ISCTE IUL
Instituto Universitário de Lisboa

"Internet Plus" Medical Services Based on Total Quality Management Theory--An Empirical Research in Public Hospital Outpatient Services in Guangzhou, China

HUANG Yingfeng

Thesis submitted as partial requirement for the conferral of

Doctor of Management

Supervisor:

Prof. Bráulio Alturas, Assistant Professor, ISCTE University Institute of Lisbon

Co-supervisor:

Prof. Jiang Hong, Professor, Southern Medical University

July, 2018

ISCTE IUL
Instituto Universitário de Lisboa

"Internet Plus" Medical Services Based on Total Quality Management Theory--An Empirical Research in Public Hospital Outpatient Services in Guangzhou, China

HUANG Yingfeng

Thesis submitted as partial requirement for the conferral of

Doctor of Management

Jury:
President: Professor Luís Martins, Assistant Professor, ISCTE-IUL
Prof. Teresa Andrade, Assistant Professor, Escola Superior de Saúde Egas Moniz
Prof. João Gonçalo Paiva Dias, Coordinate Professor, University of Aveiro
Prof. Henrique Gil, Associate Professor, Instituto Politécnico de Castelo Branco
Prof. Bráulio Alturas, Assistant Professor, ISCTE-IUL

July 2018

[This page is deliberately left blank.]

Declaration

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.

Signed: Huang Yingfeng Date 9-10-2018.

Name: Huang Yingfeng

作者申明

本人郑重申明：除了论文致谢中明确说明并致以谢意的部分外，所呈交的论文不包含任何他人或作者本人已用于获得任何教育机构的学位和证书而使用过的材料。同时尽我所知，除了文中特别加以标注引用的内容外，本论文不包含任何其他个人或集体已经发表或撰写的成果作品。

作者签名：黄颖烽 日期：2018.9.10

姓名(拼音)：Huang Yingfeng

[This page is deliberately left blank.]

Abstract

China is a large country with a population of more than 1.3 billion people, so public places are always full of people. The large public hospitals in China are even more overcrowded with a widespread medical treatment dilemma of “three longs and one short” in outpatient departments, which refers to “long waiting time of registration and payment, long waiting time of fetching medicine, long waiting time of treatment and short time of diagnosis”. This medical dilemma has long plagued medical workers as well as patients seeking treatment in outpatient departments and their families.

Based on the theory of total quality management, this research is carried out in accordance with the Juran Trilogy –“Quality Planning – Quality Control – Quality Improvement” and the “European Quality Award Logical Model”. With the prevalent phenomenon of “three longs and one short” as the orientation, this research reviews the relevant literature, illustrates the historical reason for the occurrence of the dilemma and the practical significance of solving it, proposes the hypothesis to improve outpatient medical experience through the “Internet + medical service” model, achieves outpatient treatment process reengineering through empirical research on the “WeChat + outpatient medical service” platform developed by T hospital, and realizes the goal of improving satisfaction of patients and the medical staff with quality as the key and the medical staff participating from the beginning to the end to work continuously to improve outpatient service quality.

Through practice, combined with methods such as questionnaire, interview, expert consultation, and group discussion, it has been proven that the “WeChat + outpatient service” platform can effectively alleviate or solve the dilemma of “three longs”, but there is no improvement for the “one short”. Through the five dimensions of service quality (tangibles, reliability, responsiveness, assurance, and empathy) and service quality gap analysis, it can be seen that the construction of “WeChat + outpatient service” platform has improved the patient’s medical experience, increased satisfaction of patients and the medical staff, and promoted employees’ awareness of active service.

Keywords: total quality management; Internet + medical service; improvement; medical treatment dilemma

JEL: M15; I12

[This page is deliberately left blank.]

