) in a certain region. Community services, the key to promote community development, are the only ones that can strengthen the interactions among various community elements. Moreover, community service aims to produce cohesiveness inside communities. Therefore, only by promoting the people-oriented philosophy can community be developed (Guo, 2011).

There are several representative theories in community development theories:

First, theory of community development right. Community development right is an important part in development right, which is based on the time and space integrated with development rights of the individuals and the objects. In other words, community development rights include development rights in various fields including economy, politics, and culture in the community. Although community development right belongs to collective human rights, it is different with the common development rights in subjects and the objects concerning time and space. It seems that development rights refer to the rights of economy, politics, and culture in the community, but they actually concern development rights of members in the communities. In other words, it is a collective form of development rights of individuals realized in the combination of the subjects and the objects concerning time and space. Community development right can be realized mainly from two aspects: the first is to realize exterior development right, including the rights of politics, economy, and culture in the communities by means of law; the second is to realize interior development right, that is, the development rights of members in the communities based on the principles of "of the people, by the people, and for the people" through democratic governance inside the communities. The community development right has changed from static to dynamic pattern, which mainly promotes the collective realization of full-round development of individuals by means of society development. The theoretical logical point of theory of community developing right is the harmonious development of

society and the practical logical point of the theory is the sustainable protection of residents' rights in the community (Zhang, 2017).

Second, theory of dynamic social contract. This theory is based on the philosophies of new natural law and solidarism, which mainly consists of two principles. Firstly, people choose to pass some of their rights to certain sovereigns, namely, a country or a government. With social development, people are free to reestablish their contracts and choose to pass some of their rights to some social organizations and the governments to guarantee people's safety and freedom. Instead of being static or one-off, these rights must be passed to different entities for multiple and continuous times with the development of the era. Secondly, in the society, social organizations are not only those contracts between social members, but also the contracts between the people and the governments. Therefore, in the contracts, people with different social statuses have varying influence, namely, to guarantee the relative fairness in the transaction among the people. The dynamic social contract theory has the following four characteristics. Firstly, people have the right to establish contracts continuously, namely, the right of association regulated by the Constitutional Law, which constantly puts pressure to the national governments, so as to drive governments' concern towards the interests of their people. Secondly, people have the right to transfer the single representative of public interests into multiple representatives concerning the government, communities, individuals of public interests, so as to form an effective competitive mechanism of representatives of public interests. Thirdly, social organizations seek their lawful status, so as to enhance capacities of their members to collect information and make judgment. Fourthly, because of the existing social organizations, their members would be endowed with different rights and obligations in certain social contracts because of their various social statuses. Therefore, the actual fairness of the society can be realized better (Sun, 2017).

Therefore, communities are empowered to manage complex issues such as diabetes, especially because diabetes is caused by various factors (Gross et al., 2000). Unhealthy lifestyles and bad habits are closely related to the disease. Therefore, the prevention and treatment strategy of diabetes have transformed from the traditional focus, the patients themselves, to the present one, the health, from individuals to groups, and from prevention and treatment mainly in medical institutions to mainly in communities. It is among the five principles set up to transform the medical services within large medical institutions to the communities. Furthermore, medical staff helps not only diabetics but also people in the

communities have a basic understanding of diabetes and establish a healthy lifestyle. Therefore, health services in the community is the most suitable to prevent and treat chronic diseases such as diabetes (Guo & Lou, 2011).

2.2.2 Resource allocation theory

Another way to approach this issue is from the Resource Allocation Theory. There are four types of resources, including labor force, production, technology and information. In order to meet social production and personal needs, the above four kinds of resources need to be allocated. The process of allocation is called resource allocation. In this stage, resource allocation refers to the allocation of relatively scarce resources according to a variety of different uses. Whether the allocation of resources is reasonable or not has a very important impact on the success or failure of a country's economic development.

The resource allocation from economic perspective needs to consider the balanced relationships among time, space and quantity, which are the three fundamental factors in the process of resource allocation. Whether the resource allocation is reasonable and effective depends largely on the utilization rate, cost-effectiveness and the increment of resource utilization. If the resource utilization rate is high, there is no need to add new resources, because extra resources will lead to reduction of resource efficiency and waste. From the perspective of economics, this kind of resource allocation highlights the important influence of marginal quantitative analysis. According to the time attribute, resource allocation can be divided into past tense, present tense and future tense. This classification reflects its time value. It means that using the same resource at different time will produce different values. In addition, the allocation of resources in space also has two dimensions: one is the allocation in different directions, the other in different regions, which is also the core requirement of reasonable resource allocation.

To analyze resource allocation from the quantitative perspective, we need to first understand the concepts of increment and stock, average and marginal quantity. The stock of resources refers to the amount of resources in an area, a department, or an enterprise. Similarly, the increment of resources refers to the increased amount of resources. The average amount of resources includes the average consumption of resources, the average output, and the average number of calls. The marginal amount of resources refers to the increase of the amount of input needed to increase the output of a unit, the marginal demand for production, or the increased amount of resources required by the last unit,

which is called marginal resource input. In economics, the average cost and the average benefit are determined by the relationship between resource input and output ratio. Therefore, in order to reasonably allocate the resources, it is important to analyze economic benefits, especially the marginal effect.

The concept of rational allocation of resources. There are two ways to solve the problem of rational allocation of resources: (1) Maximize the benefits of limited resources. (2) Consume resources as little as possible in order to achieve the desired benefits. According to the first kind of expression, it is required that under the condition of a certain amount of resources, through the rational arrangement and combination of resources, the benefit of the output be maximized. Here, the resource availability can be the constraint, and the benefit maximization is the objective function, so it corresponds to an optimal programming problem. According to the second statement, in order to set the target of efficiency one needs to know how to organize and arrange the use of all kinds of resources reasonably, so as to minimize the total cost of resources. Here, the value of the benefit is a constraint, and the total cost of the resource is minimal as the objective function, so it corresponds to a minimization of the optimal programming problem.

The distribution of total social labor time among each social production department is the essence of resource allocation. Whether the allocation of resources is reasonable has a very important impact on a country's economic development. Reasonable resource allocation will boost the economic development, otherwise it will hinder it. In a world with limited resources, any country, region or other countries need to allocate resources reasonably to ensure the highest utilization rate of resources and obtain the best economic benefits.

The scarcity of social resources arouses the interest of the related academic research in this field, which has great social significance. Therefore, people must have a clear understanding of the elements of resource allocation to ensure the rational use of resources. The allocation of basic medical resources should fully consider time and space factors. The social system of a country has a very significant influence on how resources are allocated. From the macro level of China, the contradiction between the people's increasing demand for medical care and the lack of medical resources requires us to allocate resources reasonably in the health sector to meet the needs of the people.

2.2.3 Public goods theories

According to related theories of public economics, social products are divided into private and public ones. In his book *The Pure Theory of Public Expenditure*, Paul Samuelson defines pure public goods as “each individual's consumption of such a good leads to no subtraction from any other individual's consumption of that good” (Qin, 2006). Therefore, indivisibility, non-exclusiveness and non-competitiveness of utility are three features that distinguish public goods from private goods. According to theories of public goods and of market economy, market economy needs to be operated in a stable environment and its external conditions are safeguarded by the government, which plays the role of macro-control in the market (Cheng & Guan, 2002). Particularly in the public economic activities, the government, through finance raising and expenditure, allocates resources to adjust market demands instead of for general economic activities.

In contrast to private goods, its public counterpart refers to services and goods provided for all members of society. As stated, public goods have two very important features, namely, non-exclusiveness in profit and non-competitiveness in consumption. Due to market failure, it is very difficult for market mechanism to achieve Pareto optimality of public goods in all fields (Chemmanur & He, 2012).

Apart from the above two unique features, there are factors such as “providing convenience” and transaction cost. If the market mechanism is only about adjustment, there will be many unexpected situations like corporate investment beyond the limit of public goods and services along with lacking public goods. Meanwhile, it will be difficult to meet people's public demands. Therefore, there will be a very low efficiency and poor realization if it only relies on market adjustments to provide public goods. As a result, the government must intervene in the market and appropriately adjust the economy. If the government or public sectors are responsible for the supply of public goods, the above situations would be reduced (Hribernik, Wuest, & Thoben, 2017).

Nowadays, public functions of the government are to meet the public requirements and to assist and provide public goods. Currently, the main purposes of government activities are to provide high-quality and enough public services and goods while meeting the service demands of all social members in a fair and equitable manner at the same time (Chen, 2017). Since government is the leader of public interests and the public, market mechanisms and social organizations are not eligible and are unable to replace the

government especially in performing its responsibilities of allocating public goods in an equitable way and improving quality of public goods. The main purposes of setting government are to create interests and to regulate competitive demands of different interests. The fundamental condition of creating interests is to set up an open region and the government should guarantee the collective security along with social welfare when providing diversified public services and goods. If the government takes providing social services such as education or healthcare as its planning objectives, public sectors will according to the objectives, provide people with services of education and healthcare, which can reallocate the revenue, reduce shortage of human capital, and narrow social gap (Stickel, 2017).

As the foundation of public health service system, the community health service, provided to residents by the government and society, is a public good. Therefore, it shares the features of public goods. When providing community health services, government and society should attach great importance on features of public goods to avoid competitiveness in consumption and exclusiveness in profit of the goods (Lin, 2005).

2.3 Necessity of community-based management of diabetes

According to statistics of China, the number of medical institutions in China has reached 993,000 by 2016, including 29,000 hospitals, among which 13,000 are public hospitals and 16,000 are private hospitals. The number of grass-roots medical institutions is the largest, reaching 930,000, among which, there are 37,000 health centers in townships, 35,000 community hospitals in cities, 21,700 outpatient departments, 29,000 specialized health institutions, 642,000 village clinics, and 3,400 different level of disease control centers. The number of public health supervision institutions (centers) is basically the same as that of disease control centers, reaching 3,100.

Community chronic disease management are expected to integrate prevention with treatment, pay equal attention to both individuals and groups, and combine macro and micro measures. Attention should be paid to primary prevention and treatment of chronic diseases, and prevention and treatment strategies should be formulated based on groups. Meanwhile, individualized management should be implemented to make progress in prevention and intervention of community chronic diseases (Lin, 2005). Although there are such problems as serious shortage of human resources, imperfect appropriation

reimbursement system and digression in the reform of urban workers' health insurance system in China's community health services (Xia, 2008), all provinces and cities have gradually included management into primary-level community health services.

For the moment, although the model of basic community prevention and treatment of diabetes has been established at this stage, there are few related documents and reports on performance evaluation on community of diabetes, suggesting the lack of corresponding feasible and effective measures for assessing chronic diseases such as diabetes. It is arguably primary care, if this means to establish health records and do follow-up visits, which have little to do with controlling the incidence rate of chronic diseases such as diabetes or being able to decrease patients' disability rate. Therefore, establishing and improving corresponding performance evaluation systems play an active and important role in improving the quality of community management of diabetes.

According to the *Standards of Care for Diabetes in China*, the key to controlling diabetes lies in doing three levels of prevention. The first-level prevention requires spreading knowledge about diabetes among the public in the community and advocating healthy behaviors, such as a reasonable diet, moderate exercise, smoking cessation and alcohol restriction, psychological balance and regular inspections. Once there is impaired glucose tolerance (IGT) or impaired fasting glucose (IFG), intervention should be implemented early. Lifestyle interventions for key populations should be conducted. The second-level prevention is early detection, early diagnosis and early treatment. The third-level prevention focuses on preventing complications and reducing the rate of disability.

According to the results of research in Nanjing, the prevalence rate of diabetes increased by 22.4% (discovery rate increased) through follow-up of health interventions. The overweight and obesity rates have also dropped. Residents have changed some of their unhealthy behaviors with diets more inclined to low salt and low fat and have also increased physical activities (Liang, 2009). The implementation of community health education in Zhengzhou showed it can improve compliance of patients with diabetes in monitoring glucose and treatment (Wang, 2009). The monitoring of glucose can effectively adjust the medication, diet and exercise programs of patients (Li & Liang, 2005). The establishment and evaluation of two-way referral for diabetes in the community shows the importance of standard treatment for patients with diabetes (Liu, 2005). Open communication allows each patient to understand the treatment plan, reduce complications

and improve quality of life (Snoek, 2005). Personalized health education can train the self-management ability of patients with diabetes (Albisser et al., 2001). By improving the control of therapeutic indicators through self-management, medical costs can be reduced (Garrett & Bluml, 2005), and the overall goal of community management of diabetes can be achieved.

Overall, both Chinese and foreign studies have demonstrated that the ratio of the number of diabetic patients involved in the community-based health program to the number of health personnel is the most important indicator to measure the effectiveness of community diabetes management. The technical skills of health personnel affect the results of the diabetes management and therefore it is necessary to assess the performance of health personnel in community diabetes management. From relevant statistical data in China, general practitioners are the backbone force of primary medical organizations, but their overall quality is far from satisfactory and remains to be improved. In order that the diabetes management objectives can be smoothly achieved, it is necessary to link up the disease management objectives with individual performance evaluation.

Therefore, it is necessary to establish a community-focused prevention and control model to manage chronic diseases such as diabetes, and tie the management objectives to the assessment of health personnel.

The establishment of community health centers in China began at the end of last century. Basically all prefecture-level and county-level cities have provided community health services. By the end of 2016, there are 15,100 community health service centers (stations) in total and most of them have provided the prevention and treatment of diabetes, but their management modes are vastly different.

Although the number of community service center in China has by far increased significantly, their management modes are different. Each region has explored its own management modes and chronic diseases management mode including diabetes. However, there is no unified management mode for community health centers across China.

In the absence of a unified management model, community health centers in different regions administer in their own way. In term of the management of diabetes, most efforts focus on the establishment of disease record and incidence control, but without management on the control of blood glucose level. Chinese scholar Zhang et al surveyed the diabetes community management in Yinchuan of Ningxia and found that the self-management of patients with T2DM failed to meet the requirements. The results

showed that: self-management with the doctor's advice and medication is the best, with the score index reaching 85.67, followed by blood glucose monitoring scoring 77.55%, while the foot care is the worst, as its score index reached 5% (Zhang & Liu, 2005; Zhang, 2006). Surveys conducted by Huang et al. (2008) in Shanghai showed that the diabetes management coverage rate in the district was 76.45, and the new card rate was 34.3% (Huang, Fang, & Su, 2010). A study on the management status quo of patients with diabetes in Huayang community of Shanghai conducted by Shao and Xu (2008) showed that patients with diabetes had poor dietary compliance and only 19.75% of patients had the habit of self-testing glucose or urine glucose. Patients with diabetes had poor mastery of disease knowledge and patients with low education and less than five years of disease had poor self-management capability (Shao & Xu, 2008).

In general, there are still many problems to be solved in the management of chronic diseases such as diabetes in community health centers, mainly including: (1) there is no unified standard for the management of chronic diseases such as diabetes in the community health service centers; (2) most of the health personnel in the community health centers lack relevant medical knowledge and sufficient professional trainings; (3) lack of professional prevention and control team; (4) the health records established for patients with chronic diseases cannot be effectively used, or even medical personnel does not understand what these health records are used for; (5) most of diabetes community management exists only in form, but lacks specific measures; (6) the patient follow-up rate is low. (7) not enough attention has been paid to the prevention of diabetes; (8) there is no a set of evaluation criteria; (9) lack of academic research in the field of health economics.

Although the community management in China is in the primary stage, there are still many problems, which hinders the development of community medical services. Therefore, it is necessary to combine early prevention with late treatment of diabetes. It is suggested that community medical services should be managed in a unified way.

The transfer of diabetes prevention and treatment from big hospitals to community health centers represents the general trend. The rapid economic growth has significantly improved people's living standards, however, diabetes caused by unhealthy lifestyles and less exercise has increased rapidly in China year by year. Statistical data show that the number of patients in 2008 increased by 9.7% compared with 1994. Diabetes, if not treated in time, will cause other complications such as retinopathy, ketoacidosis, lower extremity ulcer, which will be harmful to individuals, families and even society. Therefore, the

scientific prevention and treatment of diabetes is an urgent task in China.

Survey data from the United States show that only 8% of diabetic patients can be diagnosed and treated by specialist doctors while the rest of diabetic patients have to be taken care of by primary care doctors. The rising expenditure on chronic diseases year by year has increased enormous financial burden for individuals and families. Worryingly, many people suffer from more than one chronic disease. The speed and scale of health problems are no longer effectively controlled by special medical care (Van & Schellevis, 2006).

Special medical care has high financial and manpower cost but the benefits are limited (Shah et al., 2007). In the community, a series of measures, such as proper preventive health care, early diagnosis and intensive management, etc. can significantly improve the quality of life of people with diabetes, reduce medical costs and improve economic efficiency (Hogan, 2008).

General practice is suitable for managing chronic diseases. As most patients have more than one chronic disease, primary health doctors can deal with these situations more effectively than special doctors (Starfield et al., 2005). Patients tend to merely deal with specific disease at the special doctors but cannot obtain preventive health care unrelated to diseases (Lafata et al., 2001), yet these can be obtained from general practitioners. General practice can offer lasting health care for patients with more and more complicated needs (Overland, Yue, & Mira, 2001).

The quality of chronic disease care by general practitioners is gradually improving (Harris & Zwar, 2007). In Australia, 87% of people went to the general practitioner at least once a year, and general practice provides care for most patients with chronic conditions, especially mild to moderate diseases (Pegram, Daniel, & Harris, 2005). With the full support of specialists, general practitioners can provide care with high quality for people with diabetes (Overland, Mira, & Yue, 1999; Hays, Worley, & Coote, 2004).

Second, the advantages of community management for diabetes.

General practice provides primary medical services for the majority of people, with main responsibility for providing disease prevention, risks identification, early intervention, care for chronic diseases, emergency treatment and referrals according to circumstances for emergency patients (Davies et al., 2006; Harris & Harris, 2006;). This is a patient-centered medical service (Stewart & Stewart, 2001) with the following characteristics (Starfield,

1994): firstly, accessibility, that refers to patients being able to enjoy primary care services as needed (Whitehead, 1992); secondly, comprehensiveness, that refers to being suitable for the general needs of people in the community; thirdly, continuity, that concerns patients establishing continuous contact with general practitioners and enjoy continuous care (Freeman & Hjortdahl, 1997); and fourthly, cooperation, that refers to the needs and issues of concern of patients not being missed during referral.

The primary medical institutions are responsible for the health education for residents and therefore they should strengthen the efforts in this aspect because early disease prevention is more important than treatment. Diabetic patients in China lack the necessary knowledge of the disease risks. Therefore, it is necessary to popularize the health knowledge among healthy people, sub-health people and sick people in order to raise their awareness of risk of diabetes and preventive measures.

2.4 Experience reference of community-based management of diabetes

We summarized the experience of community-based management of diabetics in several developed countries:

2.4.1 The United Kingdom

With the increasing number of chronic patients in UK, the British government put forward 21st century new management strategies for chronic diseases and introduced the Expert Patient Program (EPP). The program, launched in 2007, listed basic regulations on the lifestyle, diet, exercise and other aspects of patients with chronic diseases. Meanwhile, it required to strengthen the training for the chronic diseases professionals, carry out intensive health education among residents to raise their awareness of the risk of chronic diseases and preventive measures, enhance follow-ups for families with patients, in order to ensure the rational use of medical resources.

2.4.2 The United States

With the help of a primary health care team, Bowyer (1997) conducted a pilot project on the high proportion group of Native Americans, Hispanic Americans and the black people whose blindness were caused by diabetes by determining the priority, choosing principles, implementing and monitoring, to prevent eye complications resulting from

diabetes, which had made some progress. Hiss et al. (2007) pointed out in their research that the cooperation between care managers and community-based primary healthcare doctors can improve the care levels of T2DM patients, and it has become a basic model for community primary chronic disease management. The comprehensive measures to effectively manage diabetes and control its complications include health education, diet therapy, exercise therapy, quantitative management, and rational use of drug by community health centers for diabetic patients in a timely and systematic manner. This has been agreed by the academic community. The American conclusions and prescriptions are as follows:

(1) High risk groups and patients

We should know the forms of activities and expected goals of high-risk groups and patients, help them to establish a goal that meets with their will, and assist them to reach the goal. We should also create healthy communities featuring moderate exercise and rational diet, to which we should allocate necessary sports grounds and equipment, thus helping high-risk groups and patients make use of and mobilize their family, friends, colleagues as well as other social members to promote the effect of non-drug treatment.

We should formulate specific plans for implementation, guide high risk groups and patients in carrying out rational diet and physical activities through home interview, telephone follow-up, letters, outpatient follow-up as well as other means and adjust and improve the intervention plans in a timely manner.

Another dimension of interest concerns feeding habits.

a) Rational diet

Attention should be paid to dietary balance. Fat should account for 20% to 30% of the total intake of dietary energy, carbohydrate 55% to 65% and protein no less than 5%. Bland diet should be advocated with the daily intake of salt being no more than 6 grams per day and high-risk groups and patients should have multiple meals a day but little food at each. The variety of foods should also be advocated and customized diet prescriptions based on individual characteristics should be formulated. As for overweight people, it is suggested to eat less staple food by 50 grams per day compared to ordinary people, and at the same time, the monthly intake of edible oil should not exceed 500 grams.

Another dimension of interest concerns physical activity.

b) Physical activities

We should formulate individualized exercise prescriptions for high-risk groups and

patients based on their physical conditions, in which we choose adequate forms, frequency and duration of exercise step-by-step and put forward cautions to prevent from sport injuries and accidents. In terms of exercise, the requirements of both quality and quantity should be fulfilled. "Quality" refers to the moderate intensity of exercising while "quantity" refers to the time for exercising. The former is calculated based on the effective heart rate. The formula is: effective heart rate = 170-age. For example, the effective heart rate of a 50-year-old person is 120. The latter refers to the duration of exercising. For example, diabetic patients may spend less time playing sports at the beginning. They may play sports for three to five minutes and then have a rest for one minute. Later, they may reduce the frequency of rest and prolong their sports time from 10 minutes to 30 or 40 minutes. Generally, the effective heart rate can be reached after exercising for 20 to 30 minutes, which indicates that the requirements of both quality and quantity are fulfilled.