Resumo

A China é um país de grande dimensão, com uma população de mais de 1,3 mil milhões de habitantes, e por isso os lugares públicos estão sempre cheios de pessoas. Os grandes hospitais públicos na China estão ainda mais superlotados com um dilema de tratamento médico generalizado de "três longos e um curto" em departamentos ambulatoriais, que se refere a "longo tempo de espera de registro e pagamento, longo tempo de espera de busca de medicamentos, longo tempo de espera de tratamento e tempo curto de diagnóstico". Este dilema médico há muito atormenta o pessoal médico, bem como os pacientes que procuram tratamento em departamentos ambulatoriais e suas famílias.

Com base na teoria da gestão da qualidade total, esta pesquisa é realizada de acordo com a Trilogia Juran - "Planeamento da Qualidade - Controlo da Qualidade - Melhoria da Qualidade" e o "Modelo Lógico do Prêmio Europeu da Qualidade". Com o fenómeno prevalente de "três longos e um curto" como a orientação, esta pesquisa revisa a literatura pertinente, ilustra a razão histórica para a ocorrência do dilema e o significado prático de resolvê-lo, propõe a hipótese de melhorar a experiência médica ambulatorial por meio o modelo "Internet + serviço médico", realiza a reengenharia do processo de tratamento ambulatorial através da pesquisa empírica sobre a plataforma "WeChat + outpatient service" desenvolvida pelo hospital T, e realiza o objetivo de melhorar a satisfação dos pacientes e equipa médica com qualidade, tendo como chave a equipa médica que participa do começo ao fim para trabalhar continuamente para melhorar a qualidade do atendimento ambulatorial.

Através da prática, combinada com métodos como questionário, entrevista, consulta com especialistas e discussão em grupo, foi provado que a plataforma "WeChat + outpatient service" pode efetivamente aliviar ou resolver o dilema de "três longos", mas não há melhoria para o "um curto". Através das cinco dimensões de qualidade de serviço (tangibilidade, confiabilidade, responsabilidade, garantia e empatia) e análise de lacunas de qualidade de serviço, pode ser visto que a construção da plataforma "WeChat +outpatient service" melhorou a experiência médica do paciente, aumentou a satisfação de pacientes e equipa médica, e promoveu a consciencialização dos funcionários sobre o serviço ativo.

Palavras-chave: gestão da qualidade total; Internet + serviço médico; melhoria; dilema do tratamento médico

JEL: M15; I12

[This page is deliberately left blank.]

摘 要

中国是一个具有 13 亿人口的大国，在公共场合到处可见人流众多。而在中国的大型公立医院，更是人满为患，普遍存在医院门诊就医“三长一短”的就医困境，所谓“三长一短”就是门诊病人就医的“挂号和缴费时间长、取药时间长、候诊时间长、医生给病人的诊病时间短”。“三长一短”的就医困境，长期困扰着广大医务人员和门诊就医的患者和家属。

本研究基于全面质量管理理论为基础，按照质量管理“朱兰三部曲”——“质量策划-质量控制-质量改进”为原则，遵循“欧洲质量奖逻辑模型”开展研究。以中国大型公立医院门诊普遍出现就医“三长一短”困境的问题为导向，通过文献回顾，系统阐述了“三长一短”就医困境产生的历史原因和解决这一困境的现实意义，提出通过“互联网+医疗服务”模式改善门诊病人的就医体验的假设，并通过 T 医院开发“微信+门诊医疗服务”平台的实证研究，再造门诊就医流程，以质量为中心、医院员工全程参与、持续改进、共同为改善门诊服务质量而努力，从而达到提高病人和医务人员的满意度为目标。

通过实践，结合问卷调查、访谈、专家咨询和小组讨论等方式，证明“微信+门诊医疗服务”平台能够有效缓解或解决门诊病人就医“三长”的困境，而对于“一短”的困境的解决没有明显的改善。通过服务质量的五个要素维度（有形性、可靠性、响应性、保证性、移情性）和服务质量差距分析，可见“微信+门诊医疗服务”平台的建设，改善了病人的就医体验，提高了病人和医务人员的满意度，同时促进和活化了员工主动服务的意识的提高。

关键词：全面质量管理；互联网+医疗服务；改善；就医困境

JEL: M15; I12

[This page is deliberately left blank.]