(2) Early detection of diabetes

a) The relevant knowledge of diabetes treatment and prevention should be disseminated via traditional media and new media to enhance the awareness of community residents on diabetes prevention.

b) Establish health records for the sub-health people with potential risk of suffering diabetes and increase follow-up efforts.

c) The community medical service center shall regularly detect the blood glucose level of the high-risk population and publicize the healthy life style and preventive measures.

d) All health data collected from residents in the local community should be analyzed in order to take targeted measures.

(3) Management of diabetic patients

a) The monitoring and treatment results of diabetic patients shall be put on record in the form of archives;

b) Establish "Diabetes Management Card" for diabetic patients and carry out preliminary diagnosis for them;

c) Communities classify diabetic patients or offer targeted technical guidance;

d) The follow-up visits of community medical service centers (stations) can take three forms, namely outpatient follow-up, family follow-up and group follow-up. Outpatient follow-up refers to the management of patients carried out by outpatient doctors at the time

of patients visiting the doctors; family follow-up visit means that community doctors, when conditions permitting, visit the homes of patients with limited mobility to carry out diabetes management; group follow-up refers to the diabetes management carried out by a team of medical experts. The community health centers should take preventive measures through general disease screening and regular health lectures on diabetes.

The requirements of follow-up visit management include:

- ① Accurately understand the patient's disease conditions, including the cause of the disease, the daily lifestyle and the patient-tailored therapies;
- ② Scientific evaluation of treatment process;
- ③ The treatment methods include food intake control, more exercise and psychological counseling;
- ④ For patients taking medicine, advise the rational drug dosage and ask them to regularly conduct body check;
- ⑤ Strengthen health education and help patients improve the efficiency of self-management.

(4) Surveillance on diabetes

Within the area covered by disease detection, monitoring on diabetes should be regularly carried out every three years. For the selection of monitoring points, whether to add provincial monitoring points should be based on the diabetes incidence and mortality in local region. The principle for the additional provincial representative point is: with prefecture-level city as unit, one urban district and one county in every city is chosen as surveillance point.

As stated, in 2005, a total number of 20.80 million people in the U.S., twice that in 1980, were troubled by diabetes, and the number is expected to reach 29 million by 2050 (Caspersen & Fulton, 2008). Data shows that the rate of self-paying was also very high (Bernard, Banthin, & Eneinosa, 2006). The enormous medical expenses on diabetes puts heavy burden on both families and countries. To reverse this situation, we should prioritize preventive measures to reduce the incidence of diabetes. US general practitioners provide a smaller range of services compared with that in the U.K. and Australia. The services provided by U.S. general practitioners include primary health care, disease immunization and surveillance, with few public health services involved. Therefore, from the perspective

of primary prevention of chronic diseases, the role of general practitioners in the U.S. is weaker than that in the U.K. and Australia. As the freedom of personality is advocated in the U.S., basically, the voluntary private medical insurance plays a dominant role in the public and the medical insurance system is very complicated. General practitioners only play the roles of “gatekeeper” and of capital master in some schemes (Zhang & Liu, 2005). Research in the U.S. also indicates that the country was intending to expand its caring and education in diabetes from urban areas to rural areas (O’ Brien & Denham, 2008).

2.4.3 Australia

According to the statistics from World Health Organization (WHO), in 2000, there were 941,000 diabetics in Australia and there will be 1,673,000 by 2030. Community health centers play a major role in community health services in Australia. They are independent from hospitals both in management and financial resources, with a dozen of staff and relatively fixed coverage. Among the full-time and half-time employees of the centers, there are occupational therapists, physical therapists, psychological therapists, social workers, and other healthcare technicians apart from nurses as the major population. Health centers often provide different project services including: child and family care, community-based rehabilitation, home care, hospice care, school healthcare, post-acute community care, health education, health promotion, mental health, psychotherapy, prevention and treatment of chronic diseases, day care for the elder and substitutive services, prevention of unexpected injury and other service projects. General practice clinics, community health centers and health centers for the elder, nursing homes, child health centers, community health agencies like community mental health centers help Australians and people in Australia from non-English speaking countries effectively and appropriately get access to public health services and health promotion services (Albisser et al., 2001).

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Chapter 3: Methods

3.1 Research design

Because the study is concerned with a complex situation, it is better to approach it from a mixed methods strategy, which allows the researcher to understand in a comprehensive way the several dimensions of the phenomenon under study (Teddlie & Tashakkori, 2009; Mayoh & Onwuegbuzie, 2015).

Therefore, we started by deploying a qualitative approach to depict the current situation and the stakeholders' subjective experience concerning it. Together with this, we deployed the quantitative approach, which consists of a survey by questionnaire targeting the main players in the community care centers namely: doctors, nurses, directors, patients and service providers. These questionnaires are suitable to collect data of a complementary nature.

3.2 Data analysis strategy

As the study grasps a complex web of data from multiple stakeholders, concerning several points of time, the identification of subjective experiences and multiple points of view on several issues pertaining diabetes management system at community level base, we elected as the prime objective the extraction of a meaningful set of data that we can, via a reflective effort, transform data into integrative and meaningful information.

This matches an Interpretative Phenomenological Analysis (Smith & Osborn, 2003) where the approach is purposively intended to account for the subjective meanings individuals create when relating with the object of research, in our case, the community based diabetes management system. Although this method has been extensively used in qualitative research in Psychology, its nature is independent of theory and epistemological considerations (Braun & Clarke, 2006) which renders it useful for management research. Objective data, e.g. archival records, is combined with subjective one, to triangulate and strengthen the depiction and interpretation of the situation. Much of this information is firstly of a descriptive nature (to understand the overall situation) and secondly of a

reflective nature.

Interpretative phenomenological analysis matches all requirements to address in a suitable manner the complex issues involved in a macro level system (Smith, 2004). Firstly, it is a method of an idiographic nature focusing on joining together pieces of information until a meaningful holistic idea emerges, which is used subsequently to structure reflection on further data. Secondly, it has an inductive nature, which allows the emergence of unanticipated topics which matches the flexible nature of semi-structured interviews, and thus effectively answers the exploratory nature of this research purpose. Lastly, it is interrogative as it goes beyond existing theories or opinions into new possible explanations that may be related and either cumulate with extant knowledge or cast doubts on taken-for-granted assumptions.

Therefore, we believe the complexity of the issue requires the data analysis to be built in a holistic fashion rather than on top of analytical step-by-step procedure. The equivalent of external validity in qualitative research is the transferability of findings from qualitative research (Tierney & Clemens, 2011). As one of the motivations of this research on diabetes management in China is to build knowledge and contribute to improve the system, we fundamentally agree with Tierney and Clemens (2011) that “any research undertaking not only involves identifying a problem, designing a study, analyzing data, and reaching conclusions, but it also needs to help decision-makers reach some sort of conclusion about what actions could be taken”.

Unlike quantitative research, a mixed methods or qualitative research is able to provide context, understanding, depth, comparison, and voice to those that are the reason why systems such as diabetes management are built. For all these reasons, we favored meaningfulness over sophisticated inferential quantitative data analysis especially because the stigma on qualitative as less rigorous than quantitative has been long gone due to progresses made in this line of inquiry (Bluhm et al., 2011).

3.3 Qualitative approach

3.3.1 Sample

The sample comprises: directors of the disease control center and Health bureau; directors of the community hospitals; the clinical staff (doctors) and clinical support staff (nurses, data center staff, IT staff) and the association of doctors and directors on diabetes

via two members of the standing committee.

Directors of the centers were considered important because they have an overview of the entire administrative system and its challenges. Doctors have direct contact with patients and understand their clinical situation and ongoing status. Clinical support staff has a more comprehensive view of social situation and play a critical role in educating patients to keep their health and IT staff have an in-depth knowledge of how data is gathered, processed and made available for all stakeholders. At the governmental level, as the study concerns public policy on diabetes management, the Directors of the disease control / health center as well as at civil level, the standing committee of the Association of Diabetes, both add critical information about the system level situation. Finally, patients' views are indispensable as they are ultimately the most important player in determining the model effectiveness due to their will to learn and adopt healthy behaviors in keeping diabetes within control. Without this sort of stakeholders we believe it is impossible to comprehensively collect data so to fully understand the current situation of this complex problem.

A single interview was conducted with both the Director of the Disease Control center and the other Director of the Health Bureau. Six interviews with Community hospital directors (one per district in Shanghai), a member of the standing committee and another one ordinary member from the Association of Diabetes. Fifteen interviews were made to patients. Twenty-four interviews were conducted to doctors and nurses, altogether, twelve each. Four professionals responsible for data and IT were also interviewed.

Not all interviews were recorded due to the sensitive nature of some issues. Instead, in many cases we took only written notes. To the exception of the interviews that could only be made to a single person, we believe saturation (Fusch & Ness, 2015) was attained as the same information emerged several times. Thus, we trust the consensus about the most important information is guaranteed by this means.

The sheer amount of information precluded an analytical procedure that strictly follows the rules of a quantitatively-based content analysis (with the category coding and frequency counting irrespective of adopting a conventional/emerging; directive/theory-driven, or summative/counting approach (Hsieh & Shannon, 2005)). Therefore, we have opted to conduct a more general analysis as we already have the categories a priori and a fully stakeholder view of the entire phenomenon. As much of the information provided followed a narrative structure (where interviewees shared stories

related with the specific cases they wanted to illustrate), we have gained understanding via the plots united by temporal anchors.

Although this approach might be more prone to bias and one should have more interpretative caution, it has been used in healthcare research precisely due to the same sort of complexity involved in data sources and topics (e.g. McCance, McKenna, & Boore, 2001).

3.3.2 Scripts

We designed interview scripts specifically for each stakeholder.

The first interview script concerned the directors of the community centers. It comprehended four questions pertaining: 1) start date of diabetes management in the community center as well as current situation, 2) structure and resources allocated in the community center for this purpose, 3) work process and organization of work flow by the community hospital staff, and 4) a critical reflection on the strengths and weaknesses of the work targeting diabetes management in the community center.

Another interview script targeted the community hospital healthcare staff. After a first block of questions concerning basic information (education level, tenure in managing chronic diseases, income, training concerning diabetes and chronic diseases) we asked for the professional experience in managing diabetic patients. Namely, we wanted to know what are the job activities the interviewee developed in diabetes community management, what was the respective level of satisfaction, positive and negative experiences, a critical reflection on how to improve the system specifically comprehending staff sufficiency, planning and rules, qualification, security and quality of service. After this we asked for opinion on the main challenges and ways to improve efficiency, what was the view on the importance of health community medical care for diabetics and the overall idea to improve diabetes management by community hospitals. The interview ended with a question focusing on expectations about service development in the next 20 years.

Another interview script concerned the doctor responsible for community. We also started by asking personal information (education, tenure dealing with chronic diseases, income, diabetes management training received, and the number of diabetic patients under the responsibility). Questions concerning diabetes management situation targeted the specific job activities developed by the interviewee, how the diabetics were identified, challenges and shortcomings in current work. We were also interested in understanding the

doctor's opinion about working at the community center as compared with working in a hospital. Lastly, we wanted to learn from the interviewee which suggestions could be offered to improve the diabetes healthcare management and expectations about service development within 20 years.

Another interview script concerned the diabetic patients. After asking for some basic information such as education, duration since diagnoses as diabetic we asked for reasons to understand why the interviewee choose to seek treatment in the community center and who is the doctor from the community center in charge of his/her treatment and monitoring. Then we asked for the level of satisfaction with the overall service provided by the healthcare staff. Because we also counted on a questionnaire specifically addressed to diabetic patients, namely their satisfaction with the healthcare management, we kept this as a very parsimonious interview. We naturally, favored a very open interaction for further information the patients might be willing to provide voluntarily as the interview developed.

Another interview script concerned the health bureau and disease control center. In this interview we started by asking for information pertaining the main responsibilities for diabetes management. Then we proceed to ask for information regarding how was the work about diabetes prevention and treatment carried out in the health service centers in the region as well as a personal reflection on its advantages and disadvantages. Lastly, we asked for information pertaining the department's plans and views on how to improve diabetes healthcare management in the community.

Another interview concerned the diabetics association. We started by asking what the main responsibilities of the association were and moved on to ask for opinion about how was diabetes managed in the region, namely its strengths and weaknesses. Then as asked for the level of satisfaction with diabetes healthcare management performed by the community centers, highlighting aspects that might deserve correction. Lastly, we asked for personal opinion on what could be done to improve the diabetes management at community level.

Additionally, we have also designed three questionnaires. One for the primary health service providers. Another for the municipal district authority and another one for diabetic patients.

The first questionnaire was addressed to primary health service providers in Shanghai. We started by stating the nature of the inquiry, providing instructions to fill in the questionnaire and offer guarantees of privacy. The questionnaire comprehends blocks. The

first block required socio-demographic and professional information pertaining personal information, qualifications, and current occupation. Then in a second block we targeted diabetes training concerning last time received training, training contents, perception about diabetes knowledge sufficiency, desired training / skills development in diabetes management, and desired type of training). A third block asks for job description concerning diabetes prevention work, perceived importance given by government and society to diabetes prevention and treatment (under the form of attention, carrying out in full treatment, equipment, funds, medical qualifications) and level of satisfaction with the diabetes prevention and treatment. This block ends with a request to identify problems and further needs to improve diabetes management in community institutions.

Another questionnaire targeted municipal districts concerning the situation in 2016. It included a block that asked for basic information such as budget for prevention and treatment of chronic diseases as well as for training. A second block asked for policies concerning chronic diseases management in the district, with some specific questions for community diabetes treatment policy. For clarity sake and to make the answer more objective, the options were only set as Yes or No. A third block concerned the diabetes management system comprehending the report, screening, registration, drug, referral and follow up, evaluation of the system effectiveness, training and development of personnel, supportive measures such as a guide and other community education tools. Answers here were also established as Yes or No format for the same reasons. A fourth block concerned the infrastructure of the system concerning the number of community health center able to manage diabetes, the databases and their articulation in a network. A fifth block targeted training and education specifically namely existing funds, number of training actions conducted in hospitals, community and at central level.

Another questionnaire targeted diabetic patients. In a first block of questions we intended to understand the participant's basic information (gender, age, and some information pertaining diabetes history). In a second block we asked for satisfaction with diabetes healthcare system comprehending medical environment, procedure, equipment, and skills and physical examination. Also included some education related issues concerning the health guide and health education. The scale ended by asking for satisfaction concerning follow up service, overall service attitude, service quality, and general satisfaction). The participant was requested to answer in a 5 point Likert scale ranging from 1 (Not satisfied) to 5 (Satisfied). We opted not to use the traditional "Totally

dissatisfied-Totally satisfied” to avoid lowering the scale range as a less extreme scale would enact more real answers (as most people opt not to answer on the 1 or 5 positions because culturally the answer may be taken as too extreme).

3.3.3 Procedure

The comprehensive nature of the research design implied that a team should be deployed to collect field data. Therefore, ten qualified individuals were chosen based on their knowledge on medical field, and their previous experience in conducting this sort of data collection. The team was chosen by the researcher and was trained to fully understand the interview script and the content of the survey. Before going to the field, the team had a meeting with the researcher for briefing purposes. A previous contact with the interviewees was established by the researcher to book the interviews and ask for further reference to have access to other stakeholders. After confirmation of participation, the team was finally deployed to collect data in the first season of 2017 (January to March).

All the settings were built to learn the status quo, problems, and relevant proposals of the community management of diabetes in Shanghai. During the investigation, we drafted outlines of the interviews and investigated duty doctors, public health administrators, and center directors for the present health management of diabetes, as well as their satisfaction to the work effect in semi-structured in-depth interviews. Moreover, we investigated administrators of chronic diseases in regional disease control and prevention sectors, supervisors of community health in public health bureaus, and leaders of the diabetes associations, so as to learn their satisfaction of the status quo of community health management on diabetes. Meanwhile, we interviewed diabetics using rapid assessment to learn about their satisfaction on the health management services of diabetes in their communities. To carry out the interviews successfully, we made appointments with the interviewees three days before the interviews and assure them of the research purpose and commitment to protect their privacy. All the one-on-one interviews lasted for average one hour per interviewee. These interviews have been recorded both in words and in tapes. After the interviews, we confirmed the answers with the interviewees and asked for their consent on the contents that might go public.

3.4 Quantitative approach

3.4.1 Sample

A survey by questionnaire was considered more suitable to collect objective information from the Directors of Disease Control center as well as the Health Bureau and from the other stakeholders already covered by the qualitative phase, namely: 60 doctors and directors of the community hospitals, 60 nurses, and 22 patients. Due to time limitation, we only investigated health care service centers in the communities in the following districts of Shanghai: Pudong New Area, Xuhui District, Changning District, Putuo District, Huangpu District, and Jing'an District. The investigation focuses on the management of diabetes.

As a complement, the archival data from the clinical situation of 608 patients (308 from Xuhui community hospital and 300 from Jing'an community hospital) was collected comprehending the full 2016 and 2017 years.

3.4.2 Measures

Because the research has a purpose of understanding how the situation evolved according with the model in use (traditional versus Shanghai model), data was collected several times. The first concerned the time just before the model was implemented in Jing'an (in 2010), the second time of data collection took place one month after the beginning of the implementation of the Shanghai model, and the third was in the first quarter of 2017 / two years after the model implementation.

Data collected on the two community hospitals (Xuhui & Jing'an) targeted several variables. Firstly, socio-demographic variables on patients: gender, age, and occupation. As a complement, clinical data was also collected. It pertained the time of diagnosis with diabetes, the blood glucose and treatment costs.

At the systemic level data targeted: 1) the detection rate of diabetic patients, expressed as percentage of population, and 2) the coverage rate of diabetic patients.

A calculation was made about the improvement rate contrasting glucose levels across three time-periods: before Shanghai model implementation (2009), one year after the model implementation, and two years after the model implementation.

Healing situation (registered as 0=not occurring and 1=occurring) was considered

when a given patient with hyperglycemia became at normal values without drug therapy. Normal values as well as the levels of glucose are referred to those stated as standards of the American Diabetes Association (ADA, 2014) as well as the Chinese Diabetes Society (2017). Normal values are those comprehended between 4.7 to 7.0 mmol/L in fasting situation (Weng et al., 2016). Improvement situation occurred when the number of levels lowered from hyperglycemic to normal situation. Better situation occurred when the level of hyperglycemia lowered at least one corresponding to HbA1c categories (e.g. from 9 to 8). Non-change is by definition all the cases where the glycemic level remained in the same level and deterioration occurs whenever there is an increase of hyperglycemia so that the level becomes worst.

The rate of drug intake was also considered since diabetic patients are required to take drugs regularly so to keep the glucose levels within healthy range. So, the number of patients that were registered as taking drugs regularly versus those that did not follow the prescribed taking hours was considered. Patients without medication (e.g. those who completely failed to take drugs) were also registered.

The social function of patients was also measured as the proportion of hours they are able to work. Thus, patients that were in a full-time job situation were counted, as well as those that could only work less than full time due to medical condition. Lastly, we counted the number of patients that were unable to work at all. We reason that the higher the number of full-time working diabetic patients, the better their social function and participation in active society.

The economic burden to the family was measured also by asking an estimation of the full costs in an interview as described in the interview script to patients. The questions pertained past and current costs estimated for a 2-year period and the follow up of the patients (the 22) lasted for 3 months.

3.4.3 Procedure

Participants in the questionnaire study (doctors, nurses, directors and patients) all were invited to fill in the respective questionnaire between January and March 2017. All participants were invited by the researcher to contribute. The invitation followed formal practices while offering guarantees within the ethical conduct in research.

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Chapter 4: Status Survey on Community-based Management of Diabetics in Shanghai

This chapter reports the findings pertaining diabetes screening and incidence in Shanghai, diabetes preventive measures such as health education for both practitioners and patients, resource allocation, support systems for community based management of diabetic patients, and the degree of satisfaction with this system. Whenever sources are not identified it means it is original data we collected as primary source or compiled from official available sources.

4.1 Screening situation of diabetes in communities

The research (Table 4-1) shows that in 53 community health centers surveyed, 74,077 patients have been diagnosed with diabetes and 100% of these patients have been recorded. Among them, 29,887 have been included in standard management, accounting for 40%. Pudong New Area had 5,210 patients under standard management and the highest rate of such patients, 88.35%, while Jing'an District had 5,106 and the lowest rate, 45.19%. The number of diabetic patients with effective control of blood glucose was 19,642, representing 26.5%. Pudong New Area had 3,750 patients with effective disease control and the highest rate of such patients, 63.59%, while Jing'an District has 3,664 and the lowest rate, 32.43%.

Health center leaders attach great importance on the community-based management of diabetes in sample districts, carry out grid management of diabetics in areas under administration by building community responsibility doctor teams, and detect diabetics by regular outpatient visits, health examination, family follow-up, health examination and other forms of health promotion activities, which contributed to a detection rate of 10.5%. Meanwhile, doctors collect health information of diabetics to establish electronic health record for all of them. Besides, through continuous follow-up visit, doctors analyze disease development trends of patients, make timely adjustment of such prevention strategies as pharmacotherapy, diet therapy, and exercise therapy, which make all diabetics under standardized management and the control rate of blood glucose reaches 33.8%.

Table 4-1 Situation of diabetes screening in surveyed communities

Category	Disease screening	Number of diagnosed patients	Number of recorded patients		Number of patients included in standard management		Number of patients with effective disease control	
			n	%	n	%	n	%
Surveyed district	n	n	n	%	n	%	n	%
Pudong New Area	7	5897	5897	100%	5210	88.35%	3750	63.59%
Xuhui District	6	6336	6336	100%	5533	87.33%	2680	42.30%
Changning District	11	6021	6021	100%	4425	73.49%	3270	54.31%
Putuo District	10	5236	5236	100%	3326	63.52%	2224	42.48%
Huangpu District	8	7899	7899	100%	6433	81.44%	4128	52.26%
Jing'an District	11	11299	11299	100%	5106	45.19%	3664	32.43%
Total	53	74077	74077	100%	29887	40.35%	19642	26.52%

Communities make use of advantages of personnel and equipment in upper-level hospitals to open diabetes specialist out-patient services, which reduce community diabetics' queuing time in comprehensive hospitals. The system for basic pharmaceuticals implemented in communities also decreases hospitalization costs for patients, and at the same time, creates convenience for community-level and upper-level hospitals in their cooperation in bi-directional health services. Through the training from diabetes specialists, community doctors improve their abilities to diagnose and treat diabetes as well as earn trust and recognition from more patients, which play an active role in improving community basic public health services and safeguarding people's health. Health promotion lectures carried out by local communities greatly promote the improvement of community's residents' health awareness, health concept transformation, health knowledge and skills.

Such new forms as standard management of diabetes and proactive exploration of diabetes specialist out-patient services in sample districts are well recognized and greatly appreciated by interviewed diabetics, district disease prevention and control centers, administrations of health, diabetes associations and other upper-level authorities concerned.

4.2 Number of participants in health promotion lectures held by community health centers

Statistics of the recent year shows that surveyed community health centers held 61 lectures on diabetes health education per month on average. Among districts surveyed, Pudong New Area held 200 such lectures, ranking first, with an average of 16.67 lectures on diabetes health education per month. These lectures had totally 4,132 participants and an average of 344 participants per month. Changning District held 85 such lectures, ranking at the sixth place, with an average of 7.08 lectures on diabetes health education per month. The district had the largest number of lecture participants, at 7,079, with an average of 590 participants per month. The number of participants in Xuhui District, Putuo District, Huangpu District, and Jing'an District was 235, 253, 321, and 235 respectively per month on average (see Table 4-2).

Table 4-2 Number of participants in health promotion lectures held by community health centers

Surveyed districts	Health education lecture		Number of participants	
	Total	Average/per month	Total	Average/per month
Pudong New Area	200	16.67	4132	344
Xuhui District	94	7.83	2824	235
Changning District	85	7.08	7079	590
Putuo District	94	7.83	3035	253
Huangpu District	135	11.25	3857	321
Jing'an District	124	10.33	2820	235
Total	732	61.00	23746	1979

4.3 Patients' health education situation

Table 4-3 shows that over the recent year, 53 community health centers have carried out health education of various forms for diabetics regularly. The education forms included health education prescriptions, on-the-spot lectures, videos, bulletin boards and other forms. Community health centers that have adopted these approaches accounted for 100%, 88.68%, 62.26%, 98%, and 24.53% respectively.

Table 4-3 Forms of health education in community health centers in surveyed districts

Surveyed districts	Community health centers		Health education prescriptions		On-the-spot lectures		Videos		Bulletin Boards		Other forms	
	n		n	%	n	%	n	%	n	%	n	%
Pudong New Area	7	7	7	100%	6	85.71%	5	71.43%	7	100%	2	28.57%
Xuhui District	6	6	6	100%	5	83.33%	3	50.00%	6	100%	2	33.33%
Changning District	11	11	11	100%	10	90.91%	6	54.55%	10	91%	2	18.18%
Putuo District	10	10	10	100%	10	100.00%	5	50.00%	10	100%	3	30.00%
Huangpu District	8	8	8	100%	6	75.00%	6	75.00%	8	100%	1	12.50%
Jing'an District	11	11	11	100%	10	90.91%	8	72.73%	11	100%	3	27.27%
Total	53	53	53	100%	47	88.68%	33	62.26%	52	98%	13	24.53%

4.4 Proceeding situation of diabetes management

Table 4-4 shows that for 29,887 patients who have been included in standard management by 53 community health centers, 71.07% of them could be supervised to take medicine on time and they could be supervised only once a month; 77.29% of them could receive glycosylated hemoglobin examination at least once every three months; 45.1% of them could have regular examination of complications; 87.83%, 89.83%, and 84.38% of

them could participate in publicity/training, follow-up, and regular appointment activities respectively.

Table 4-4 Situation of diabetes management in community health centers in surveyed districts

Surveyed districts	1 n	2 n	3 %	4 %	5 %	6 %	7 %	8 %
Pudong New Area	7	5210	71.43%	77.23%	63.65%	96.54%	96.54%	93.65%
Xuhui District	6	5533	66.67%	64.00%	60.00%	85.00%	83.00%	75.00%
Changning District	11	4425	72.73%	59.30%	35.62%	75.12%	77.86%	78.33%
Putuo District	10	3326	70.00%	80.00%	42.00%	91.67%	100.00%	83.33%
Huangpu District	8	6433	75.00%	72.51%	31.00%	90.64%	90.64%	90.64%
Jing'an District	11	5106	72.73%	68.26%	58.23%	85.32%	90.91%	85.32%
Total	53	29887	71.70%	77.29%	45.10%	87.38%	89.83%	84.38%

Note: (1) number of centers; (2) number of patients included in standard management; (3) supervision of taking medicine on time / month / once; (4) glycosylated hemoglobin examination / three months; (5) complications examination; (6) publicity / training / month; (7) follow-up / month; (8) regular appointment activities / month.

4.5 Diabetes training situation

4.5.1 Participation of diabetes training

Table 4-5 shows that over the past year, the number of trainees, who worked as medical staff in community health centers, participating in further study / training programs held by state-level institutions was 53, while the number of those participating in further study / training programs held by institutions at province-level, city-level, district-level / county-level, and other levels were 93, 607, 550, and 429 respectively.

4.5.2 Situation of training organized by centers

Table 4-6 shows that over the last year, medical staff in 53 community health centers organized 1,734 internal trainings of diabetes and each surveyed district organized 2.7 such

trainings per month.

Table 4-5 Number of participants in diabetes training at all levels in community health centers in surveyed districts

District	State-level	Province-level	City-level	County-level	Other
	Trainees	Trainees	Trainees	Trainees	Trainees
Pudong New District	1	18	90	68	3
Xuhui District	37	25	308	192	120
Changning District	2	4	110	198	193
Putuo District	0	9	33	32	25
Huangpu District	9	27	30	21	36
Jing'an District	4	10	36	39	52
Total	53	93	607	550	429

Table 4-6 Training of medical staff in community health centers in surveyed districts

Surveyed districts	Number of centers	Internal diabetes training / month	Total times	Times per month on average
	N	%	N	N
Pudong New Area	7	98.00%	154	1.8
Xuhui District	6	95.00%	198	2.8
Changning District	11	92.62%	242	1.8
Putuo District	10	100.00%	420	3.5
Huangpu District	8	100.00%	192	2.0
Jing'an District	11	100.00%	528	4.0
Total	53	96.00%	1734	2.7

Among these districts, Jing'an District totally held 528 such trainings, ranking first, with an average of 4 per month. Pudong New Area, Xuhui District, Changning District, Putuo District, and Huangpu District held 154, 198, 242, 420, and 192 internal trainings of diabetes respectively and 1.8, 2.8, 1.8, 3.5, and 2 such trainings per month on average.

4.5.3 Contents of diabetes trainings

Community health centers' diabetes training contents are showed in Table 4-7. In terms of training contents, 100% of centers in all districts involved "diabetes prevention, diagnosis, diet, exercise, and drug treatment". Only 42 centers' training contents involved skills of managing diabetic patients" and 6 centers in Pudong New Area, 6 centers in Xuhui District, 8 centers in Changning District, 8 centers in Putuo District, 6 centers in Huangpu District, and 8 centers in Jing'an District taught such contents, accounting for 85.71%, 100%, 72.73%, 80%, 75%, and 72.73% respectively. For training contents of "the use of diabetes system management software", 29 centers involved, representing 54.72% and 4 centers in Pudong New Area, 3 centers in Xuhui District, 5 centers in Changning District, 5 centers in Putuo District, 5 centers in Huangpu District, and 7 centers in Jing'an District taught such contents, occupying 57.14%, 50%, 45.45%, 50%, 62.5%, and 63.64% respectively.

Table 4-7 Diabetes training contents of community health centers in surveyed districts

Surveyed districts	1			2		3	
	n	n	%	n	%	n	%
Pudong New Area	7	7	100%	6	85.71%	4	57.14%
Xuhui District	6	6	100%	6	100.00%	3	50.00%
Changning District	11	11	100%	8	72.73%	5	45.45%
Putuo District	10	10	100%	8	80.00%	5	50.00%
Huangpu District	8	8	100%	6	75.00%	5	62.50%
Jing'an District	11	11	100%	8	72.73%	7	63.64%
Total	53	53	100%	42	79.25%	29	54.72%

Note: training contents include (1) diabetes prevention, diagnosis, diet, exercise, drug treatment, and related knowledge; (2) skills of diabetic patient management; (3) use of diabetes system management software.

Table 4-8 Training methods of community health centers in surveyed districts

Surveyed districts	Centers	On-the spot lectures given by medical staff		Experience sharing by patients		Giving out free professional books or materials		Trainings involving workers from pharmaceutical companies		E-learning	
		n	%	n	%	n	%	n	%	n	%
Pudong New Area	7	7	100.00%	6	85.71%	7	100%	5	71.43%	6	85.71%
Xuhui District	6	6	100.00%	4	66.67%	6	100%	4	66.67%	2	33.33%
Changning District	11	11	100.00%	8	72.73%	11	100%	7	63.64%	4	36.36%
Putuo District	10	10	100.00%	8	80.00%	10	100%	7	70.00%	7	70.00%
Huangpu District	8	8	100.00%	7	87.50%	8	100%	5	62.50%	4	50.00%
Jing'an District	11	11	100.00%	9	81.82%	11	100%	9	81.82%	6	54.55%
Total	53	53	100.00%	42	79.25%	53	100%	37	69.81%	29	54.72%

4.5.4 Diabetes training methods

Training methods (Table 4-8) adopted by medical staff for patients with diabetes mainly include on-the spot lectures given by medical staff, experience sharing by patients, giving out free professional books or materials, trainings.

It involves workers from pharmaceutical companies, and E-learning. Among community health centers in various districts, 100% of them have adopted training methods of on-the spot lectures given by medical staff and giving out free professional books or materials, while 42, 37, and 29 of them have chosen training methods of experience sharing by patients, trainings involving workers from pharmaceutical companies, and E-learning respectively.

Table 4-9 Number of community health centers equipped with diabetes management offices and computers in surveyed districts

Surveyed districts	Number of centers equipped with chronic disease management offices		Number of centers equipped with chronic disease management computers		Number of computers for medical staff	
	n	%	n	%	n	%
	Pudong New Area	5	71.43%	7	100.00%	49
Xuhui District	5	83.33%	6	100.00%	54	10.8
Changning District	11	100.00%	10	90.91%	88	8.0
Putuo District	10	100.00%	10	100.00%	110	11.0
Huangpu District	8	100.00%	8	100.00%	60	7.5
Jing'an District	8	72.73%	10	90.91%	132	16.5
Total	47	88.68%	51	96.23%	493	10.5

4.6 Resource allocation of community management of diabetes in Shanghai

4.6.1 Allocation of office and computer for community management of diabetes

The research (Table 4-9) showed that all community health centers were equipped with offices and computers especially used for chronic disease management. Besides, the number of computers for medical staff were 10.5 per center on average.

4.6.2 Database establishment for community management of diabetes

The research (Table 4-10) shows that 88.68% of centers have established a chronic disease management database and all centers have built a diabetes management database. However, diabetes management databases just established by some community health centers were still in the debugging process, so they were not so stable and only 47.17% of them functioned normally.

Table 4-10 Diabetes management databases of community health centers in surveyed districts

Surveyed districts	Chronic disease management database		Diabetes management database		Normal operation	
	n	%	n	%	n	%
Pudong New Area	6	85.71%	7	100.00%	5	71.43%
Xuhui District	6	100.00%	6	100.00%	5	83.33%
Changning District	9	81.82%	11	100.00%	0	0.00%
Putuo District	9	90.00%	10	100.00%	0	0.00%
Huangpu District	7	87.50%	8	100.00%	6	75.00%
Jing'an District	10	90.91%	11	100.00%	9	81.82%
Total	47	88.68%	53	100.00%	25	47.17%

4.6.3 Overhead expenses for community management of diabetes

The research (Table 4-11) shows that overhead expenses for chronic disease mainly came from governments' funds for public health services. All surveyed centers had overhead expenses for chronic disease, with RMB 1,568,000 per center on average. Districts which community health centers are under the jurisdiction of had different

economic conditions, number of patients, and government support, so their overhead expenses for chronic disease varied a lot. For example, in Putuo District, the overhead expenses for chronic disease was RMB 102,400 per center on average, while the amount was 241,400 in Jing'an District. The overhead expenses for diabetes was RMB 50,500 per center on average. Xuning District's overhead expenses for diabetes was RMB 20,900 per center on average, being the lowest, while Jing'an District's was RMB 82,100 per center on average, being the highest. Prevention and treatment of chronic diseases is one of the nine major basic public health services and its overhead expenses come from funds for public health services.

Table 4-11 Overhead expenses for chronic disease of community health centers in surveyed districts

Surveyed districts	Number of centers with overhead expenses for chronic diseases		Overhead expenses for chronic disease (RMB: ten thousand)		Overhead expenses for diabetes (RMB: ten thousand)	
	N	%	Total	Average	Total	Average
Pudong New Area	7	100.00%	147.85	21.12	46.32	6.62
Xuhui District	6	100.00%	65.15	10.86	12.56	2.09
Changning District	11	100.00%	152.7	13.88	39.63	3.60
Putuo District	10	100.00%	102.42	10.24	57.25	5.73
Huangpu District	8	100.00%	97.44	12.18	21.78	2.72
Jing'an District	11	100.00%	265.56	24.14	90.35	8.21
Total	53	100.00%	831.12	15.68	267.89	5.05

All local governments are increasing their funds for public services, which supports the implementation of prevention and treatment of major chronic diseases to some extent. Besides, for the implementation of chronic disease management, the budget subsidies for public health are also used for establishing residents' health files, carrying out health education, vaccination, maternity care, childcare, care for the elder, prevention and treatment of infectious diseases and holergasia management. Non-guaranteed special funds for community-based management of diabetes, heavy workloads along with trivial and complicated job contents reduced the working enthusiasm of community responsibility doctors and community nurses. Moreover, there are some problems, which are mainly

manifested in:

(1) Excess public health service projects, heavy workloads of prevention and treatment, insufficient overhead expenses.

(2) Funds for public health services are only enough for primary-level health service institutions to carry out public services. Therefore, disease prevention and control centers do not have sufficient funds to carry out prevention and treatment of chronic diseases, which is not in favor of carrying out work.

(3) Funds for public health services in some regions are not paid on time, which impedes the work of the institutions.

(4) Measures need to be taken to prevent some local governments to take funds for public health services as wages for staff in primary-level health service institutions.

(5) Although chronic diseases have become major diseases that influence people's health, there is still insufficient special fund provided for prevention and treatment of chronic diseases such as pulmonary tuberculosis and psychosis.

4.6.4 Detection of diabetes and equipment allocation

The research (Table 4-12) shows that all surveyed centers offered diabetes testing and were equipped with glucometer. In addition, 83.02% of centers were equipped with biochemical analyzers and 79.25% were equipped with urinary sugar detector.

Table 4-12 Configuration of diabetes instruments in community health centers in surveyed districts

Surveyed districts	Diabetes testing		Glucometer		Biochemical analyzer		Urinary sugar detector	
	N	%	n	%	n	%	n	%
Pudong New Area	7	100.00%	7	100.00%	7	100.00%	6	85.71%
Xuhui District	6	100.00%	6	100.00%	6	100.00%	4	66.67%
Changning District	11	100.00%	11	100.00%	8	72.73%	8	72.73%
Putuo District	10	100.00%	10	100.00%	8	80.00%	9	90.00%
Huangpu District	8	100.00%	8	100.00%	7	87.50%	6	75.00%
Jing'an District	11	100.00%	11	100.00%	8	72.73%	9	81.82%
Total	53	100.00%	53	100.00%	44	83.02%	42	79.25%

Table 4-13 Medicine allocation of community health centers in surveyed districts

Surveyed districts	Number of centers	Sulfonylurea	Biguanide	Glucosidase inhibitor	Insulin sensitizer	Hypoglycemic Chinese patent medicine	Animal insulin	Recombinant human insulin
		Types of drugs	Types of drugs	Types of drugs	Types of drugs	Types of drugs	Types of drugs	Types of drugs
Pudong New Area	7	20	6	2	6	7	2	8
Xuhui District	6	22	6	2	5	8	2	9
Changning District	11	28	7	3	7	12	3	12
Putuo District	10	26	8	3	7	10	3	14
Huangpu District	8	17	9	2	6	12	2	9
Jing'an District	11	29	6	4	7	9	2	10
Total	53							

Note: types of drugs are counted by the approval number of drugs of different pharmaceutical companies.

Statistics shows that community health centers are still lack of high-end equipment, including blood biochemical analyzer, health assessment software, and health risk assessment tools, which hinders the development of community diabetes management.

4.6.5 Treatment of diabetes and medicine allocation

Table 4-13 shows that in the treatment of diabetes, community health centers mainly chose drugs on the National Essential Medicine List which can be reimbursed by medical insurance. In addition, 53 centers have been allocated with various diabetes drugs that can be divided into oral hypoglycemic drugs and insulin according to the route of administration.

Oral hypoglycemic drugs mainly include sulfonylureas, biguanide, glucosidase inhibitor, insulin sensitizer, and hypoglycemic Chinese patent medicine, while insulin includes animal insulin (being an alternative drug, it is rarely used), recombinant human insulin (short-acting insulin, medium/long-acting insulin, and mixed insulin).

Every center has been allocated with full range of diabetes drugs and that's mainly because the government requires that community health centers have 90% of all kinds of drugs and use drugs on the National Essential Medicine List.

4.7 Support system for community-based management of diabetes patients

4.7.1 Policy and system establishment

With the launch of nine projects of national basic public health services, the equalization of basic public health services has been promoted, which is of great significance for improving the residents' accessibility to public health services, narrowing the differences of public health services between urban and rural areas, improving residents' health condition and promoting social harmony.

Based on the results of the survey, presently, the community-based system management of diabetes has been gradually implemented, while the related support system needs to be further improved.

The diabetes system management requires a complete support system, attention and participation of the whole society, as well as supportive policy and system, funds,

advanced information system and supervision and evaluation system. Besides, to establish the cooperation mechanism among community health centers and hospitals, centers for disease control (CDC) and other organizations, the participation and cooperation of all residents are necessary (See Figure 4-1).

Based on the current situation of the diabetes system management in the surveyed areas, the support system for the management of diabetes in various areas is being improved while some shortcomings worthy of further attention still exist.

In response to the equalization of public health services, many districts in Shanghai have successively issued a number of policies and set up systems by releasing basic documents such as *Implementation Plan for Basic Public Health Service Projects* and *Implementation Methods for Performance Assessment of Basic Public Health Service Projects*. The Development and Reform Commission and the Finance Bureau of Shanghai have also drawn up *the Implementation Plan of Equalization of Basic Public Service Projects of Shanghai in 2020*.

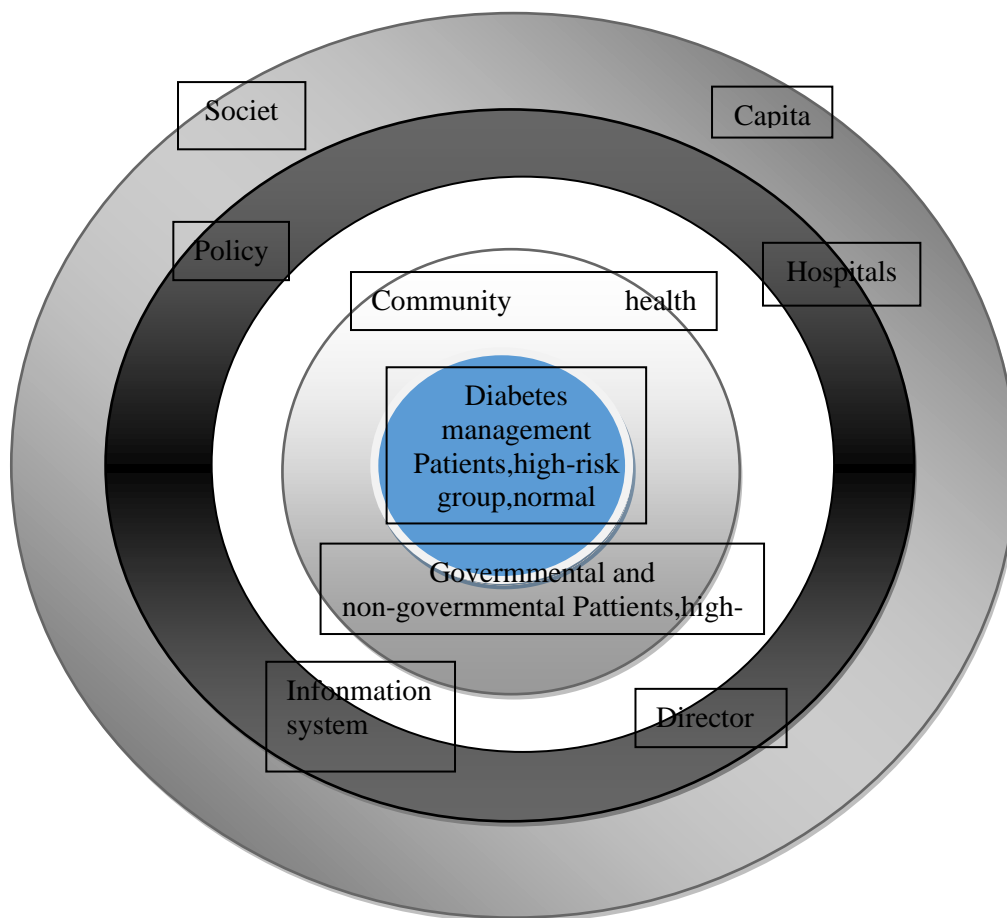


Figure 4-1 Support system of diabetes prevention and control in communities

Leading groups of chronic disease management have been set up in various districts.

For example, Shanghai Municipal People's Government has set up a public health committee with a leading group of chronic disease management. At the same time, the health promotion actions have created a good health support environment. At present, the main cause of death of Shanghai residents is chronic non-infectious diseases. The rate of death caused by cardiovascular and cerebrovascular diseases (which bring great psychological trauma and economic losses to families and the society) has ranked first. Meanwhile, the prevention and control of the infectious diseases also face great challenge. However, for the prevention and treatment of both chronic diseases and infectious diseases, health promotion is the fundamental measure. The health promotion works continuously carried out by Shanghai city improved the citizens' health awareness and healthy behaviors, especially the actions of building a healthy city such as distributing special salt spoon, special oil bottle, waistline ruler, *Shanghai Citizens Health Self-management Knowledge Manual* and other supportive tools for a healthy lifestyle (Chen et al., 2013).