Acknowledgements

I learned of the doctor of management in healthcare program by chance on the occasion when my son was in his first year of university as a freshman. Perhaps, as a father, I should stand on the starting line together with him, and also I want to let him know that one is never too old to learn, so I followed the impulse to apply for the program.

I am grateful to the ISCTE –University Institute of Lisbon (ISCTE-IUL) and the Southern Medical University for giving me the opportunity to return to university campus when I was nearly 50 years old. This is a brave experience and challenge to my life.

Before enrolled in the doctor program, I have been the vice president of Guangzhou First People's Hospital, a large public hospital with 2000 beds, for 10 years. I have certain experience in hospital management and an MBA degree, and have been engaged in general surgical clinical work for more than 20 years. Over the past 10 years, the rapid development of China's medical and health services has posed many new problems to hospital administrators, who need to conduct research based on the actual situation of China's national conditions. Systematic re-learning of the classical management theories and new management models and concepts has become necessary and of important guiding significance.

In 2015, I was appointed president of the Guangzhou Twelfth People's Hospital. Due to the sudden change of post, the main research subjects proposed in the thesis proposal changed. The Guangzhou Twelfth People's Hospital is a relatively young public hospital with 500 beds, and the outpatient volume is much smaller than that of the Guangzhou First People's Hospital. The change of the research cross-section made me struggle in the continuation of the research. I do appreciate Professor Virginia and Professor Jiang Hong for their encouragement and support as well as all the Portuguese and Chinese professors who have instructed and enlightened me in how to carry out research and write the thesis and strengthened my determination to continue the original research. After more than three years of hard work, the thesis has finally been finished, and it is really a difficult process.

I want to extend my gratitude to Portuguese Professor Bráulio Alturas for his careful guidance and support.

I want to extend my gratitude to Chinese Professor Jiang Hong for her careful guidance and support.

I appreciate Professor Virginia Trigo and Professor Nelson Antonio and all the other ISCTE professors who are passionate, kind-hearted and fully committed to Sino-Portuguese

educational exchanges.

My thanks also go to Professor Yu Yanhong, the then president of Southern Medical University, for her concern for this program and Professor Wang Dong, Dean of School of Health Services Management for his guidance.

I want to thank Ms. Xu Ruimin and Ms. Ou Weiyan of the program for their continuous care and gracious assistance to us.

I want to thank Ms. Jia Lanlan from Guangdong University of Foreign Studies and her team for their guidance and help.

My sincere appreciation also goes to all the colleagues of the research group for their help and hard work.

Last but not least, I want to thank my family for their support, especially my wife and son.

Contents

[This page is deliberately left blank.]

List of Tables

[This page is deliberately left blank.]

List of Figures

[This page is deliberately left blank.]

Chapter 1: Introduction

1.1 General Background and Dilemma in the Research

China is a country with a large population of over 1.3 billion (National Bureau of Statistics of People's Republic of China, 2011). It is overcrowded whether at streets or other public places. Many foreigners, especially those from the West, who come to China for the first time, would exclaim that they have never seen so many people, which seem to be an army of ants.

Similarly, a phenomenon featuring an endless stream of treatment groups and outpatients is often seen in China's hospitals, especially public ones with over 500 sickbeds, which becomes a rarely-seen phenomenon in the world. In these hospitals, medical staff, even overworking, fails to meet the demands of patients for seeking medical advice and to provide patients with intimate services.

The daily number of doctor visits in the large-sized public hospitals ranges from 3,000 to 10,000 (National Health and Family Planning Commission of People's Republic of China, 2015). It is crowded to capacity in the outpatient departments, which is even more serious in hospitals with over 1,000 sickbeds. According to Ouyang Feng's article Top 100 Chinese Hospitals in Terms of Annual Visits to Outpatient and Emergency Departments in 2017, which was published in Vistamed in April 2018, the annual visits to outpatient and emergency departments in Guangdong Provincial Hospital of Chinese Medicine, which topped the list, were 7.70 million while that of Boai Hospital of Zhongshan, which ranked No. 100, were 2.30 million (Ou , 2018).