Since Shanghai implemented the national health promotion actions in 2007, the secondary national health promotion networks of districts, towns and villages (subdistricts) have become increasingly improved. For example, the health education instructors have conducted health education lectures in various towns and villages (subdistricts); volunteer teams of young medical and health personnel have carried out various kinds of publicity, consultation and free diagnosis services; the community doctor teams have provided services of basic medical care, follow-up of chronic diseases, and health check-ups. There are 632 fitness courts in Shanghai, and the coverage rate of indoor and outdoor fitness facilities in all administrative districts and communities has reached 86.7 % and 100 % respectively. The rise in the number of fitness courts has stimulated the enthusiasm of citizens to participate in fitness activities, which to a certain extent has improved their physical quality as well as promoting the harmony of Shanghai communities. By virtue of establishing healthy workplaces, the national health promotion actions have been extended to villages, communities as well as schools, hospitals, enterprises. In addition, during the construction of healthy urban areas, Shanghai issued in 2010 *Shanghai Health Promotion Plan (2011-2020)*, in which 10 major health promotion actions have been drawn up, namely promoting reasonable diet, national fitness, smoking cessation and alcohol restriction, mental health, rational medication, preventive treatment of disease, healthy community, healthy workplace, improving health of women and children, and enhancing health of the elderly. Therefore, with the support from government, society and

communities, diabetes patients have enjoyed more accesses to the health education and their health awareness and health conditions have been gradually enhanced. The community-based management has been also improved.

However, there are still some problems existing in the policy and system construction of diabetes community-based management in Shanghai:

(1) The prevention and treatment of chronic diseases is the key to the health of the population, which should reflect the government behavior from planning to implementation. And government's constant attention plays a decisive role in the chronic disease management.

(2) At the national level, there is a lack of comprehensive prevention and treatment system for chronic diseases.

(3) Governments at all levels have not included the public health services (including the prevention and treatment of chronic diseases) in the government assessment mechanism.

(4) The prevention and treatment of chronic diseases lacks government arrangement, such as policy documents concerning planning and guidelines for the prevention and treatment.

4.7.2 Construction of institutional network

The construction of the network of grassroots health institutions requires further attention and improvement. At present, the surveyed area has made some achievements in the construction of the network of grassroots health institutions. The health service construction in urban communities has laid a solid foundation for the prevention and treatment of chronic diseases. Despite the fact that the community health service system is not established in rural areas, the rural health institutions has made the rural service network gradually stable with the support of the new rural cooperative medical system and the rural health integrated construction.

Major problems:

(1) In some urban areas of Shanghai, the layout of community health institutions needs to be adjusted. The health institutions now serve a much larger number of people from a much wider area than they can originally handle. Besides, as no affiliated health stations has been set up, the people cannot have an easy access to the community health

services, which is unfavorable to the prevention and treatment of chronic diseases in the community.

(2) Some patients still stick to the old mindset of seeking medical treatment and are accustomed to going to large medical institutions for medical treatment.

(3) Some grassroots health institutions, especially the urban community health service centers, lack enough workplaces such as those specially used for health education.

4.7.3 Information management system

The research shows that the construction of information management systems for chronic diseases has brought convenience to the systematic management of diabetes. The chronic disease information system is mainly integrated into the community health service information system and the resident health record management system. The health bureaus of Shanghai, Xi'an and Wuhan have developed unified community health service information management systems for community health service institutions. However, the progress is uneven in the establishment of the information management system for chronic diseases in rural areas, which are mainly organized and developed by the provincial health departments.

The follow-up records of electronic health records in the sample community are a proof of the dynamic management of the records. However, within more than two months of observation, we found that the community doctor teams did not make full use of the information recorded in the electronic health records during the community-based management of diabetes patients. For example, during the outpatient services and follow-up visits, doctors mainly recorded the patient information in the outpatient log and the medical records of the patients, and compared the blood glucose level measured on site with that recorded in the medical records as the basis for evaluating the blood control effect of the patients. When assessing the health conditions of diabetes patients, the doctors of the sample community mainly made subjective judgments based on their clinical experience. Although information such as follow-up records and outpatient records was used as a reference, there was still a lack of a comprehensive assessment of the health condition of the patients, or a scientific assessment taking advantage of the professional statistical analysis methods or the assessment analysis software. There were no written forms of the detailed assessment report on the patients' health condition during check-ups or outpatient service. After the community doctors discovered health risk factors of the diabetes patients,

they mainly adopted intervention measures such as drug intervention and health education, without providing a comprehensive and scientific guidance from psychological, dietary and sports aspects. The Shanghai Municipal Health Bureau has developed the Resident Health Record and Hospital Medical Record Management System with a chronic disease management module for use in community health service centers. The progress in the construction of chronic disease information management system in the sample community was very uneven and that in some other areas were still lagging behind, which is unfavorable to the detailed implementation of systematic management of chronic disease in rural communities. Although there have already been many sets of information management systems for chronic diseases in many districts of Shanghai, the data and information of some systems cannot be shared, which will definitely increase the workload of the staff of grassroots health institutions. The existing management system is still underdeveloped, unstable in operation and imperfect in functions, which will cause loss of data and failure in carrying out statistical analysis. Currently, the networking of the information systems for chronic disease management has neither been completed.

4.8 Degree of satisfaction towards community-based management of diabetes patients

4.8.1 Degree of satisfaction of service providers towards community-based management of diabetes patients

The director of the community health center, as an administrator at grassroot-level health system, is familiar with the requirements of the supervising authorities in the health management of chronic diseases such as diabetes in the community, and knows well the overall situation of management of chronic diseases such as diabetes within the district. The public health management personnel who directly manages the community doctor teams is familiar with the details of the diabetes health management work carried out by the doctors and nurses in the community. Community doctors, who are the frontline service personnel in diabetes health management, not only provide daily outpatient services, but also take on responsibilities such as follow-up visits and health education. Through interviewing the director of the community health service center, public health management personnel, and responsibility doctors of community, we can know their satisfaction degree with the health management work in the diabetes community and their

suggestions in order to discover the current advantages and disadvantages of the health management work in the diabetes community and propose proper improvement strategies.

(1) Director of the center

The director of a community health service center in Jing'an District of Shanghai said in an interview: "Our center has established a team of community doctors and implemented the grid management of diabetes patients in the community in order to know the basic health condition of patients in the community. It's like the gatekeeper system of community doctors in Britain, in which residents know who are their community doctors. And they will first go to see their community doctors for consultation, diagnose and transfer treatment when it comes to health problems. Community doctors carry out regular follow-up visits to the residents under management and may conduct one-to-one health education during the follow-up, which, based on mutual understanding, can improve their health awareness and urge them to change unhealthy behaviors", "Our community carries out health check-ups for farmers every two years. Through this opportunity, we can improve the health records, better understand the health condition of residents, and carry out timely detection, diagnosis and treatment for residents with health risk factors. We are exploring new models for the management of chronic diseases such as diabetes. Every Thursday, diabetes specialists from district-level hospitals will offer outpatient services and provide guidance for community doctors and nurses. This has attracted many patients to visit the doctors regularly. From the end of 2016 to the middle of 2017, nearly 20 diabetes patients were transferred for treatment through the diabetes specialist service."

"On the 20th of each month, we will hold a diabetes health promotion lecture which is delivered by diabetes specialists from higher level hospitals in order to improve the health knowledge of the diabetes patients. Since this July, we have started to try to make use of the platform of the outpatient doctor's workstation which will later be launched in the center. Through this workstation, the medical records and doctors' advice will be entered into the computer immediately during the outpatient services, and also we change the prescription in paper form into electronic form. I believe that with this workstation, the efficiency will be greatly improved. Each week, every follow-up information of the diabetes patients will be input into the chronic disease management module of the Shanghai community health service information system, thus the community doctors can easily check the patient information during outpatient services and follow-ups. In 2016 and 2017, the health bureau of the district organized advanced health management workshops

for directors of the all community health service centers in the district, in which health management is one of the lessons.”

(2) Public health management personnel

During the interview, all three public health management personnel said that they had not participated in any special trainings in the knowledge of diabetes or health management. They reported the problems in diabetes management as follows: “Although the government allocates funds for chronic disease management every year, in terms of such a large population served in the community, the management fund of tens of thousands of yuan is obviously not enough to make doctors at grassroots work actively and effectively. For example, we have a service station with only three doctors but nearly 9,000 people to be served at present. The doctors are responsible not only for outpatient service, dispensing of medicines, information registration, but also for publicizing health knowledge, their work efficiency is low without doubt. This reflects the quantity mismatch between the supply and demand sides.”, “The community doctor reported that due to the frequent migration within the district, there were a floating population of 50,000 people, resulting in incomplete coverage of the management.”, “There is no fixed place for regular health education in the community.”, “Most residents are not at home during the day and it is highly likely that the doctors cannot find the patients during the follow-up visits”, “The public health workers need diabetes clinical knowledge which may be used in the community diabetes management, but they lack professional training in that.”

(3) Community doctors

Among the 10 community doctors interviewed, only two had participated in special training in knowledge of diabetes, and none had participated in special training in knowledge of health management, but each managed 40 diabetes patients on average.

The main tasks and responsibilities in diabetes management, according to the community doctors, were “measuring blood glucose and blood pressure for outpatients”, “checking patient’s health condition via telephone or on-site follow-up”, “establishing health records”, and “carrying out health education and provide life guidance”. The main ways for them to find diabetes cases are “out-patient services”, “household surveys or health check-ups”, “health promotion activities in the community” and “on-site follow-ups”.

For their advantages of carrying out diabetes health management in the community,

fours doctors said: “I am familiar with the community”, “the service station is close to the residential area”, “the residents around trust me and are willing to take blood pressure and blood glucose tests in the station.” In terms of successful experience, some people thought that “the ways of management of diabetes patients should be different according to the patients’ characters. For example, we should be tactful in guiding those patients who are irritable; for the patients who do not care about their diseases, we will give examples around us to illustrate various complications caused by diabetes and let them be aware of the severity of diabetes without control. For patients who suffer heavy psychological burden, it is quite important to give counsels and comfort.” However, most of the deficiencies reported in their work lie in the difficulties of carrying out health education, paying follow-up visits and offering other services. For example, “most of the residents I serve receive a low level of education and as a result the health education becomes very difficult”, “There are nearly 300 hypertension patients and 40 diabetes patients in my community. Regular follow-up visits, health education and especially on-site follow-up will be very difficult for us to implement when we are busy in outpatient services. Therefore, outpatient services and telephone follow-up are common alternatives.” For the disadvantage of carrying out diabetes health management in the community, the community doctors generally believe that we focus on the treatment of common diseases such as colds and fractures but are inexperienced in diabetes treatment, such as the how to use insulin, identify complications, and teach them to carry out scientific diet and exercise to prevent diabetes”, “Residents have doubts in our professionalism”, “Doctors in major hospitals can receive trainings organized by medical companies; however, community doctors have few opportunities of receiving trainings in diabetes and other aspects, and consequently their ability of diagnosis and treatment can hardly be improved.” In terms of opinions and suggestions for the government or the health administrative department, most people said “more opportunities of trainings in diabetes and health management knowledge and skills training should be created, and funds for diabetes management should also be increased”.

4.8.2 Degree of satisfaction of demand side towards community-based management of diabetes patients

4.8.2.1 Questionnaire on the degree of satisfaction

We investigated the degree of satisfaction of 22 diabetes outpatients with the rapid

evaluation method. Among these, 13 are men and 9 are women with an average age of 52.9 years and a medical history of two years and above.

The questionnaire shows the evaluation of the following 10 aspects (the treatment environment, the treatment process, the treatment equipment, the treatment technology, health check-ups, the health guidance, the health education, follow-up services, the service attitude and the service level). The total score of the options (ranging from “satisfied” to “unsatisfied”) to questions of the questionnaire is regarded as a measure of the degree of satisfaction. Respondents’ degree of satisfaction towards the diabetes health management service in this community are ranked from the most satisfied to the least satisfied as follows: the service attitude, the treatment process, health check-ups, follow-up services, the health guidance, the health education, the service level, the treatment technology, the treatment environment, and treatment equipment. See Table 4-14 for details.

4.8.2.2 Individual in-depth interview about degree of satisfaction

Table 4-14 Diabetes patients’ degree of satisfaction towards the diabetes health management in the community

Item	Unsatisfied	Relatively unsatisfied	Neither satisfied nor dissatisfied	Relatively satisfied	Satisfied
Treatment environment	3	1	14	4	0
Treatment process	1	4	2	7	8
Treatment equipment	0	1	20	1	0
Treatment technology	0	0	4	18	0
Health check-ups	0	1	4	8	9
Health guidance	0	0	11	6	5
Health education	0	0	9	9	4
Follow-up service	0	2	3	9	8
Service attitude	0	0	10	2	10
Service level	0	1	18	1	2

Note: Figures show absolute frequency.

We carried out a face-to-face semi-structured individual in-depth interview with two Type II diabetes patients with over four years of diabetes history who pay regular visits to the community health service center and have good communication ability.

The interview focused on the reasons of seeking for diabetes treatment in the community, the degree of understanding of the community doctor, the service they receive from the doctors, and the evaluation and suggestions on the diabetes community health management.

Patient A: gender: female; age: 60, occupation: retired from enterprise.

Brief introduction to the state of illness: This patient has been diagnosed with diabetes more than 10 years ago. However, due to her misunderstanding of diabetes and her neglect of treatment, her blood pressure level was 165/95mmHg and postprandial blood glucose level 21.9mmol/L when she saw the community doctor in February 2011. She showed symptoms such as gaunt complexion, fatigue, dizziness and emaciation at that time. Consider the severity of her illness, Xiao Yu, a community doctor, patiently shared the diabetes knowledge with her and illustrated with examples the harm of diabetes and its complications. Since the patient was passive towards treatment, Dr. Yu gained his husband's trust through a private conversation with him and let him cooperate with the doctor to help the patient treat her diabetes. With the support and cooperation of the patient's husband, the patient kept visiting the health center every week, so that Dr. Yu could keep abreast of her health condition and living habits such as diet, exercise, and timely adjust medication and lifestyle interventions according to changes of her state of illness. Finally, the patient's blood pressure level was stabilized at 140-150/80-90mmHg and postprandial blood glucose level at 8.2-8.9mmol/L. During the outpatient service in July 2016, the patient has obviously been in a much better mental state than that at the first outpatient service. At the beginning, the patient was taciturn and unwilling to talk to the doctors and nurses, but now, she is willing to talk with the doctors and nurses openly and talk about her diet, exercise, and life situation in this week. She has now mastered the correct medication method and is satisfied with his current blood sugar level.

The main content of the interview: "it takes just more than ten minutes from home to the community (health center) and I am now familiar with most doctors and nurses in the community." "At present, to see a doctor in the community is not expensive, and it is not as

crowded as the major hospital so it won't take long to register and wait in line." "Every time I come to see a doctor, the nurse will take my blood pressure and blood glucose. I have made friends with the doctors and nurses, who know very well about both my state of illness and family. They often ask about my diet and complications conditions, and tell me what I can eat and what I should eat less." "When I come here to see a doctor, I feel relaxed and I can chat with doctors and nurses. It's just like visiting my old friends every week."

Patient B: gender: male; age: 71, occupation: freelancer.

Brief introduction: This patient has suffered from diabetes for more than 10 years. His FBG (fasting blood glucose) level has remained 7.0 mmol/L and postprandial blood glucose level 12.0mmol/L for a long time. His eyesight, hearing and expression ability are relatively good, and he can take care of himself. His doctor provides outpatient services or paid on-site follow-up visit to him every week, timely adjusts the types of medication used according to his self-reported adverse drug reactions, advises him to carry out appropriate physical exercises and conducted psychological counseling for him.

The main content of the interview: "I have always been here to see the doctor and get medicines." "As I'm illiterate, I don't know how to take the medicine sometimes when I go back home, then I will come to ask the community doctors again." "I know the community doctors very well. Sometimes they will visit my home and help me measure the level of blood pressure and blood glucose. I have good relationship with the doctors." "Sometimes the doctors will call me and ask me to attend lectures (the diabetes health promotion lecture), in which we are told to eat less pickled food, stop smoking and drinking, and take regular exercises. Some of the patients will be taught how to take injections (insulin injections)." "I feel that the doctors and nurses in the community are both enthusiastic and trustworthy."

4.8.2.3 Degree of satisfaction of the supervising authorities

The supervising authorities of the community health service center are Shanghai Center for Disease Control and Shanghai Municipal Health Bureau. The management of chronic disease of community is mainly charged by the Chronic Disease Control and Prevention Division of the CDC which is directly charged by the Rural Health Office of the Health Bureau.

Shanghai Diabetes Association, as a local social organization composed by

diabetes-related medical workers and people concerning the diabetes rehabilitation from local communities, with the purpose of improving the rehabilitation level of diabetes, has the functions of extensively mobilizing all efforts from the society, organizing the cooperation within and between communities, strengthening the academic exchanges, popularizing the health knowledge concerning diabetes, promoting the advanced technologies for diabetes rehabilitation and assisting in the development of talents in the field of diabetes rehabilitation. This study has carried out an in-depth individual interview with the leaders of the Chronic Disease Control and Prevention Division of the CDC, the Rural Health Office of the Health Bureau, and the Diabetes Association to see how to what degree they are satisfied with the health management work in the diabetes community and their work plans.

4.8.2.4 Chronic disease control and prevention division of the CDC

The main responsibility of the CDC is “to collect the quarterly reports on diabetes and hypertension patients submitted by the community health service center, including the filing of the electronic health records, disease management and control situations. In case of deaths from chronic diseases, the community health service center will report through the direct reporting online system, and we can immediately collect such information in the whole district.” “Every year, we will carry out on-site inspection, technical guidance and personnel training for chronic diseases work of community at least once. Every month, we will review the database of the whole district, make the annual data summary and work summary as well as annual monitoring reports.” “We will usually forward some notices and *Work Standards* from the provincial institutions.”

For the diabetes management carried out by the community health service center, the Division indicated that: “The chronic diseases works in the community are mainly managed by the various community health centers. and the management mainly include 2 parts: hypertension and diabetes, as these two diseases have the highest prevalence rate among the residents these years and these rates are on the rise every year. In Shanghai, the rural population accounts for the majority of the total population. With the improvement of the diet, lifestyle and economic conditions, the chronic disease such as diabetes have accordingly emerged.” “Shanghai's prevalence of diabetes has almost doubled in more than a decade. Latest statistics shows that for the city’s permanent residents over 35 years old, the prevalence rate of diabetes has reached 17.65%. It is estimated that there are about 2 million patients with diabetes in the city, which causes huge disease burden. The

standardized management rate is 87%, and the effective control rate is about 50%. Most of the community health centers have done meticulous and serious work in diabetes management. For example, they will report data timely and actively participate in training courses organized by us. They are very willing to cooperate with us.” “As the community health service centers and stations are the grassroot-level of the network, they are faced with numerous, trivial and complicated tasks. Basically, they provide medical services. In terms of chronic disease management, they mainly provide outpatient services and follow-up. In addition, they also carry out health education. All of the above are mandatory tasks.” “The southern city (the community health service center of Nanyuan Street) has done the most excellent work in diabetes management in the whole Shanghai. It can be seen from the onsite investigation and some summary materials submitted that they attach great importance to the management work. In recent years, through research on diabetes health management, the number of outpatients with diabetes in that community has increased. Their leaders have attached great importance to diabetes management and worked hard on creating a good management model and providing trainings for management personnel.”

As for the deficiencies of the diabetes work in this community, the Division said that “to manage the rural diabetes patients is very difficult since their education level is generally low and they usually have many misunderstandings about the diabetes. And some of them who have fairly good economic conditions will choose to go to the major hospital instead of the community health center. The community doctors generally deal with common diseases and frequently-occurring diseases and may not be very proficient in the diabetes treatment, so that the residents may not put much trust in them.

In terms of the work plan, the Division said “in the future, we will provide more training opportunities for the community doctors, provide them with more knowledge about diabetes, and invite more experts and professors to offer guidance for their work. We will carry out more education and publicities together with the health education center so as to raise the residents’ understanding of diabetes and their health awareness.”

4.8.2.5 Rural health office of Shanghai Health Bureau

The responsibility of the Rural Health Office of the Health Bureau is “to charge the management work of rural health in the whole district including the management of the chronic diseases”. For the diabetes management carried out by the community health service center, the Office said that: “Our district started on trial the community health

services in 2000, and it has been 11 years since then. We have now 33 community health centers and 178 community health stations. Most of them were rural health centers and clinics originally. Compared with the original ones, the community health service center provides public health services in addition to basic medical services.” “In terms of public health services, the community focuses more on health education to improve the health awareness of the residents.” “As many doctors of community are also residents of the community, they know the environment and people there very well. It is more convenient for them to carry out some of the works and easier for them to earn the residents’ trust.”

In terms of the deficiency, the Office said: ‘health management’ is the buzzword in recent years. At present, the management of diabetes and other chronic diseases in the community still mainly consists of the basic health education and follow-up, outpatient and check-ups. However, most community doctors may not be able to achieve the health management of patients given their current clinical ability, and it will be especially difficult to ask them to formulate intervention measures to obviously improve the patient's state of illness.” “Most residents have a relatively low education, weak health awareness and difficulty in learning new knowledge. Presently, we can only start with follow-up visits and health education.”

In terms of the work plan, the Office said: “We can say that the Health Bureau spares no effort in enriching the knowledge and improving the skills of medical workers (doctors of community) at grassroots level. The community doctors have opportunities to receive in-service education and short-term special trainings, and the Health Bureau has issued many rules, regulations and technical specifications to guide the community in how to carry out the management of public health (chronic diseases). We are also very concerned about how to improve the chronic disease management in communities. We have been exploring new models and are considering conducting research in one or several communities as a trial.”

4.8.2.6 Diabetes Rehabilitation Association

The main responsibility of the Diabetes Rehabilitation Association is: “to provide guidance for the management of diabetes rehabilitation in the whole district.”, “to organize voluntary health consultation on diabetes for the public, to organize doctors and specialists in diabetes in the district hospitals to provide guidance for doctors of community, to actively explore district-specific diabetes health management methods, to study the eight-character strategy of district work, and to explore how to use *Diabetes Patient*

Management Diary to strengthen the patients' management of their own health. We have started our research by taking the community health center of Jing'an sub district as a trial." "We have also issued documents such as the *Notice on the Management of Diabetes Network*, in which we require the district hospitals to provide diabetes specialist outpatient services and provide technical guidance for relevant community service centers and stations. We also ask the community doctors to collect information of the diabetes patients and carry out health education for them. Besides, we require the disease control personnel to provide guidance during the health education carried out by hospitals and communities." "However, we are not an administrative department, we cannot force relevant personnel and institutions to follow our orders."

For the diabetes management work of the community health service center, the Office believes that "there is a lack of special health manager in the community to carry out diabetes health management, so it is necessary to create a new management method and model. And we should work according to local conditions".

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Chapter 5: Problems in the Community-Based Management of Diabetes in Shanghai and Their Root Causes

This chapter explain the problems found in the community based management of diabetes patients in Shanghai. It will start by identifying the problems focusing on sufficiency of services and staff, management procedures concerning case notes management and use of IT support and then it explores underlying causes (taken as circular process where the cause feeds the problem and the problem intensifies the action of the cause).

5.1 Problems in the community-based management of diabetes in Shanghai

5.1.1 Few community services for diabetes and incomplete medicine allocation

Currently, proactive efforts have been made in Shanghai to promote the diagnosis and treatment of diabetes, which are as key projects in community health services, and communities are encouraged to provide diversified handy services for the public. No radical curing method has yet been found due to the relatively complicated pathogenesis of diabetes, which means that the treatment of diabetes will accompany diabetic patients throughout their whole lives. With the constant development in medical care, the public's understanding on diabetes has continuously deepened, but globally, control of diabetes is unoptimistic. We contend that the fundamental cause lies in the lack of effective management of diabetic patients and the neglect of the importance of community-based management. Although close cooperation exists between community health service stations and rural hospitals, very few diabetes-related services are involved. Diabetes detection services fail to be provided due to insufficient funds. Healthcare services in community health service stations, such as successional community-based management, home visit and home care, do not play their practical roles. Under the influence of national medicine policies, 90% of drugs purchased by community health service stations should have their names on the National Essential Medicine List, which causes community health service

stations, compared with large hospitals, have a different medication catalogue and much fewer types of drugs. For example, community health service stations can only provide diabetic patients with regular oral medicines, including Acarbose Tablets, Gliclazide Sustained-release Tablets, Glipizide Tablets, Glipizide Extended Release Tablets and Metformin Hydrochloride Tablets. Due to inadequate types of insulin, community doctors can only prescribe for their patients according to the existing medication catalogue. Therefore, there are limited types and number of drugs available for patients.

5.1.2 Unscientific allocation of health human resource management

Firstly, the talent structure in community health service stations is below optimal situation. Both doctors and nurses are at a relatively old age and there are few young talents, which results in the lack of enthusiasm for work compared with those in large hospitals. As communities are advanced units in the integration of districts and towns, in the allocation of healthcare human resources, outstanding general practitioners have been introduced and former village doctors have also been retained at the same time. However, they have been treated differently in terms of management and the polarization is very severe, which dampen the enthusiasm of village doctors. As a result, patients even stand in a long queue to wait for specific general practitioners for treatment services while village doctors are left without anybody to care for them, which greatly waste resources. In addition, the ratio of doctors to nurses is unreasonable, and many community health service stations do not have enough nurses. Secondly, communities are in lack of scientific training for staff in health service stations, especially training on rehabilitation and nursing care of chronic diseases such as diabetes and high blood pressure. Medical workers are also short of scientific ideology and their comprehensive quality is not high, which further influence the effect of healthcare services. Finally, there is no standardized and discipline-based management for healthcare workers. It has become a consistent tenet for the public service industry of healthcare to provide citizens with quality services. Due to the easygoing management, medical workers pay no attention to their personal image, neglect regulations and systems and violate rules and disciplines in time of few visitor flows. As the principal part of management, communities lack effective management and supervision.

5.1.3 Non-standard management of case notes of diabetic patients

According to provisions, community health service stations should do a good job in diabetic case notes of community standardized management for diabetic patients, which are issued by the centers for disease control and prevention, and complete follow-up visit records of community-based management of diabetic patients, understand the general situations of patients, and keep track of patients' testing items, non-drug treatment, other follow-up visits, prescription and other items. In the actual mechanical process, however, the lack of management leads to the arbitrariness in the management of case notes in community health service stations, and some patients fail to have detailed diabetic case notes. On the one hand, this impairs patients' interest, and on the other hand, this influences the statistics of diabetes.

5.1.4 Insufficient publicity of diabetic services and prevention and control

For a long time, there has been a lack of proactive publicity of special diabetic services, prevention, healthcare and rehabilitation and other services in communities. Likewise, handbooks and leaflets related to diabetic prevention have not been properly distributed. As a result, the public has fewer approaches to get further knowledge of diabetes. Therefore, many services, which are to be provided by communities, fail to deliver expected results, making it even harder to improve the sustained treatment rate of diabetes and further influencing the control of course of diseases.

5.1.5 Relatively low level of informatization in case management

Informatization is a development trend in China's public management (Basu, 2004). As the informatization in community health service stations is at an initial stage and there is a lack of scientific management of case notes of diabetic patients, the information technology fails to be effectively used to manage the case notes, which to some extent increase workloads and is bad for the follow-up survey of patients' actual conditions.

5.2 Root causes of problems in the community-based management of diabetes in Shanghai

5.2.1 Unbalanced allocation of healthcare resources

It has been a long time for the Chinese government to maintain unbalanced allocation of health resources such as medical staff, medical equipment and health funds between rural and urban areas as well as between different regions (Wu & Lam, 2016; Zhang et al., 2017). About 84% of health resources have been put in urban areas. Statistics show that governments at all levels in Shanghai have put 30% of health resources in urban large hospitals.

In the sampled communities, there are 465 diabetic patients, to whom medical staff in communities needs to provide successional services, such as the establishment of electronic health files, health education and follow-up visit. Currently, these communities have 11 responsibility doctors, seven nurses and three public health staff members who are responsible for the community-based management of diabetes as well as the basic medical services for community residents and the community-based management, prevention and control of infectious diseases, report and management of holergasia for children, pregnant and lying-in women and the elder. As they have heavy workloads, their working efficiency is difficult to be raised and their job satisfaction is relatively low. In addition, high-end, precision and advanced medical equipment is mainly allocated in urban large hospitals and thus community hospitals can only carry out basic examination and test in the treatment and diagnosis of diabetes, such as routine blood examination, routine urine examination and B-mode ultrasound. This creates a disadvantage of getting a full and in-depth understanding on patients' health conditions through various physical signs and as a result, it influences the evaluation on patients' health and formulation of prevention strategies. This also serves as a reason why many patients go to large hospitals for medical services and why the compliance to community follow-up visit is poor.

In 2017, 70 tasks were listed as key tasks in the *Notice of the General Office of the State Council on Issuing the 2017 Major Task List on Deepening the Medical and Health Care System Reform* (hereinafter referred to as *MHCSRNotice*) issued by Chinese Government Network. The *MHCSR Notice* stresses that the gradual equalization of public health services should be regarded as a key task and per person government subsidy

standard for basic public health services should be increased to 50 yuan. Efforts should be made to strengthen the construction of disease prevention system and the system of prevention and control of chronic diseases so as to promote health. In fact, however, the sampled communities only received per person subsidy for basic public health services of 32.2 yuan in 2017, which was lower than the national standard. In addition, the funds used for the community-based management of diabetes in the sampled communities are mainly sourced from government subsidies for public health that are used for over 30,000 residents in the communities. This indicates that there is a weak guarantee for special funds in the community-based management of diabetes. Likewise, it indicates Community public health liaison officers do not have enough supporting funds for carrying out health education and other management of chronic diseases, leading to the restriction on many activities in the community-based management and decreased working enthusiasm of related staff engaging in the community-based management.

5.2.2 Imperfect talent training mechanism for community-based management

Presently, the majority of medical workers in community health service institutions have only received technical secondary education or junior college education while preventive healthcare personnel has received even lower education and have a poor professional background. As a result, it is difficult for them to acclimatize themselves to the “Six-Pronged” community health services featuring prevention, medical care, healthcare, rehabilitation, health education and family planning.

Chinese Health Minister Chen Zhu pointed out in the 2011 National Conference on Primary-level Health and New Rural Cooperative that China had about 60,000 qualified general practitioners, accounting for 3.5% of the country’s medical practitioners. This figure, however, was much lower than the global average level of 30% to 60%. In the sampled communities, only 20% of responsibility doctors have received a bachelor degree and most community doctors graduated from Clinical Medicine Science and do not receive systematic training on general practice after being engaged in community health services. Among the three public health workers, only one has received a bachelor degree on preventive medicine; the remaining two have received junior high school education and a bachelor degree on health management respectively. The directors in community health centers enjoy advanced study and training on health management once or twice a year while other general medical workers and public health staff are in lack of training on

management science, related theories and technologies in community-based management. Although centers for disease prevention and control organize community responsibility doctors to participate in short-term training courses on diabetes every year, they fail to get a full understanding on the functions, effects and side effects of various therapeutic drugs for diabetes due to the lack of systematic learning of clinical knowledge and techniques of diabetes. In the interview, both doctors and public health staff have expressed their dissatisfaction on current opportunities for training and training content.

Low education level, simple knowledge structure and few opportunities for training lead to weak awareness of community-based management of diabetes, insufficient attention to the formulation, implementation and summary of working plans of the community-based management, and the lack of guidance on scientific knowledge and methods in health risk evaluation of diabetic patients and their implementation of health prevention. The so-called community-based management of diabetes only refers to complete some mandatory tasks.

As residents' demands for healthcare gradually increase, more and more people go to community health service institutions for medical services. As these institutions perform the dual functions of basic medical services and basic public health services for residents, government and the society are laying more and more emphasis on the service levels and capabilities of community doctors.

In the interviews, some community responsibility doctors expressed that although centers for disease prevention and control organize them to participate in short-term training courses on diabetes every year, they fail to get a full understanding on the functions, effects and side effects of various therapeutic drugs for diabetes due to the lack of systematic learning of clinical knowledge and techniques of diabetes. As a result, they feel quite helpless in the face of complicated risk factors and complications of diabetes in outpatient departments or follow-up visit. When evaluating health conditions of diabetic patients, they mainly judge and classify the hazard levels of diseases based on their experience, with a lack of scientific evaluating methods, even though they have fully collected patients' health information.

Besides collecting such health information as blood pressure level and blood glucose level, in the community-based management, community nurses are expected to be responsible for health education. Compared with community doctors, community nurses have more time for contact and communication with patients when measuring their blood

pressure and blood glucose and it is easier for them to win patients' trust through friendly services in a patient manner, so they can deliver more effective results in one-on-one health education. The research in sampled communities finds that, however, in health education, community nurses only support community doctors, without independently undertaking health guidance for patients. This may be related to their lack of specialized knowledge in the pathogenesis of diabetes, biochemical index testing, drug using, injection of insulin, professional training and practice of health education, and other aspects.

According to the experience of other countries, general practitioners or specialized community-based managers are the main forces in community-based management. In China, however, due to the lack of faculties, curriculum provision standards, assessment and evaluation systems in the training of general practitioners in the medical education system, the training of general practitioners might become a mere formality. In addition, the implementation of community-based management requires health workers to master theories and practical skills of community-based management, such as health evaluating methods, means for health preventions, and they need to learn to apply knowledge of sociology, preventive medicine and management science to regulate personal and group health. At present, the training of community-based managers in China is at an initial stage and the training system is imperfect and the training content and mechanism need to be improved. Moreover, after acquiring the qualification certificate, these managers still need to go through a long-term practice before they can accumulate management experience and improve their management capabilities.

The medical teams involved in the management of diabetes should be comprehensive, including specialist physicians of diabetes, psychologists, traditional Chinese medical doctors, nurses, information technology professionals and regular health managers (Shortus et al., 2007). In actual work, however, not all staff members are involved in the management and there is no special diabetes management staff in China. Community doctors have low education levels, low medical levels and low recognition degree of patients, and there is a lack of establishment of professional norm for employees, which to some extent influence the effectiveness of management of diabetes. As for medical workers in comprehensive hospitals, they are not really willing to spend time in the management of diabetes and increase their workloads if there is no material incentive and moral encouragement for them. There are great demands for talents in medical information technology, especially those who are both familiar with medical health business and

proficient in computer technology, which to a certain extent restrict the development of information technology in the management of diabetes. Health management science is a comprehensive interdisciplinary, covering preventive medicine, clinical medicine, social science and other fields. In addition, many important disciplines, including evidence-based medicine, epidemiology, biostatistics, bioinformatics, health promotion, kinematics and nutrition science, are closely related to health management. However, China does not have training system or mechanism for talents in healthcare management, or mature faculties or corresponding talent reserve.

5.2.3 Weak basis of community-based management

In China, the community-based management is only at a stage of conceptual popularization, and the theoretical research and industrial development research related to the community-based management remain immature. The modes of community-based management of chronic diseases such as diabetes in all regions are totally different, representing the forms of “health hut”, self-service community-based management mode, friend-like community-based management mode and four-word (social, two-way, whole-process and evaluating) strategy for regional work. Currently, the Department of Disease Prevention and Control, from the Ministry of Health of China is promoting the research on the mode of integration of hospitals and communities for treatment of diabetes in Liaoning Province, Heilongjiang Province, Zhejiang Province, Chongqing Province, and Shanghai City. In several pilot communities in Shanghai, this mode has demonstrated some progress in diabetes glycemc index and control of risk factors. However, due to the differences in economy, society, culture, allocation of health resources, foundation of work and other aspects in different regions, there is a lack of a mode of community-based management of diabetes for reference.

Although community health services in Shanghai started early, they need to go through an adjustment and adaptive process before the disease-oriented service mode becomes transformed into health-oriented one. Additionally, it is not long before the management of diabetes in communities becomes standardized while diabetic patients in communities have weak health consciousness, low education levels and many unhealthy living habits, which bring great obstacles to the prevention of harmful behaviors of patients.

5.2.4 Weak basis of computer information technology

The medical information technology in China starts relatively late, and particularly, core technical supports are absent in operating systems, databases, sensors, servers and other key technical fields, representing great gaps with other countries. With the continuous development of Internet of Thing (IOT) technology, patients have higher requirements for sensor equipment. They call for smaller, softer, more intelligent and more economical equipment as well as more humanized and intellectualized management platforms. At the same time, doctors need more precise and stable equipment and systems to guarantee the scientificity and availability of medical data. The interconnection of information platforms between medical institutions at all levels is the fundamental requirement for community-based management of diabetes based on IOT. IOT is a powerful network that connects patients, communities and hospitals. Currently, on the one hand, all large hospitals in China maintain a conservative attitude towards the interconnection of medical information, and on the other hand, many information service providers in China follow imperfect norms and standards for their management information systems and their systems cover a small area, which impede the sharing, analysis and utilization of information among different regions. Moreover, these systems are unsustainable and isolated, which undoubtedly increase the difficulties in the management of diabetes.

Compared with traditional medical activities, the information transfer through Internet has replaced face-to-face communication between doctors and patients, but such kind of information transfer involves multiple links and is vulnerable to hacker attack and Internet virus infection during the data transfer, and the number of unstabilizing factors also increases. Information data such as electronic medical record (EMR) improve the service efficiency; while at the same time, it brings some hidden troubles as lawbreakers may falsely obtain these data. New challenges of safety also arise in the information sharing between different platforms.

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Chapter 6: Policy Suggestions for the Community-Based Management of Diabetes in Shanghai

The above analysis shows that, in Shanghai, with the implementation of community health services, some achievements have been made in the community-based management services of diabetes and the service mode has also been gradually improved. This goes in line with a recent longitudinal study concerning Shanghai where in a 7-year period the community based management of diabetes integrated with hospitals was found to improve most of the health indicators (hemoglobin A1c and blood pressure) that are used by the Chinese Diabetes Society to identify diabetic risk (Chen et al., 2018). According with the same study, the screening of chronic diabetes complications has also increase substantially although in varying degree. Likewise, another study conducted by Guo et al. (2018) has found that the use of basic medical services in Shanghai has improved in a 6-year period (from 2009 to 2014) although it is mostly evident in urban areas and not so much in suburban areas. Thus, there are still many problems that remain to be solved. In order to do a better job in the community-based management of diabetes in Shanghai, this thesis puts forward some countermeasures and suggestions to improve the community-based management of diabetes from the following levels.

6.1 The level of governments and health administrative departments

6.1.1 Optimizing assessment standards and regularizing assessment teams

In order to complete the specified tasks in assessment standards, not a few management members only pay attention to the quantity of management while neglecting the quality of management. They maintain the registration rate at a high standard while carrying out low-standard management, and thus only a few patients are under standard management. It is suggested to focus on the quality and effect of management, lower the registration rate, and raise the standardized management rate and patients' satisfaction degree. In the mode of management, sort management should be carried out based on patients' degree of coordination: better services should be provided as more as possible to those who are willing to receive the management services (such as patients with high

degree of coordination and poor economic condition); for those who refuse to receive the management services, many ways, such as home visit, telephone communication, small gift and brochure and establishment of health management agreement, can be used to raise their degree of coordination; for those who still refuse to receive the management services even after communication, it is not necessary to impose the services to them so as to avoid “mandatory services”. As for the problems resulting from non-uniform assessment staff members, an assessment expert database can be established, from which experts can be transferred to carry out assessment. Alternatively, the experts who formulate assessment standards should carry out training for temporary assessment members to specify requirements and assessment standards.

Unlike traditional clinical services, the community-based management of diabetes calls for the transformation of the service concept and this is especially urgent for the health service institutions in rural areas as it directly influences the implementation of prevention and control of diabetes. Currently, efforts should be made to gradually initiate the community health services in Shanghai and strengthen the training on related concepts of community health services for management staff and other medical workers in primary health service institutions in Shanghai. In addition, more efforts should also be made to complete the assessment of community health services in Shanghai as public services and the assessment results should be taken as an important basis for promotion and awards.

6.1.2 Raising salary and stabilizing management teams

Talents play an important role in the community-based management of diabetes. Failure to attract and retain talents remains one of bottlenecks in the development of community health service centers at the current stage (Pei et al., 2018). It is learned that the main reason why residents choose to go to large hospitals for medical services is that these hospitals enjoy advanced medical facilities and the doctors there boast excellent medical skills. In recent years, as a policy to reinforce community health services (Yaping, 2001; Wang et al., 2015) the government has put more investment in medical facilities in communities, established policies for attracting talents, and worked out a programme in 2016 where 500 university graduates are recruited every year and sent to assist community health service centers after two-year training. However, due to low salary and other factors, the outflow of talents still remains a severe issue in community health service centers (Zhang & Liu, 2005; Ran et al., 2013).

In accordance with Maslow's hierarchy of needs as well as the education levels and personal quality of medical workers in communities, the theory of soft management should be introduced in the community-based management of diabetes to encourage related departments to increase investment, guarantee community workers' salary and welfare treatment, raise their social-economic status and ensure that their average annual income is not lower than the average level of those in Grade II hospitals (Wang, Zhang, & Yu, 2009). What's more, it can also attract graduates from medical universities by raising regular wage or other preferential policies to work in community health service centers as recommended by Zhang and Liu (2018).

6.1.3 Making more efforts in training and encouraging on-the-job education

Since 2001, a program of post training for general practitioners has been initiated at a full range in Fujian Province. It plays an important role in promoting the development of community health services in Fujian and solving the problem of shortage of general practitioners. With the rapid development of primary health services and increasing health demands of the public, however, general practitioners fail to satisfy the demands of development, both in quality and quantity of training (Yu, 2011). A qualified general practitioner should be equipped with clinical skills and experience as well as other techniques in healthcare management such as public health and epidemiology (Zhou, 2002) as well as communication skills (Shao et al., 2018). Currently, however, the training ways for community general practitioners in Fujian is not perfect enough (Yu, 2011), and the major of general practice has not yet been set up in medical universities and most community doctors only participate in training when engaging in community work. Overall from a large-scale survey in nine provinces the training time has been considered insufficient by doctors (Shao et al., 2018). Among the management staff of diabetes in the surveyed communities, the majority of doctors have not received the training of general practitioners, indicating relatively great demands for such kind of training. Therefore, more efforts should be made to increase the number and strength of training to satisfy the demands for staff in primary level. At the same time, those who have participated in the training, after returning to their post, should communicate with their colleagues about the training content to let them know what and how to do so as to balance the working level, procedures and mode of each staff member. By this way, the influence on work will be minimized even though staff members are replaced by others. Under the current situation

where there is a lack of high-level medical talents, more efforts should be made to strengthen the reeducation of existing staff members, encourage them to pursue a higher academic degree, or arrange doctors at primary level to engage in advanced studies in upper-level hospitals at a regular basis so as to constantly update their knowledge and improve their service levels and capabilities. As for the problems where there are fewer staff with medium- or high-grade professional titles and where the overall satisfaction degree of professional title appraisal of medical workers is not high, it is suggested to raise the proportion of staff with medium- or high-grade professional titles in community health service centers, which at least should not be lower than that of educational system.

Currently, primary health service institutions are in lack of knowledge and skills related to diabetes and they are not qualified in the prevention and treatment of diabetes. The government should formulate training plans of diabetes, initiate special training on diabetes, ask recipient hospitals and mandated hospitals to make more efforts on training medical workers at primary level, offer awards, such as academic credits and subsidies, to those who participate the training so as to arouse their enthusiasm.

6.1.3.1 Strengthening the training of general practitioners and community nurses

Currently, China adopts different training systems of general practitioners in different provinces and each province develops independent modes of enrollment and training (Zhu, Li, & Chen, 2016). In Shanghai, the standardized training of general practitioners is mainly divided into theoretical study and rotation of major departments in hospitals, but the problems of irrational clinical rotation time and arrangement of the contents still exist (Du, 2003). General practitioners lack diabetes-oriented in-depth study and clinical experience, which is harmful to the diagnosis and treatment of diabetes.