Among the hospitals that we have surveyed and visited, the First Affiliated Hospital of Wenzhou Medical University ranked No. 19 in the above list (Table 1-1) with 4.19 million annual visits to outpatient and emergency departments; Xiangya Hospital of Central South University ranked No. 64 with 2.99 million annual visits; and Guangzhou First People's Hospital ranked No. 75 with 2.76 million annual visits.

Eight hospitals in Guangzhou, where our research group is located, were included in the list. These hospitals include Guangdong Provincial Hospital of Chinese Medicine (No. 1, 7.70 million annual visits), The First Affiliated Hospital of Sun Yat-sen University (No. 9, 4.90 million annual visits), The Third Affiliated Hospital of Sun Yat-sen University (No. 10, 4.80 million annual visits), Sun Yat-sen Memorial Hospital of Sun Yat-sen University (No. 16, 4.28 million annual visits), Guangzhou Women and Children's Medical Center (No. 22, 4.05 million annual visits), Guangdong General Hospital (No. 34, 3.70 million annual visits), The First Affiliated Hospital of Guangdong University of Traditional Chinese Medicine (No. 55, 3.10 million annual visits), and Guangzhou First People's Hospital (No. 75, 2.76 million annual visits).

Table 1-1 Main hospitals surveyed in China in 2017

Ranking	Name of Hospital	Annual Visits to Outpatient and Emergency Departments (10 thousand)
1	Guangdong Provincial Hospital of Chinese Medicine	770
2	The First Affiliated Hospital of Zhengzhou University	689
3	Tongji Hospital of Tongji Medical College of HUST	600
4	The First Affiliated Hospital of Xiamen University	592
5	West China Hospital of Sichuan University	532
6	Union Hospital of Tongji Medical College of HUST	523
7	Renmin Hospital of Wuhan University (Hubei General Hospital)	500
8	Chinese PLA General Hospital	490
9	The First Affiliated Hospital of Sun Yat-sen University	490
10	The Third Affiliated Hospital of Sun Yat-sen University	480
16	Sun Yat-sen Memorial Hospital of Sun Yat-sen University	428
22	Guangzhou Women and Children's Medical Center	405
34	Guangdong General Hospital	370
55	The First Affiliated Hospital of Guangdong University of Traditional Chinese Medicine	310
75	Guangzhou First People's Hospital	276

Source: Ouyang (2018)

Obviously, it is particularly overcrowded in China's large-sized public hospitals. For a long time, due to a lack of outpatient appointment system, outpatients sought

medical services as they arrived in hospitals. After arriving in hospital, patients would first go to the registration office in the outpatient lobby to decide from which department or doctor they sought medical services. Those who have little elementary medical knowledge would sometimes describe their discomfort to the staff there and consult which departments they would register. As a result, the registration was in low efficiency. Since there were so many patients seeking medical services, it was natural that a long queue was formed in the registration office due to excessive patients, which is called “long registered time” phenomenon.

Due to large and uncontrollable outpatient numbers, in the early stage, many hospitals would prescribe a limit to the registered amount based on doctors’ full-load work. Consequently, in order to register or visit doctors as soon as possible, patients would get up much earlier or even hurry to the hospital from other places. As early as before the day, people waiting for registration formed a long queue in the registration office. This is the “long registered time” phenomenon.

Usually, outpatient departments in many hospitals begin to treat patients at eight o’clock. In order to facilitate patients to register, however, staff in the registration office is required to be on duty half or even one hour earlier to register for patients or their family.

Later, those who manage to register swarm forward related departments for awaiting diagnosis. Due to large number of patients waiting to visit doctors, it often takes half or even one to two hours before diagnosis (Zhao, 2011). During waiting time, some patients would become so restless and anxious that they would leave the waiting-room bench; since there were too many patients, those who had no access to the waiting-room bench would have to stand, and they would often enter the consulting room and stand around doctors’ office table, waiting anxiously. They even turned a deaf ear to doctors and nurses who persuaded them to leave the room so as not to affect doctors’ work and other patients’ primacy. A large amount of patients would look on doctors and patients who are seeking medical services. This is the “long waiting time and onlooker” phenomenon.