Many other countries have long before trained public health nurses and family healthcare nurses (Zhang, 2000). They take community care as a major to recruit students, and the training level is divided into undergraduate and postgraduate students. China is immature in the establishment of curriculum system, content and standards and levels of training of community nurses (Li, 2007). Currently, most community nurses in China are the nurses in hospitals who have received training of general practice or graduates majoring in nursing in technical secondary schools, junior colleges and universities (Yan, 2006). The training system leads to community nurses' inability to adapt to the requirements of community-based management, especially in health education and psychological guidance.

Therefore, in the training of community general practitioners and nurses, China should, on the one hand, strengthen the clinical education of common diseases and frequently-occurring diseases as well as establish platforms to provide more opportunities of practice for general practitioners and nurses, and on the other hand, it should offer regular short-term training, strengthen topic-oriented in-depth learning and integrate theoretical study with clinical practice by using resources from upper-level medical institutions, upper-level institutions for disease prevention and control and social groups and organizations.

6.1.3.2 Accelerating the training of community-based managers

From the perspective of occupation division, the prime candidates for the community-based management of diabetes is community-based managers, who are one of the 11 new kinds of professionals announced by the Ministry of Labor and Social Security of China in 2005. However, there are few community-based managers who have passed the accreditation of the Center for Vocational Skills Appraisal and Guidance, Ministry of Health of China (Li, 2009). More efforts need to be made to accelerate the training of community-based managers, regulate the training institutions of community-based managers and their training content and the qualifications of participants.

6.1.3.3 Improving the management capabilities of community public health managers

Although community public health managers are not the frontline service staff in the community-based management of diabetes, they are responsible for preventive immunization and management of chronic diseases in their areas as well as planning and organization, health education in the community-based management of diabetes and performance evaluation of community responsibility doctor teams. Therefore, they should also develop the concept of community-based management and strengthen their learning of diabetes knowledge so as to better coordinate and supervise responsibility doctor teams to carry out a series of work.

Efforts should be made to improve the management system of professionals engaging in the management of diabetes, establish comprehensive diabetes management medical teams that are composed of specialist physicians of diabetes, general practitioners, psychologists, doctors of traditional Chinese medicine, IT professionals and health managers, and stress labor division coordination and cooperation between medical teams. Related professional norms need to be formulated to specify the qualifications and

operating instructions of professionals engaging in the management of diabetes so that these professionals have rules to follow in the management of diabetes. Their salary system should also be improved to arouse their working enthusiasm by moral encouragement and material awards and thus raising the efficiency of the management of diabetes. It also needs to map out development strategies for health managers and medical health information professionals, scientifically plan talent demands, requirements for knowledge and skills and training and assessment system, and enhance the medical health service capabilities of community general practitioners and health managers and other staff by strengthening related training and learning of all staff member in the management team. Currently, China is reforming the system of performance pay in primary health service institutions, which is the basic condition to ensure the quantity and quality of public health services as well as the basis for the prevention and treatment of diabetes. In such a reform, all people and groups should be treated indiscriminatingly, with uniform establishment of post and grade. Meanwhile, the wage level in primary health service institutions should not be lower than that in local public institutions so as to attract excellent health talents to transfer or return to the communities.

6.1.4 Lowering the thresholds of authorized posts and increasing the number of authorized personnel

The great shortage of authorized personnel and a large number of temporary employees are the common problems in the surveyed community health service centers. Those who want to become authorized personnel have to pass the examination organized by the government and there are restrictions on the education background and major of staff, so there are great difficulties for those temporary employees to become authorized, especially for those elder staff with low education level but rich working experience who have been working in communities for a long time. Due to the disadvantages of low salary, narrow development space and greater mobility for temporary staff members, it is suggested to moderately lower the thresholds of authorized posts so as to provide more opportunities for those staff members who have been working in communities for a long time to become authorized and arouse their working enthusiasm.

6.1.5 Strengthening community-based prevention and treatment of diabetes and enhancing system construction

With the shift of the disease spectrum of residents in China, diabetes gradually becomes an important problem that influences people's health. Therefore, China should pay equal attention to the prevention and treatment of diabetes like other infectious diseases and public events, and issue some legally effective regulations on the prevention and treatment of diabetes, such as Regulations on the Prevention and Treatment of Diabetes. In addition, China should promote the "Healthy City" or "Healthy Counties" projects in a planned manner and guide residents' health through government behaviors, which is beneficial to the prevention and treatment of diabetes. Some plans concerning the prevention and treatment of diabetes and uniform guidance on prevention and treatment should also be introduced in Shanghai to specify the responsibilities, tasks and rights of public hospitals at all levels, centers for disease prevention and control, community health service institutions and rural hospitals. In addition, the goals of prevention and treatment of diabetes should be incorporated into the assessment system in central and local government as well as community (village) resident committees.

We should improve the standardized functions of administrative institutions at all levels, stress that large hospitals and primary medical institutions have divisions but equal status, develop medical-technical guidance and communication between medical institutions at all levels, remove the concept of different status and levels, and strengthen the repeated cooperation between medical institutions at all levels. We should also formulate professional norms of participants in the management of diabetes, and train improved management teams of diabetes. We should develop IOT-based operation specifications and guidance for community-based management services of diabetes so as to make the management of diabetes more standardized and scientific. We should improve related laws and regulations, and explore the establishment of IOT-based laws and regulations related to the community-based management of diabetes based on the existing legal system, specify the medical responsibilities and legal relationships between different medical institutions, between medical institutions and patients as well as between doctors and patients, and draw up related privacy policies so as to protect patients' privacy and safety in a legal manner. We should also develop a supervision system in this field, make more efforts to strengthen the supervision on medical institutions, medical workers and the whole management process, guarantee the normativity and validity of the process of

management of diabetes, and improve the effect of management.

6.1.6 Gradually increasing the funds for the management of diabetes and adopting the management of separate accounts

Presently, the funds for the prevention and treatment of diabetes are mainly sourced from financial resources for public health services. These funds are increasing year after year but still remain at a relatively low level. With the increasingly severe threat of diabetes against people's health, it is necessary to increase special funds for the prevention and treatment of key diabetes and adopt the management of special accounts and the mode of fixed sums for fixed purposes.

China should put more financial support to the management of diabetes, provide more preferential medical insurance policies to communities, and improve the system of medical insurance for the management of diabetes. Gradually it would be beneficial to incorporate related service items into the medical insurance. China should broaden the financial channels for medical insurance, advocate and encourage the introduction of commercial insurance into the industry of management services of diabetes or even the industry of medical services, eliminate multiple risks simultaneously, lighten the economic burdens of government, institutions and individuals, and implement multi-level medical service securities. The government should make more efforts to support the management of diabetes, develop overall planning, strengthen the cooperation among administrative departments, medical institutions at all levels, enterprises and insurance companies, encourage innovative development modes of management of diabetes in different regions, expand pilot regions and groups through financial and policy supports, and develop a more scientific, feasible and replicable mode of community-based management of diabetes.

6.1.7 Developing supportive technology

Since 2005, when the concept of Internet of Things (IoT) was barely acknowledged as useful for medical purposes (Hillestad et al., 2005), the technological breakthroughs reached produced today an offer of a wide range of devices to monitor glycaemia and record the fluctuations continuously along the day. Its incorporation as a key element in diabetes management policy has been recognized as world-class best practice and offers many solutions to counter the incremental and insidious nature of this disease (Deshkar, Thanseeh, & Menon, 2017). Combining standard procedures to monitor and compensate

via drug therapy, dietary change, physical exercise and lifestyle change can fully account of the major factors that promote diabetes.

Amongst the many possibilities, IoT medical devices linked to diabetes allows one to self-management (Zhang et al., 2018) and it can be home-based with obvious advantages from the point of commodity and cost efficiency for the overall society and the patients (Krishna & Sasikala, 2018),

At a more advanced level, for systemic monitoring, management and policy making, diabetes IoT integration coupled with artificial intelligence allow for building up databases upon which prediction algorithms can help anticipate problems, find causal paths, and segment profiles of more susceptible groups and individuals in the population (Kaur et al., 2018).

The healthcare authorities have been pushing this process of digitalization of medical processes (e.g. electronic medical record) that has already translated into considerable financial savings for Chinese health system (Li et al., 2012) and China is a leading player in developing applications for artificial intelligence in healthcare (Jiang et al., 2017) with functional possibilities in early screening, treatment, outcome prediction and prognosis. Diabetes has been also a targeted chronic disease for the integration of advanced technology in China (Chen et al., 2018) but still, judging on the criticality and growth of diabetes, China should put even more emphasis on technological solutions with an ultimate objective of fully automating all routine processes thus releasing much needed resources, avoiding economic and human costs of preventable chronic diseases.

So, overall, IOT information technology can also be used in the community-based management of diabetes. Breakthrough should be made in the research on key IOT medical technologies, including sensing, transferring, processing and information safety. Efforts should be made to promote the development of IOT technologies and develop sensing equipment based on the demands of standardization, low costs and humanization; the medical communication technologies should become more high-efficiency in data transfer and scheduling of resources, more precise in positioning and more capable in anti-interference and safer; progressive efforts should be made to develop hospital-community platforms for diabetes information sharing, establish regional data centers for medical institutions and build comprehensive branch centers for the management of diabetes of medical data centers integrating medical institutions and health administrative departments at municipal, provincial and national levels; efforts should also

be made to improve the construction of IOT standard systems, accumulate results and experience in practice by connecting project applications or pilot projects, achieve the interconnection of network frameworks, support the acquiring, transferring, processing, services and other links in medical information, coordinate medical institutions, industries and administrative departments, guarantee the mutual links between different standards, and satisfy the requirements for applications in different institutions and regions.

6.2 The level of community health service institutions

6.2.1 Strengthening experience communication and improving management levels

Community health service centers with different operating levels have various management capabilities of diabetes. The communities with high operating levels are superior to other communities both in the quantity and content of management, which is closely related to many factors, including degree of emphasis of centers' directors, cohesion and working enthusiasm of community staff members and population in the communities. It is suggested to strengthen the experience communication and sharing between different communities. Different communities should communicate, interact and learn from each other on a regular basis while competing with each other at the same time. The community workers who do a good job in community work should introduce the construction levels of their communities, management conditions of diabetes and modes of management and other aspects, so as to promote the overall improvement of community-based management of diabetes.

6.2.2 Raising consciousness of innovation and diversifying modes of management

In the community-based management of diabetes, the key to do a good job in management is to improve the formation rate of people's concepts and behaviors (Lü, 2010). Considering the characteristics of some senior citizens, such as old age, low education levels and poor comprehension ability, besides outpatient follow-up visit and family follow-up visit, the mode of "partner education" can also be adopted to arouse the interest of patients. Comparing with the mode where community-based managers of diabetes carry out health management four times every year or on an irregular basis, there is more frequent communication between patients. Therefore, community management staff members can choose some patients with high education levels and high degree of

coordination to carry out detailed health education and management training for them. Such a word-and-deed teaching methods by backbone staff can make up the deficiency of spoon-feeding education of community-based managers of diabetes, exert influence on both patients and their family and finally realize the goals of community-based management of diabetes.

6.2.3 Conducting health education and raising perception to diseases

Some researches show that residents go to the community health service centers mainly for health consultation and guidance on lifestyle (Ge, 2011). In this research, however, there are only a small proportion of diabetic patients and residents without diabetes who have received health education. One of the important features of diabetes is that diabetes is difficult to be cured. During the treatment process, it often delivers poor treatment effect and recurrence is likely to occur if the patients pay no attention to health education and prevention of their behaviors and lifestyle and only rely on drug treatment and interference of other factors. In terms of the therapeutic methods of diabetes, communities in Shenzhen give priority to prevention of lifestyle and then to drug treatment (Pei, Guo, & Zhao, 2011). Therefore, during the management process, the management staff members of diabetes have to put residents' health education in the first place, change residents' bad habits and lessen the damages of diseases.

6.2.4 Strengthening the publicity of community health services

The government must strengthen the publicity during its supports in the development of basic public health services and enhance residents' acceptance on community health service centers. Some excellent modes of community health services fail to be promoted due to residents' insufficient recognition on basic public health services. According to this study's on-site researchers, they were always confronted with residents' cold shoulder and refusal during their research, and during their interview with residents, they also found that residents had imbalanced knowledge on basic public health services, let alone the benefits from these services.

In order to gain residents' common support in community basic public health services, the government should strengthen the publicity on basic public health service centers through newspaper, television, Internet and other media, and enhance the awareness rate and participation rate of community residents. Community publicity windows, community

newspapers and other media in the streets should be used to provide guidance for residents in utilizing basic public health services to comprehensively change and raise the awareness of the whole society on community health services.

The research on the influencing factors of awareness rate shows that those who suffer from chronic diseases and who have low education level will be a key group of people to receive the publicity and education of basic public health services. Our findings show that residents acquire knowledge mainly from five channels, including television, doctors' one-on-one introduction, book brochures, large-scale public welfare publicity events and display boards, through which the popularizing rate on health knowledge exceeds 1%. Those who have an education level lower than primary school education can acquire information through doctors' one-on-one introduction, interpersonal communication, radio and display boards. Those who have received junior high school education can obtain information through doctors' introduction, public welfare publicity events, display boards and book brochures. Besides public welfare publicity events, book brochures and display boards, female residents also give consideration to interpersonal communication when acquiring information while their counterparts lay emphasis on public welfare publicity events, book brochures and display boards.

Street committees can join hands with community health services centers in carrying out some public benefit activities to intensify the interaction between residents and the service centers as well as close the distance between them. The service centers should also inform the residents about their services (such as information related to well-known doctors and outstanding departments, equipment and technologies, convalescence environment and daily schedule) to let the residents know that the service centers provide are able to deal with their diseases and illness, to let them learn about and trust the service centers, to let them understand and accept the public health services and cooperate with competent departments of public health services, and to let them express their interest demands for public health services to the competent departments, so as to transform from negative participants to active ones and further improve the basic public health services. And the service centers should also enhance their cultural construction and establish harmonious doctor-patient relationships.

It is inevitable to have problems and imperfection in the development of basic public health services. It is believed that, by sticking to the government's right leadership, full attention of the society, as well as related policies and rational establishment of system

framework of basic public health services, we are sure to realize “the same accessibility for the same demands”.

6.2.5 Strengthening the guidance and management of district centers for disease prevention and control on diabetes

Traditional centers for disease prevention and control have always taken the prevention and treatment of infectious diseases as their major tasks and thus they are not familiar with the management of diabetes and related businesses and are unable to provide guidance for primary health service institutions. Currently, district (county) centers for disease prevention and control need to intensify the construction of department of prevention and treatment of diabetes, specify responsibilities in the prevention and treatment of diabetes, increase work funds, and attract professional managers with clinical background to engage in the prevention and treatment of diabetes.

In the utilization of health services and support of medical policies, health administrative departments should make continuous efforts, including: provide more human resources to balance the current doctor-patient ratio, especially the ratio between doctors of community follow-up visit and diabetic patients under management; issue related policies to offer free screening to diabetic patients so that they can discover and control the development and process of chronic complications of diabetes; take measures to expand the coverage of medical insurance and change the phenomenon where patients have no access to insulin treatment due to the restriction on insulin prescription in community hospitals; put the mechanism of performance management into trial use and introduce quantitative index of follow-up visit management in the community-based management of diabetes so as to arouse the working enthusiasm of doctors of follow-up visit and demonstrate the efficiency of community management.

6.2.6 Accelerating the construction of information system for the management of diabetes

The construction of information system for community health services (including information system for the management of diabetes) in urban areas is better than its counterpart in rural areas. Currently, management systems are being built in all provinces, cities and even some (districts) counties but these systems are relatively different in management functions. Therefore, the Ministry of Health should put forward solutions for

the construction of information system of management of diabetes and accelerate the integration of systems. It would be better to develop software that is under national uniform management and can carry out networking operation to improve the management functions and efficiency of information systems.

As an important medical document, a case history is the records of texts, figures, videos and other materials that are formed in inquiry, physical examination, diagnosis, treatment, nursing and other medical activities after comprehensive analysis and sorting and filing (Liang, Cai, & Chen, 2008). The standardization of management of case history helps to fully utilize patient data. As the turnover rate of patients in community health service stations is fast and a nurse plays multiple roles simultaneously and the environment layout in the stations is relatively limited, it can simplify the recording time and indirectly reduce nursing time by implementing information management of case history and further promoting electronic case history and nursing records. As the treatment of diabetes is a continuous process, it can carry out effective follow-up survey on patients' conditions by information management of case history.

The established network of comprehensive prevention and treatment of diabetes should be fully utilized to ensure that patients are able to participate in community management and continue to receive medical services. We should use dynamic monitoring system, and by developing platforms of public health information that are based on residents' health records, incorporate the medical workers in outpatient department of diabetes in Grade II and Grade III hospitals into the system of community-based management of diabetic patients, so as to form a network of community-based management of diabetic patients integrating prevention, medical care, control and interference.

Residents' electronic health records serve as the basis and prerequisite of community-based management. The analysis on the health information in the records helps to evaluate residents' health conditions, forecast disease risks and formulate interference measures. In urban areas, community doctors use residents' electronic health records more frequently than their counterparts in rural areas, mainly for updating and supplementing information.

With the help of system of residents' electronic health records, community doctors can carry out daily management on patients suffering chronic diseases such as diabetes, input patients' height, weight, family history, case types and other information into the

system for the convenience of level-to-level management; records (date of follow-up visit, ways, time for next appointment, drug usage, complication, constitution distinction and health education) of patients' follow-up visit can be used to arrange follow-up time in a timely manner, specify the ways of follow-up visit, and design personalized content of follow-up visit based on patients' condition; on the basis of patients' clinical symptoms, blood pressure, blood glucose, body mass index, smoking, alcohol, sports, compliance, adverse reaction and complication in former follow-up visits, the analysis on the changes and causes of the changes is carried out to judge health risk factors and predict the development trends of diseases; community doctors can check patients' drug usage and decide whether to change drug types or drug dosage in accordance with the progression of diseases; they should timely adjust the content of health education for the benefit of patients' health. Obviously, residents' electronic health records nearly include all of their health information and are convenient for community responsibility doctors to get to know the changes of patients' conditions at any time and provide a platform for information storage in the community-based management. Community responsibility doctors should make full use of the electronic health records to store health information, analyze disease conditions, identify risk factors, establish and adjust interference measures.

6.3 The level of workers in community health service institutions

6.3.1 Establishing service awareness and adjusting work attitudes

Unlike traditional passive diagnosis and treatment, the community-based management of diabetes is active, which leads to the difficulties in the management. Positive attitudes are extremely important in the community-based management of diabetes. As patients need a period of time to understand and accept the management and a process to trust and rely on management staff, management staff should not be anxious for success in the management. However, most university graduates lack such kind of patience and carefulness as typical of Y generation (Zhao & Liu, 2008). Besides some objective conditions in the communities, it is difficult for these graduates to stay in the communities for a long time due to their eagerness for quick results, featuring great personnel mobility (Li et al., 2014). Management staff of diabetes must realize and accept this situation and proactively face the difficulties in work with persistent belief and will, and not be afraid of setback and failure. Only in this way can they succeed.

6.3.2 Enhancing capability training and improving professional skills

In view of low education level and technological level of management staff of diabetes, besides attracting more talents, management staff should also try their best to improve their professional literacy and professional skills. They should constantly accumulate experience in daily work, make use of spare time to acquire professional knowledge, and make full use of all channels to consult professionals and experts to improve their own technological levels.

6.3.3 Improving the mechanism of coordination and distribution of responsibilities and enhancing team cohesiveness

As the community-based management of diabetes is for all people in communities and there are considerable difficulties and a large population, it is impossible to finish the work only by individual strength. Therefore, a good team is a strong guarantee for the community-based management of diabetes. Under the current situation of few employees and low technological level in communities, the perfection of the mechanism for coordination and division of responsibilities of a team as well as the improvement of team cohesiveness can promote the smooth operation of community-based management of diabetes. Efforts can be made from three aspects: training of harmonious team spirit, work ethos featuring energy and enthusiasm, and personal quality characterizing enterprising spirit (Li, 2009). The person-in-charge in the community health service centers can design a system of rewards and penalties where hardworking employees will be rewarded both mentally and materially (for example, awarding certificates to excellent employees, or organizing some activities for employees) while indolent employees will be punished.

6.3.4 Directors in centers should make themselves an example and play a leading part

Leaders in an enterprise play a dominant role in the construction of enterprise culture. Their thought, opinions and belief influence the moving direction of the whole enterprise. Similarly, directors in community health service centers also serve as a connecting link between the preceding and the following in community health services. This means that they are not only responsible for communicating with superior departments but also coordinating internal departments of the centers. A good service team cannot succeed without the guidance of its director, whose performance directly influences the operation of the whole team. Therefore, directors must bear a sense of competition, service awareness,

and the awareness of organization authority limit, and be able to manage organizational culture, establish interpersonal relationships, and maintain clear analytical thinking even in the face of heavy and complicated community work (Li, 2009).

6.4 The level of diabetic patients and residents

6.4.1 Changing concepts and establishing a correct concept of health

The community-based management of diabetes in Shanghai has been carried out for several years, but most residents are relatively weak in the awareness of tertiary prevention due to the influence of traditional biomedical models. In particular, those residents who do not suffer from diabetes are only aware of vaccination, diagnosis, and treatment of common diseases about the community health service centers and they are unfamiliar to the management services of diabetes. Quite a few residents do not understand or accept the management work of community management staff, believing that their own health does not need any management or that they have no time for the management of their health. According to a report of World Health Organization (WHO), senior citizens develop diabetes mainly because they have bad habits when they are young; but it is a time-consuming and arduous process to change bad habits (Malins & Stuart, 1971). Therefore, residents should change the traditional concept that one is healthy if he is disease-free, and establish a correct concept of health focusing on prevention and combining prevention with control.

6.4.2 Thinking in different perspectives and being more cooperative in management

The smooth operation of community-based management of diabetes will not be achieved without the cooperation of patients. Under the current situation featuring imperfect facilities, insufficient personnel and low technological levels in community health service centers, patients should learn to think in different perspectives, understand the difficulties and hardship of community workers in carrying out community work, proactively participate in various activities organized by communities, and cooperate with community workers in the management of diabetes.