Due to the large amount of patients waiting for diagnosis and the interference of

onlookers and complaint from patients at the end of the queue, doctors would have to complete the diagnosis and treatment as soon as possible; as for some simple symptoms such as cold, fever or pain in waist and lower extremities, doctors, when listening to patients’ chief complaint, would at the same time check and make a prescription for patients or send them to run the X-ray check-up so as to distribute patients and reduce pressure resulting from excessive patients (Wang, 2004). This often leads to patients’ complaint that “I spend over one hour on registering and waiting for diagnosis while doctors only treat me for several minutes”. This is the “long waiting time, short treatment time” phenomenon.

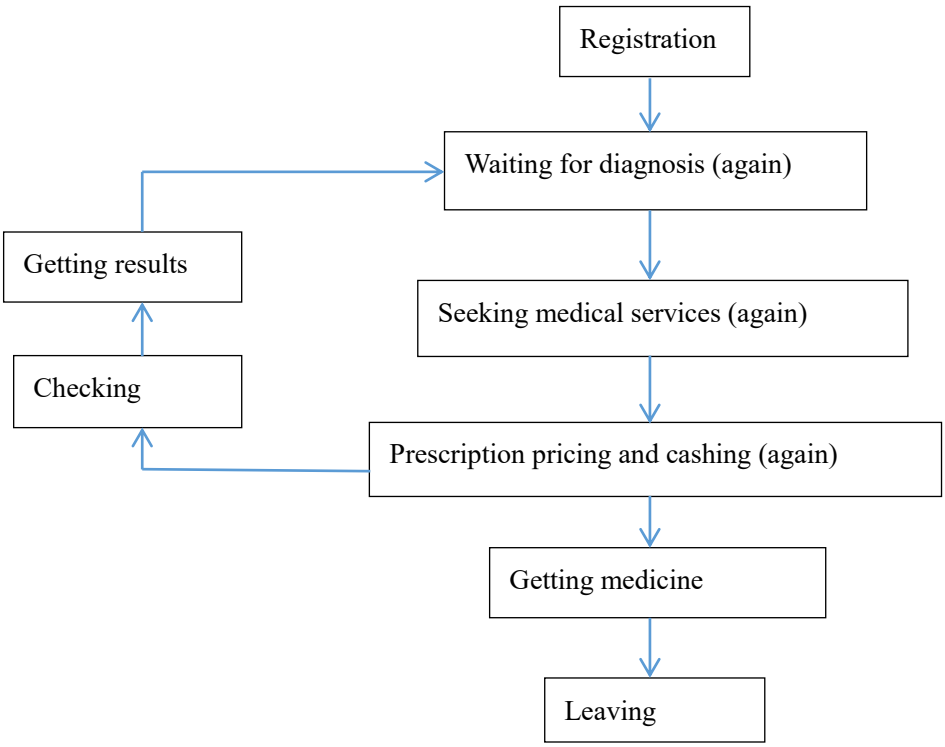
After leaving the consulting room, patients would first go to the prescription pricing and cashier before getting the medicine or being checked. At this moment, patients would once again queue up. This is the “long time for paying and getting medicine” phenomenon.

Evidently, there is a universal phenomenon of “Three-Long & One-Short” in outpatient departments in China’s large-sized public hospitals (Yang, 2009). The so-called “Three-Long & One-Short” phenomenon refers to “long registered time and charging time, long time for getting medicine, long waiting time and short treatment time”. This phenomenon troubles both patients and doctors. The former complains about difficulties in seeking medical services while the latter does a thankless task. Medical staff fails to satisfy patients, the public and the government even they overwork. As a result, hospitals are often criticized for non-action or bad service attitude, which becomes one of the reasons for the strained doctor-patient relationship and more and more medical dispute.

Most medical workers and hospital administrators are troubled by the dilemma that satisfies neither patients nor medical staff, and they have always been looking for and exploring the ways to solve the dilemma.