6.4.3 Improving management level through communication

Besides patients' positive cooperation, the smooth operation of community-based

management of diabetes will not be achieved with the absence of communication between doctors and patients. In view of low drug compliance of patients, for example, managers should strengthen the health education of patients on the one hand, and patients should also communicate with managers and express their ideas on the other hand, thus improving the drug compliance through constant communication (Zhongdi, 2002). As for the problems in the management, meanwhile, patients can use many channels and ways to inform managers about their ideas and suggestions and help to improve the overall management level when affirming the achievements in the community-based management of high blood pressure and diabetes.

Chapter 7: Empirical Analysis on the Evaluation of the Optimization Effect of Community-based Management of Diabetes Patients in Shanghai

7.1 Object and method

Based on scientific principles and being practicality-oriented, the research adopts the purposive sampling and cluster sampling methods to select the research objects to understand the development of health services and community-based management of diabetes in Shanghai. By conducting in-depth investigation through various methods, analyzing and summarizing the forms and contents of diabetes management in communities that have standardized the management of chronic diseases in Shanghai, the research compares the effects of diabetes management in the communities with standardized management and those without standardized management. It also studies the effect of standardized community-based management of diabetes in Shanghai and explores the standardized community-based management model of diabetes.

The research objects selected are two community health service stations in Shanghai, one of which has conducted standardized management of diabetes and the other has not. This location was chosen because Shanghai is one of the first areas to conduct community health service research. A large amount of research projects about community health services and community-based management of chronic diseases are carried out here. In 1992, Shanghai began to develop community health services, becoming one of the earliest regions in China to explore community health services and standardized community-based management of chronic diseases. It has carried out different explorations on the community-based management of chronic diseases and thus accumulated a lot of experience. Located in Jing'an District of Shanghai, the intervention group is among the first batch of demonstration areas of community health services in China. This intervention group has accumulated a lot of experience in the systematic community-based management of chronic diseases. Since 2005, it has been actively exploring the standardized community-based management of diabetes, with a set of effective systems,

norms and technologies established, and innovations made in various aspects. With the support of the Municipal Commission of Health and Family Planning and the Health Bureau, Jing'an District began to explore the establishment of the regional medical partnership model for diabetes at the end of 2011. At the end of 2012, the 321 Diabetes Management Project was officially established in Jing'an District, forming a medical partnership with Huashan Hospital as the lead, Jing'an District Central Hospital as guarantee and the community health service center as foundation. The 321 Diabetes Management Project has not only made the specialist clinics accessible to more people, but also provided a two-way referral mechanism for diabetic patients, offering a personalized long-term diabetes management program. In the community-level clinics for diabetes, most patients can complete the assessment of pancreatic islet function, screening for diabetic complications, individualized treatment goals and formulation and adjustment of treatment programs. Patients with poor blood glucose control, acute diabetic complications, severe chronic complications, or severe comorbidities can be referred and admitted to a secondary or tertiary hospital as soon as possible through green channel. When blood glucose control becomes stable and the acute or chronic complications or comorbidities are controlled, they can be transferred back to the community health service center for follow-up treatments. The community health service center is the foundation and core of the project, which is responsible for the establishment of files of diabetic patient, daily outpatient follow-ups, and preliminary physical, pathological and complication examinations, including pancreatic islet function, glycosylated hemoglobin, albumin/creatinine ratio and carotid ultrasound.

Secondary hospitals are an important guarantee for the project, because Jing'an District Central Hospital is a member of the Huashan Medical Group. Secondary hospitals are an organizational guarantee for the project and responsible for most of the screening for diabetic complications, including color fundus photographs, electromyography, vibration perception threshold, skull CT, MRI and screening for diabetic retinopathy, diabetic neuropathy and diabetic lacuna infarction in a bid to ensure the orderly advancement of the overall project. Tertiary hospitals are responsible for the quality control and guidance of the project. They mainly conduct diagnosis and treatment for some difficult and critical cases and are responsible for the examinations of complications and comorbidities that cannot be done by first-level or secondary hospitals. To operate this model well, it is necessary to count on leading experts with outstanding professional skills as well as the

perseverance in teaching others. In the past 4 years, endocrinologists from Huashan Hospital and Jing'an District Central Hospital have formed a core expert group and conducted teaching for a designated community health service center. They established a half-day teaching clinic in the community every week, conducting real-time training in the process of screening high-risk groups, establishing files, detailed medical consultations, report interpretation and making adjustment plans, where community doctors and nurses were taught in person. In addition, the expert group regularly organizes professional lectures and case discussions on diabetes each quarter. The core members of the project took the lead to organize the endocrinologists of major hospitals in Shanghai to compile the textbook *Treatment Standards and Two-way Referral of Community Type 2 Diabetes* to provide reference materials for community health care workers. Community hospitals also organize a weekly class of science education for diabetic patients, in which community doctors or nurses give lectures and answer questions face-to-face to help diabetic patients learn self-management. Professor Hu Renming at the Department of Endocrinology, Huashan Hospital, led the production of the education video *Love on the Road of Combating Against Diabetes*, which was distributed free of charge to patients through various channels, so that everyone can learn more about diabetes while enjoying the video. In addition to the diabetic patients who come to the community to register and set up files on their own initiative, during the annual screening for high-risk diabetic patients, community doctors will also conduct targeted health education and screening for high-risk diabetic patients in the region for early detection and timely treatment.

The research summarizes the standardized management model of diabetes conducted in the intervention group and analyzes its management effect, which provides experience for the management of diabetes and even the management of chronic diseases in the communities of China. The control group (here taken as a counterfactual source, i.e. the baseline group that shows what would happen if nothing was changed) is located in Xuhui District, Shanghai, and the two communities are similar in terms of location, demographic characteristics and the development of community health service. Therefore, there is some comparability in the management of diabetes. A total of 1838 patients were diagnosed with T2DM by clue investigation and all were registered and documented. Among the 1838 T2DM patients who were included in the community prevention of diabetes and treatment management system of Jing'an District, Shanghai, 308 were randomly selected as the research group, and another 300 patients with T2DM were randomly selected as the control

group filed as type 2 diabetic patients who did not receive prevention and treatment management in Xuhui District, Shanghai.

The global diabetic epidemic survey predicted in 2000 that by 2030, the increase in the number of diabetic patients mainly comes from developing countries, where the distribution range of diabetic patients is mainly the age between 45 and 64, but the increase in the number of diabetic patients between 2000 and 2030 mainly comes from the patients of over 65 years old. In 2008, the data from the Centers for Disease Control and Prevention (CDC) showed that among the number of newly diagnosed diabetic patients in the United States, patients aged 65-74 took the largest part, accounting for 19.9%. In this research, the average age of the management group in the intervention group was 69.71 ± 10.58 years old, while the average age of the control group was 69.52 ± 9.2 years. The two groups surveyed in this study were consistent with the above surveys.

Table 7-1 and Table 7-2 below are the basic information of the surveyed objects. There were 156 males and 152 females in the research group; the average age was 69.71 ± 10.58 years; the average duration in sick was 19.1 ± 10.9 years. There were 148 males in the control group, with an average duration of 16.7 ± 10.2 years in sick. There were 152 females, with an average age of 69.52 ± 9.2 . There was no significant difference in the chi-square and t-student tests for gender, average age and course of disease between the two groups ($p > 0.05$).

Table 7-1 Comparison of gender between the research group and the control group

Group	Male		Female	
	n	%	n	%
Research Group (n=308)	156	50.6	152	49.4
Control Group (n=300)	148	49.3	152	50.7
p	>0.05			

Table 7-2 Comparison of age and duration between the research group and the control group

Group	Average Age	Average Duration
Research Group (n=308)	69.71 ± 10.58	19.1 ± 10.9
Control Group (n=300)	69.52 ± 9.2	16.7 ± 10.2
P	>0.05	

7.2 Analysis of the intervention content of the community-based management model of diabetes

There are a large number of norms and guidelines for the management of diabetes and related treatments home and abroad, such as the guidelines for the standardized management of T2DM formulated by the International Diabetes Association, the WHO guidelines for the management of diabetes, the guidelines for primary care of diabetes developed by National Institute for Health and Clinical Excellence of UK, and standard of care for diabetes in China. These management guidelines include the following: screening for diabetes, continuous health care, health education, mental health care, lifestyle management, blood glucose monitoring (including clinical monitoring and self-monitoring), blood glucose control (including oral medications and insulin therapy), blood pressure control, cardiovascular risk factor estimation, screening for eye disease, renal damage, foot care, nerve damage, etc.

To revise, the standardized community-based management of diabetes in this research refers to the effective screening, evaluation, management, follow-ups and regular health education for T2DM patients in the community in accordance with the *Regulations on Community-based management of Type 2 Diabetes Patients* published in China, for the purpose of controlling T2DM. The specific measures include: the integration and utilization of community health resources, the formation and division of the general team, the diabetes management process, follow-ups, health file management network, health education and assessment indicators.

7.2.1 Resource utilization

In resource utilization, WHO encourages the establishment of strategic alliances, including government organizations, international or regional development organizations, health or non-health sectors, mass media, industrial partners, NGOs, and foundations for diabetes prevention and health care, etc. The Guidelines of the Prevention and Care of Diabetes in China emphasizes that in the management of diabetes, relevant personnel and social resources should be organized and mobilized to provide common care for diabetic patients according to actual conditions. The research found that community health workers can make full use of various resources around the community (including administrative agencies, human resources, etc.) through interviews with the medical workers and residents

of the community (Jing'an Street Community Health Service Center) where standardized management is conducted. By using the various resources around, it is possible to effectively carry out disease management. For example, in the community where standardized management of diabetes is conducted in the research, a chronic disease club is established by forming a cooperative relationship with the community committee.

7.2.2 Team building

Through the establishment of medical team, the shortage of human resources can be alleviated and the efficiency of community-based management improved. As for team building, WHO proposes to establish a standardized core team that is in line with local conditions. The team should be centered on medical experts (general practitioners and/or specialists), educators of diabetes, nutrition experts and patients, and also involving ophthalmologists, cardiologists, nephrologists, great vessels surgeons, obstetricians, foot disease doctors and psychologists. The ADA Guideline recommends (clinical medicine) a form of doctor cooperation team (general team), which includes physicians, assistant doctors, registered nurses, dieticians, pharmacists and mental health professionals with expertise in diabetes. The diabetes management team recommended in The Guidelines of the Prevention and Care of Diabetes in China is similar to the one recommended by WHO, with diabetic patients, general physicians, endocrinologists or diabetic specialists and diabetic education nurses as the core, involving other relevant personnel (such as nutritionists, ophthalmologists neurologists, psychologists, podiatrists and other medical workers and staff members of diabetes management in government and non-governmental organizations).

The general team in this research includes general practitioners, assistant physicians, general nurses and public health assistants. Through the segmented grid management of the residents within the community, a regional accountability system for physicians is established. Each team member manages the health of the residents within the region under the guidance of the team leader (i.e. the general practitioner). The establishment of this system is based on the lack of community medical workers in China, the absence of a smooth two-way referral system and the shortage of relevant personnel in various disciplines, and this system greatly improved the efficiency of work.

7.2.3 Work procedure

A scientific and rational work procedure can greatly enhance work efficiency. The standardized community-based management model of diabetes has established a series of work procedures that is easy to practice based on the guidelines for the management diabetes home and abroad, including how to effectively screen for diabetes patients in the community, how to establish comprehensive health files, how to assess patients' conditions, include them in appropriate categories for management, develop long-term community-based management programs based on adequate communication with patients and adopt appropriate follow-up methods for different people.

7.2.4 Information management

A general practitioner is responsible for a person's health problems throughout his life (i.e., from birth to death). General practitioners need to master all of the person's information and conduct "long-term and responsible care" for him. In the process of community-based management and health promotion, effective management of information is very important. In the standardized community-based management model for diabetes in this research, the classification of health files (paper version and online version), the timely update of residential information, management plans and follow-up planning records have greatly improved the efficiency of work.

7.2.5 Health education

Domestic and international guidelines on diabetes management point out that health education is an indispensable part of diabetes management, and it should be planned and procedural. Health education of diabetes management includes: diet, lifestyle, drugs, insulin application and monitoring of complications.

The WHO guidelines on diabetic health education state that effective health education can improve the outcomes to a certain extent and should provide systematic health education for every diabetic patient. In the process of health education, diabetic patients, their families and their caregivers should be involved, and all available community resources should be fully utilized for health education (see Figure 7-1).

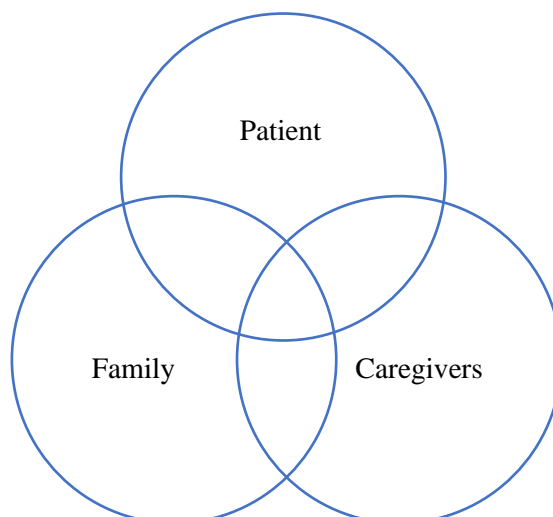


Figure 7-1 Relationship of patient-family-caregivers

Effective health education should enable patients and their families/caregivers to understand the following:

- (1) the nature of the disease,
- (2) its symptoms,
- (3) the risk of complications (especially the importance of foot care),
- (4) individualized treatment goals,
- (5) individualized lifestyle changes and diet plans,
- (6) the importance of regular exercise,
- (7) the interaction of food intake, physical exercise, oral hypoglycemic drugs, insulin, other drugs,
- (8) self-monitoring of blood glucose and urine glucose,
- (9) the significance of blood glucose results (adjustments should be made according to the situation), and how to deal with emergencies, such as hypoglycemia, surgery.

In the guidelines about diabetes management developed by the National Institute for Health and Clinical Excellence (NICE) of UK, it is emphasized that telling every patient and their caregivers that health education is an indispensable part of diabetic care when he is diagnosed with diabetes. Systemic education, periodic reviews and the supplementation of relevant knowledge should be provided. In the UK, there are many educational programs tailored for diabetic patients with different characteristics. Patients can choose an education program that is suitable for themselves and meets the standards of the Department of Health and Diabetes UK Patient Education Working Group under the

guidance of their doctors. This program has a systematic curriculum that helps patients, their families and caregivers/ health care providers establish self-management attitudes and beliefs, master relevant knowledge and skills, and set specific goals and learning objectives and continuously tracks records of and helps them.

The Guidelines of the Prevention and Care of Diabetes in China divides the health education of diabetes into the health education for newly diagnosed patients and the health education for patients with diabetes one month after their diagnosis. For newly diagnosed diabetic patients, they should be made aware of what is diabetes and the dangers of diabetes, and provided with psychological support to help them adapt to new situations, reasonable diet, exercise plan, smoking cessation and knowledge of the use of insulin. For patients with diabetes one month after their diagnosis, they should be given a deeper and more comprehensive understanding of diabetes, setting goals for diabetes control, individualized diet, exercise programs, self-monitoring blood glucose, diet, exercise and insulin dosage adjustment according to blood glucose changes, prevention and treatment of complications, foot, skin and oral care, etc.

Table 7-3 Status of the coverage of detection and prevention and treatment methods for diabetic patients in Jing'an District and Xuhui District of Shanghai

	Jing'an District		Xuhui District	
	Detection Rate (%)	Coverage Rate (%)	Detection Rate (%)	Coverage Rate (%)
Before the implementation of the model	1.92	5.4	1.68	4.08
One month after the implementation of the model	3.84	21.24	1.8	4.2
Three months after the implementation of the model	6.6	32.16	2.16	4.32

Health education in this research includes group education and individualized education, which make full use of community resources, take media as a means of promotion, conduct health lectures, organize clubs of chronic disease to promote the

knowledge of disease, so that patients can fully understand diabetes and the problems that should be noted in its management. In addition, according to the characteristics of people, targeted group education and individual education should be conducted. Each form needs to be fully patient-centered, allowing patients and their families/caregivers to fully participate in the management of the disease.



Figure 7-2 The difference before and after the operation of the community-based prevention and treatment management model

7.3 Results

7.3.1 Status of the coverage of preventive and treatment measures

Table 7-3 shows that the operation of the community-based prevention and treatment management model of diabetes in Jing'an District of Shanghai has made the detection rate of diabetic patients in Jing'an District of Shanghai increase year by year, from 1.92% before the operation of the model to 3.84% after one month of operation and 6.6% after two

months, while the detection rate of Xuhui District was always at a low level of between 1.4%-1.8%. The detection rate of Jing'an District in Shanghai after the operation of the model has increased year by year (all $P < 0.01$) compared with that before the operation, higher than the level in Xuhui District ($P < 0.01$) at the same period. The difference is statistically significant.

Similarly, the operation of the community-based prevention and treatment management model of diabetes in Jing'an District of Shanghai has made the coverage rate of diabetic patients in Jing'an District increase year by year, from 5.4% before the operation of the model to 21.2% after one month of the operation and 32.16% after two months, while the coverage rate of Xuhui District is always at a low level of about 4.08%. The coverage rate of Jing'an District after the operation of the model has increased year by year (all $p < 0.01$) compared with that before the operation of model, higher than that of Xuhui District at the same period ($p < 0.01$). The difference is statistically significant. Figure 7-2 shows very clearly the widen gap resulting from the standardized model in Jing'an District.

7.3.2 Influence on efficacy of patients

Table 7-4 shows that the research group's improvement (healing + improvement) rate increased from 20.9% before the operation of the model to 46.4% after one month of operation and 52.5% after three months. The improvement rate of the control group in the past 3 years has only remained at a low level of between 15.5%-21%, and the proportion has decreased year by year. Compared with the model before operation, the improvement rate of the research group after the operation of the model increased year by year ($p < 0.01$), higher than the control group's level at the same period ($p < 0.01$). The difference is statistically significant.

The deterioration rate of the research group decreased from 12.98% before the operation of the model to 7.1% after one month of operation and 6% after three months, while the deterioration rate of the control group increased year by year, reaching a higher level of 35%. Compared with the model before operation, the deterioration rate of the research group after the operation of model decreased year by year ($p < 0.01$), and was lower than the control group ($p < 0.01$). The difference was statistically significant.

Table 7-4 Effect of the community-based prevention and treatment management model of diabetes on the curative results of patients

	Group	n	Recovery Rate	Improvement	Better	Non-change	Deterioration
Before the implementation of the model	Research Group	308	0 (0.0%)	65 (20.9)	80 (25.8%)	123 (39.9%)	40 (12.98%)
	Control Group	300	0 (0.0%)	63 (21%)	84 (28%)	126 (42%)	27 (9%)
One month after the implementation of the model	Research Group	308	0 (0.0%)	143 (46.4%)	103 (33.5%)	40 (13%)	22 (7.1%)
	Control Group	300	0 (0.0%)	60 (2%)	70 (23.3%)	84 (28%)	86 (28.7%)
Three months after the implementation of the model	Research Group	308	0 (0.0%)	162 (52.5%)	109 (35.5%)	17 (5%)	20 (6%)
	Control Group	300	0 (0.0%)	46 (15.5%)	65 (21.5%)	84 (28%)	105 (35%)

Table 7-5 Effects of the community-based prevention and treatment management model of diabetes on patients' drug therapy

	Research Group (n=308)			Control Group (n=300)		
	Regular medication	Irregular medication	Without medication	Regular medication	Irregular medication	Without medication
Before the implementation of the model	89 (29%)	116 (37.5%)	103(33.5%)	89(29.5%)	107(34.6%)	104(34.7%)
One month after the operation of the model	249(81%)	59(19%)	0(0.0%)	93(31%)	84(28%)	123(41%)
Three months after the implementation of the model	282(92%)	26(8.5%)	0(0.0%)	96(32%)	92(30.7%)	112(37.3%)

7.3.3 Effects on the patients' drug therapy

Clinically we consider that there was improvement when glycemic levels change e.g. from unhealthy levels (> 11.9 nmol/L) to normal levels (8-10 nmol/L) or excellent levels (< 8.0 nmol/L). Table 7-5 shows that the regular rate of drug therapy in the research group increased from 29% before the operation of the model to 81% after one month of operation and 92% after two months, while the regular rate of drug therapy of the control group only maintained at a low level of between 29.5%-32%.

The regular rate of drug therapy of the research group after the operation of the model increased year by year ($p < 0.01$) compared with that before the operation, and was higher than the control group's level at the same period ($p < 0.01$). The difference was statistically significant.

To clarify, we consider there is a 1) cure when excellent levels are achieved without medication (< 8.0 nmol/L), 2) improvement when excellent levels are achieved with medication or the patient's glycemic level lowers four levels in the rating scale, and 3) betterment when the glycemic levels drop one or two levels in the rating scale.

Table 7-6 Effects of the community-based prevention and treatment management model of diabetes on patients' social function

	Group	Number of patients	Full labor	Half labor	Non-labor
Before the implementation of the model	Research group	308	18 (6%)	116 (37.5%)	174 (56.5%)
	Control group	300	23 (7.5%)	106 (35.5%)	171 (57%)
One month after the implementation of the model	Research group	308	40 (13%)	140 (45.5%)	128 (41.6%)
	Control group	300	23 (7.5%)	46 (15.3%)	174 (58%)
Three months after the implementation of the model	Research group	308	45 (14.5%)	165 (53.5%)	98 (31.8%)
	Control group	300	20 (6.5%)	91 (30.3%)	189 (63%)

7.3.4 Effects on patients' social function

Table 7-6 shows that the research group's social participation (full labor and half labor) rate increased from 43.5% before the operation of the model to 58.5% after one month of operation and 68% after two months, while the social participation rate of the control group in the past three years has only remained at a low level of between 36.8%-43%, and the proportion has decreased year by year.

The social participation rate of the research group after the operation of model increased year by year ($p<0.01$) compared with that before the operation, and was higher than the control group's concurrent level ($p<0.01$). The difference is statistically significant.

7.3.5 Effects on families' economic burden

Table 7-7 shows that after the implementation of community diabetes prevention and control measures, the total medical cost of a patient in research group is 3273.82 yuan, and the monthly average total cost is 1091.27 yuan.

Table 7-7 Analysis of the effect of community-based prevention and treatment model of diabetes on family economic burden

Expense (yuan/person-time)	Research group (n=308)	Control group (n=300)	P
Direct medical expense	3222.34±4286.92	4152.39±6411.57	<0.05
Indirect medical expense	40.15±11.11	172.15±121.33	<0.05
Indirect expense	11.33±8.14	150.37±218.24	<0.05
Total expense	3273.82±4306.17	4474.91±6751.14	<0.05

The total cost of a patient in the control group is 4474.91 yuan, and the average monthly cost is 1491.63 yuan. This shows that the implementation of community diabetes prevention and control measures can reduce the total annual medical cost of patients' families by 4804.4 yuan, in which the annual direct medical cost can be reduced by 3720 yuan, the annual indirect medical cost can be reduced by 528 yuan, and the annual indirect cost can be reduced by 556.16 yuan. The direct medical expenses, indirect medical expenses, indirect expenses and total expenses after the operation of the model of the research group are lower than the control group's level at the same period ($p<0.05$). The

difference was statistically significant.

7.4 Discussion

The input of health funds for diabetes is the main source of funds and important guarantee for the management of community mental illness prevention and control. The results of the research indicate that the community-based prevention and treatment of diabetes in Jing'an District and Xuhui District of Shanghai are mainly funded by the national special fund for diabetes health service, self-raising funds of the community and mental health-related research funds. Most of the funds are used for the treatment and rehabilitation of diabetic patients. Judging from the current effects, community-based prevention and management of diabetes have delivered certain fruits, but these funds are far from sufficient to ensure the sustainability of prevention and management and mobilize the initiative of mental prevention professionals. Other districts and counties under the administration of Shanghai City have no special funds for diabetes, so the medical expenses are borne by the families of diabetic patients, which adds to the economic burden of the patients' families. As there is no effective cure for diabetes and the high recurrence rate requires patients to take drugs and insulin for a long time, many families are forced to return to poverty due to illness and unable to maintain treatment.

The family income level of some diabetic patients is lower than the local per capita income level (Hsu et al., 2012). Due to limitations of the economic conditions, after having the illness, they tend to endure and bear it as much as they can. Studies have shown that patients with low or extremely low household income levels are 0.198 times more likely to go to professional institutions for treatment than those with moderate or high household income levels. Some families seek cheaper private places and other non-medical institutions for treatment in order to save expenses. Therefore, the treatment and management of diabetic patients are a big social problem, which requires the support of government departments and the care and funding from all fields of society.

The detection rate refers to the proportion of diabetic patients surveyed in the total population that shall be covered in the region. The coverage rate refers to the proportion of patients who have received community-based prevention, management and rehabilitation in all patients diagnosed of diabetes in the region.

The detection rate and coverage rate are one of the important aspects to assess the

quality of community mental illness prevention and treatment. Through three years of efforts, the research has made the detection rate of diabetic patients in Jing'an District of Shanghai increase year by year, from 1.92% before the operation of the model to 3.84% after 1 month of the operation and 6.6% after three months. Moreover, compared with Xuhui District, the detection rate after implementing the community-based prevention and treatment of diabetes is higher than that of Xuhui District at the same period. Meanwhile, the coverage rate of diabetic patients in Jing'an District of Shanghai has also increased year by year. The coverage rate has increased from 5.4% before the operation of the model to 21.24% after 1 month of operation and 32.16% after three months, while the coverage rate of Xuhui District has always been around 4.2%.

Insufficient understanding of the patient's conditions, poor economic status and side effects of drugs are all-important factors affecting the patients' drug compliance, which has always been a major problem in the field of mental illness treatment. The main measure of community prevention, treatment and rehabilitation in this research is to provide patients with convenient systemic drug therapy. The results show that the regular rate of drug therapy in the research group has increased from 29% before the operation of the model to 81% after one month of operation and 92% after three months, while the regular rate of drug therapy in the control group for three years has maintained at a low level of between 29.5%-32%. The regular rate of drug treatment after the research group's operation of the model is higher than that of the control group compared with that before the operation. This shows that the community-based prevention and treatment management of diabetes carried out in Jing'an District of Shanghai can greatly improve patients' drug compliance, and are conducive to the treatment and rehabilitation of patients.

Social function refers to the individual's survival ability, the ability to study and work and interpersonal skills, which is one of the important indicators measuring the degree of disease. For patients with diabetes, the effects of treatment on social functions include the following: First, various treatments can alleviate symptoms, while patients with no symptoms or mild symptoms can make them better perform their social functions and achieve more social recognition. Second, treatments should not only relieve the pathological symptoms of diabetes, but also improve the cognitive and social function deficits associated with the disease to a certain extent.

The medical expenses of patients include direct medical expenses, indirect medical expenses, and indirect expenses. Direct medical expenses include outpatient medical

expenses and inpatient medical expenses. Indirect medical expenses include the expenses of patients and their families incurred by the disease, such as the transportation fees for patients and their families to travel to and from the hospital, accommodation and food expenses and the cost of purchasing nutrients. Indirect expenses are the cost of taking care of patients, the loss due to family members' absenteeism and the loss due to the patients' work stoppages.

Most of the diabetes patients possess the characteristics of being poor due and returning to poverty to the illness. However, their treatment is still limited to hospitalization. The direct medical expenses, indirect medical expenses and indirect expenses have further increased the economic burden of patients and their families, which requires us to transform the treatment model for diabetic patients and extend the scope of service to the vast communities of Shanghai.

This research constructs a community-based management model of diabetes prevention and treatment. The direct medical expenses, indirect medical expenses, indirect expenses and total expenses of the research group after implementing community prevention and treatment measures are lower than that of the control group in the same period. Among them, the research group has reduced the total annual expense of patients' families by 4,804.4 yuan/person-time by implementing community diabetes prevention and rehabilitation measures; the direct medical expenses have decreased by 3,720 yuan/person-time, the indirect medical expenses by 528 yuan/person-time, and the indirect expenses by 556.16 yuan/person-time. The results of the research are consistent with the results of other similar domestic studies, which show that the community-based management model of diabetes in Jing'an District of Shanghai has reduced the medical expenses of diabetic patients to a certain extent and alleviated the economic burden of patients. Managing treatments in the community is accessible, economical and practical, which is suitable for the situation of Jian'an District, and also a low-cost, high-efficiency and strongly operative disease prevention and treatment service model.

Chapter 8: Conclusion and Prospect

8.1 Conclusion

The research discusses the issues from the surface to the center, from simple to profound. Firstly, an overview about community-based management of diabetes of community health service centers in Shanghai is given. Then, questionnaires and interviews are conducted to investigate and analyze the supply side and demand side of diabetes management. Finally, countermeasures and suggestions are proposed for the community-based management of diabetes from the perspectives of the government, health service center, medical staff and residents.

It can be seen from the research results of this paper that the current community-based management of diabetes in Shanghai has achieved good results. Shanghai's basic prevention and treatment network system for diabetes has been basically established. In general, the capabilities in diabetes prevention and control of primary health care institutions are insufficient. However, there are still some problems in terms of human resources, hardware support and investment funding, etc. Some management departments have paid insufficient attention to the prevention and treatment of diabetes, which has affected the improvement of the capabilities of primary health care institutions in diabetes prevention and treatment. The overall quality of the basic health professionals is not high, lacking the professional knowledge of diabetes prevention and management. Therefore, their abilities are not equal to their ambitions in the prevention and treatment of diabetes. The training on the knowledge and skills of diabetes for primary health care institutions has lagged behind, which has affected the improvement of the prevention and treatment level of medical workers. There is no special fund for the prevention and treatment of diabetes and the existing funds for the prevention and treatment of diabetes mainly come from the public health funds, and the amount is very small. As a result, the support for the prevention and treatment of diabetes is limited. The construction of the information system for primary diabetes management has taken on an imbalanced situation. Residents' health awareness is poor, and there is a lack of participation and coordination in the prevention of diabetes, which becomes a problem to be solved.

Through joint efforts of government authorities, community health service institutions, medical staff and patients, we can promote the development of community-based management of hypertension and diabetes as shown by the impact of measures such as salt restriction and intake education (Shao et al., 2017). For all levels of government and health administrative departments, efforts should be made in optimizing the criteria of evaluation, standardizing the team of evaluation, improving pay packages, stabilizing the management team, enhancing training, encouraging in-service education, lowering the standards for government institutions staffing and increasing the authorized strength. For Shanghai's community health service institutions, efforts include raising the awareness of innovation, diversifying management models, increasing publicity, enhancing awareness, strengthening the exchange of experience, improving management level, conducting health education, raising disease awareness and tightening the link between medicine and public health. For community service workers, they should establish service awareness, adjust work attitudes, strengthen capacity building, improve technical level, improve the mechanism for team cooperation, and enhance team cohesion and importance should be attached to the leading role of the center director. For community residents, it is necessary to change the concept of health, establish a correct health outlook of prevention first and the combination of prevention and treatment, learn to empathize, understand the difficulties and hardships of community workers in carrying out their work, and actively cooperate with them.

8.2 Prospect

The research starts from the empirical background and theoretical background to clarify the challenges faced by diabetes management, analyzes feasible methods through theoretical analysis, and combines the advanced experience of community-based management of diabetes home and abroad, using survey by questionnaire and semi-structured interviews to explore a community-based health management strategy for diabetes, which proves its effectiveness to some extent through the project pilot. The sample community surveyed in this research is a case study of a community-based management of chronic disease in Shanghai, which is one of the pilots of community-based management model of diabetes carried out by Shanghai Association of Diabetes Rehabilitation. It is fairly representative in the community-based management of diabetes in Shanghai. However, due to the time of transition from township hospital to community health service center, the foundation for the implementation of

community-based management of diabetes may be different and comprehensive investigation should be implemented to reflect the status of community-based management of diabetes in the whole district. It cannot be ignored that, with the current development level of community-based management of diabetes in China, this community-focused management model cannot completely replace the importance of hospital treatment for the time being. It can only perform routine monitoring and health management for patients, while specific treatments still should be completed by hospital. However, with the development of information technology, the change of domestic policies and the gradual improvement of the medical model in the future, it is believed that the era of truly home-based and intelligent community-based management of diabetes will be sure to come.

Meanwhile, as the project is design *ab initio*, it was conducted and established from no previous research in the field, the implementation time was short, and the pilot area is relatively limited. Therefore, only the experience of some medical information platform construction and community-based management of diabetes at home and abroad was studied. As a result, although the research is in-depth it may not have covered all issues in detail. Methodological analysis is mainly based on qualitative analysis, and the evaluation indicators are not constructed for quantitative evaluation. The natural limitations of interviews and the selection of survey objects adding to the limitations in manpower and material resources and the feasibility and convenience of implementation, may have incurred in some risks concerning bias. However, this was considered the approach that could offer a more comprehensive and meaningful view of a complex and critical problem for people and societies.

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Appendix I: Questionnaire for Diabetes Prevention and Treatment Staff of Shanghai's Primary Health Service Institutions

In order to understand the basic situation of diabetes prevention and treatment in Shanghai's primary health service institutions, this survey is carried out. We sincerely hope to get your understanding, support and cooperation. Thank you for helping us fill out this questionnaire. Your answer shall reflect the real situation. Please fill in the form according to the specifications of the questionnaire. Except for a few that need to fill in the numbers, please "√" your options. The questionnaire is anonymous and will not harm your privacy. We again sincerely thank you for your support and cooperation.

Address: _____Province _____City _____District (County)_____Street
(Township)

I Personal information

1. Workplace: (1) community health service center (2) health center
2. Gender: (1) male (2) female
3. Age:
4. Education level: (1) high school and below (2) Technical secondary school (3) Junior college (4) Undergraduate (5) Graduate
5. Current main work: (1) public health (2) clinical services (5) nursing (6) traditional Chinese medicine (7) pharmacy (8) others
6. Licensing qualifications: (1) practicing physician (2) assistant practicing physician (3) registered nurse (4) others: _____
7. Professional title: (1) advanced (2) intermediate (3) primary (4) none
8. Permanent staff or not: (1) Yes (2) No

II Situation of diabetes prevention knowledge training

9. Have you received training in diabetes prevention knowledge and skills?
(1) Yes (2) No (please skip to 12)
10. If you have participated in the training, the times of training:

___national training(s); ___provincial training(s); ___city-level training(s); ___district-level training(s); ___other training(s).

11. The training contents you have participated in include (Select all that apply):

(1) Diabetes epidemic status (2) Diabetes prevention policies and strategies (3) Diabetes health education (4) Diabetes detection and treatment (5) Diabetes diagnosis and treatment technology and progress (6) Others: _____

12. Do you think your existing knowledge can satisfy the needs of diabetes prevention and management?

- (1) fully satisfied
- (2) generally satisfied
- (3) dissatisfied

13. What kinds of knowledge and skills do you want to gain to improve your working ability?

Diabetes diagnosis and treatment skills	need	basically need	urgently need
Diabetes prevention and treatment policies	need	basically need	urgently need
Diabetes medication principles and specific medication guidelines	need	basically need	urgently need
Diabetes epidemiology survey techniques	need	basically need	urgently need
Nutrition and exercise guidance for diabetics	need	basically need	urgently need
Monitoring and control skills for diabetic complications	need	basically need	urgently need
Rehabilitation and psychological guidance skills for diabetics	need	basically need	urgently need
Other skills: _____	need	basically need	urgently need

14. Through what channels do you want to gain the above knowledge and skills? (Select all that apply)

(1) special training classes (2) free professional books or materials (3) further education (4) distance education (network training) (5) others: _____

III. Community diabetes prevention and treatment

15. What are the specific contents of your current diabetes prevention work? (Select all that apply):

(1) patient diagnosis and treatment (2) patient care (3) health education or training for patients and their family members (4) establishing health records (5) patient family visits (6) others: _____

16. Are you qualified for diabetes prevention and treatment?

(1) Yes (2) basically Yes (3) No

17. Does the government attach importance to diabetes prevention and treatment?

(1) Yes (2) basically Yes (3) No (4) I don't know

18. Is current diabetes prevention and treatment fully carried out?

(1) Yes (2) basically Yes (3) No (4) I don't know

19. Can this unit's sanitary equipment meet the needs of diabetes prevention and treatment?

(1) Yes (2) basically Yes (3) No (4) I don't know

20. Is the funds currently used for diabetes prevention and treatment sufficient?

(1) Yes (2) basically Yes (3) No (4) I don't know

21. Can the knowledge and skills of the medical staff of this unit meet the needs of diabetes prevention and treatment work?

(1) Yes (2) basically Yes (3) No (4) I don't know

22. Are you satisfied with current diabetes prevention and treatment?

(1) very satisfied

(2) relatively satisfied

(3) basically satisfied

(4) dissatisfied

(5) very dissatisfied

23. What problems do you think need to be improved in the current diabetes prevention and treatment in community institutions? (Select all that apply)

(1) lack of unified planning by government

(2) lack of advanced information system support

(3) lack of scientific guidance from higher-level institutions

(4) lack of cooperation with diabetics

(5) unscientific prevention mode

(6) lack of work enthusiasm

(7) insufficient diabetes training

(8) lack of diabetes prevention and treatment full-time staff

(9) others

24. Your suggestions on diabetes prevention and treatment:

Thank you for your valuable suggestions!

Appendix II: Questionnaire on the Management of Diabetes in Communities of Municipal Districts

_____Province _____City _____District

(fill in by district health center)

Name: _____ phone number: _____ date: 2017_____

Program	Content
I. Basic situation (2016)	
Expenditure for the prevention and treatment of chronic diseases in the district (yuan)	
Expenditure used for health training in the district (yuan)	
II. Chronic diseases management policy	
Has the district set up a chronic disease management leading group?	a. Yes b. No
Has chronic disease management been included in the government assessment target?	a. Yes b. No
Has the "chronic disease outpatient medical insurance policy" been formulated?	a. Yes b. No
Has the "reduction policy for the treatment of diabetes in communities" been formulated?	a. Yes b. No
Has the "Community Basic Public Health Service Project" been established?	a. Yes b. No
Has the "Community Public Health Assessment Subsidy Measures" been launched?	a. Yes b. No
Has the "community diabetes control plan" been formulated?	a. Yes b. No
Has the "diabetes training program for community medical staff" been formulated?	a. Yes b. No

III. Diabetes management system

Diabetes report, screening, registration system	a. Yes	b. No
Diabetes drug management system	a. Yes	b. No
Referral and follow-up system for diabetics	a. Yes	b. No
Assessment system for diabetes prevention and treatment	a. Yes	b. No
Personnel training, assessment, reward and punishment system for diabetes prevention and treatment	a. Yes	b. No
Diabetes treatment work specifications	a. Yes	b. No
Diabetes community prevention guide	a. Yes	b. No
Diabetes community management process	a. Yes	b. No
Diabetes emergency rescue system	a. Yes	b. No
Diabetes health education system	a. Yes	b. No
Other diabetes management system (please write down)	a. Yes	b. No

IV. Implementation of diabetes management (2016)

The number of community health service centers in the district that implements diabetes system management

The number of community health service centers in the district that establishes chronic disease system management database

Whether the chronic disease system management database in the district is networked	a. Yes	b. No
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V. Diabetes training situation (2016)

Does the district have special funds for diabetes training?	a. Yes (___yuan)	b. No
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Times of diabetes training for hospital staff

Times of diabetes training for community staff

Times of training organized by the Ministry of

Health

Times of training organized by provincial health department

Times of training organized by municipal health bureau

Times of training organized by district health bureau

Has the education activity for diabetics been held? a. Yes (times) b. No

The number of diabetes trainees among hospital staff in the district

The number of diabetes trainees among community staff in the district

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Appendix III: Interview Outline for the Director of the Community Center

1. When did your community hospital start community management for diabetics? What is the status quo?
2. Under current situation, what is the structure of the diabetes community management service provided by community hospitals? What are the resources, as well as the management and arrangements for diabetes communities, provided by community hospitals?
3. Under current situation, what is the process of diabetes community management services provided by community hospitals? How do the current community hospital staff distribute their work and how is the work carried out in practice?
4. Under current situation, what are the advantages and disadvantages of the diabetes community management work provided by your community hospital?

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Appendix IV: Interview Outline for Community Public Health Staff

I Basic information

1. Education level: _____ Major: _____
2. You have been engaged in the chronic diseases (hypertension, diabetes) management for _____ years.
3. Your average monthly income is _____.
4. Have you participated in diabetes knowledge training?
 - a. Yes
 - b. No
5. Have you participated in the training of chronic diseases health management knowledge?
 - a. Yes
 - b. No

II . Diabetes management situation

6. What is your main job in diabetes management?
7. Are you satisfied with the diabetes management in your community? Can you share some successful experiences? What are the deficiencies?
8. What advantages and disadvantages do you think the community has in managing diabetes health?
9. Please provide your plans, opinions and suggestions on how to improve the efficiency of diabetes health management.
Such as: 1) Capacity (sufficient to meet the number of diabetes patients in the community)
2) Design (whether the design of buildings and facilities can help optimize local work)
3) Planning, service rules, operational IT systems
4) Staff qualification/training
5) Service security and quality of service.

10. What are the main problems and challenges in your work? If you have sufficient power and resources, how will you improve the efficiency?

11. What is the value of health community medical care for diabetes patients?

12. What are your suggestions for the diabetes community management service system provided by community hospitals?

13. What aspects do you think your community has done very well and are worth learning from other health care institutions?

14. What do you think the diabetes community service will develop in the next 20 years? What will be different? What do you think?

Appendix V: Interview Outline for Community Responsibility

Doctor

I Basic information

1. Education level: _____ Major: _____
2. You have been engaged in chronic diseases (hypertension, diabetes) management for _____ years.
3. Your average monthly income is _____.
4. Have you participated in diabetes knowledge training?
 - a. Yes
 - b. No
5. Have you participated in health management knowledge training?
 - a. Yes
 - b. No
6. At present, the number of diabetes patients you manage is _____.

II. Diabetes management situation

7. What is your main job in diabetes management?
8. How do you mainly find cases of diabetes?
9. Every organization does a good job in certain aspects, and there are also aspects that need improvement. Do you think there are any challenges or shortcomings in your work? In addition, what experiences can you share with other people in your work?
10. What are the differences in professional experience in working here and working in hospitals?
11. Please provide your plans, opinions and suggestions on how to improve diabetes health management.
12. What do you think this service will develop in the next 20 years? What will be different? What do you think?

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Appendix VI: Interview Outline for Diabetics

1. Name: _____ Education level: _____
2. You have got diabetes for _____ years.
3. What is the reason that you choose to seek treatment in the community?
4. Who is your community responsibility doctor?
5. Are you satisfied with the outpatient, follow-up, health education and other services provided by the community health care staff?

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Appendix VII: Interview Outline for Disease Control Center/Health Bureau

1. What are your main responsibilities in diabetes management?
2. At present, how is the work on the management of chronic diseases, diabetes in particular, carried out by the community health service centers in the region? What are the advantages and disadvantages?
3. Please talk about your department's plans, opinions and suggestions so as to improve diabetes health management in the community.

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Appendix VIII: Interview Outline for Diabetes Association

1. What are your main responsibilities?
2. At present, how is the work on diabetes management carried out in the whole region?
What are the advantages and disadvantages?
3. Are you satisfied with the diabetes health management work carried out by the street community health service center? What are the deficiencies?
4. Please talk about your plans, opinions and suggestions, so as to improve your community's diabetes health management.

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Appendix IX: Questionnaire on Diabetics' Satisfaction with Health Management

In order to understand your satisfaction with the diabetes health management services in the community, we invite you to participate in this survey. Please "√" on the appropriate options according to your actual situation. Thank you very much!

I . Basic information

1. Gender: (1) male (2) female
2. Age:
3. Diabetes history:

II .Satisfaction with diabetes health management service

	Not satisfied	Less satisfied	Generally satisfied	Relatively satisfied	Satisfied
Medical environment					
Medical procedure					
Medical equipment					
Medical skill					
Physical examination					
Health guide					
Health education					
Follow-up service					
Service attitude					
Service quality					
Overall situation					