In conclusion, the conventional diagnosis and treatment procedures in China (11 procedures) are shown in Figure 1-1.

Figure 1-1 Conventional diagnosis and treatment procedures in China (11 procedures)



Alternatively, the conventional diagnosis and treatment procedures in China (6 procedures) are shown in Appendix 3, Figure 1.

Based on the above two figures, patients have to queue up in each procedure, and the more visits to outpatient departments, the more people in the queue and the longer time it takes. It takes nearly half day for local patients to seek medical services for minor illness such as cold, and it even takes one or a few days for patients from other places. Patients are miserable, and medical staff has much pressure with overload work in poor working environment. Patients even complain when doctors go to drink water or go to the toilet at the interim of treating two patients. Patients do not get intimate services and have no primacy or respect, while doctors do not receive respect from patients or their family.

The Action Plan for Further Improving Medical Care Services issued by the National Health and Family Planning Commission of the People’s Republic of China (National Health and Family Planning Commission of People’s Republic of China, 2015) in January 2015 pointed out that, from 2015 to 2017, efforts would be first made in building pleasant and intimate environment for seeking medical services and promoting appointment diagnosis and treatment services so as to strengthen medical

management, improve service procedures, solve the problem of over-crowdedness in hospital, and facilitate the public in seeking medical services.

According to the document spirit, it becomes the important topics and goals for recent work in hospital administration to explore the ways to improve patients’ treatment experience, promote appointment diagnosis and treatment services, provide better service procedures, and solve the problem of over-crowdedness in hospital, which is of great practical and profound historic importance.

1.2 Research Contents and Goals

In order to solve the “Three-Long & One-Short” dilemma, both national and local governments and departments as well as hospitals at all levels have tried every means to make continuous progress, which can be seen from the promotion of coverage of medical reform to hierarchical medical system and from improvement in medial quality to better medical services. These efforts are made to meet the demands of patients to the maximum extent under current conditions.

A brain-storm discussion and exploration was carried out in China’s hospitals. Over last two decades, information technology was used to fundamentally improve and optimize service procedures in all aspects in hospitals and to enhance service quality. Over last ten years, through the third-party involvement, such measures as appointment registration on the Internet, appointment registration through public telephone query platform (114) and appointment registration through mobile phone platform (12580) were taken to deal with crowdedness resulting from on-site registration, which delivered certain results. Over past five years, it was found in bank systems that there were massive cash flows related to medical services and that bank workers needed to go to hospitals for cash escort; and then banks and hospitals jointly developed self-service registration and self-service paying systems, thus the bank-hospital one-card-pass came into being, which greatly relieved pressure resulting from over-crowdedness in outpatient departments in hospitals (Peng, Sang，Wang，Pan，Wang, & Xiong, et al, 2012).

Many hospitals that became aware of the benefits of application of bank-hospital one-card-pass in outpatient lobbies and waiting areas would devote greater efforts to establish cooperation with several banks in putting various kinds of bank equipment in hospitals to facilitate patients, which relieved pressure resulting from registration and long queue for fee payment. Our research group once visited the Second Xiangya Hospital of Central South University and the First Affiliated Hospital of Wenzhou Medical University, which were known for their solutions by bank-hospital one card pass. It was found that it did shorten waiting time since there was much bank-hospital one-card-pass equipment put into use in outpatient departments and patients were relatively distributed. However, it did not reduce visitor flows in outpatient departments in unit time, and outpatient lobbies have to be commodious enough to provide better and satisfactory environment for seeking medical services.

With the promotion of “Internet plus”, especially the development of WeChat and popularization of mobile phone, “Internet plus medical services” also develops rapidly. It can better meet the demands of both hospitals and patients by carrying out various online mobile medical services and constantly improving the software development of medical services with the help of WeChat platform.

In order to further innovate and explore various ways to solve the “Three-Long &One-Short” dilemma, especially to reduce visitor flows in hospitals in unit time, achieve the model of and the aim of time-phased appointment and treatment, and deal with the problem of narrowed space in outpatient departments, T Hospital selected outstanding banks and their cooperative software developers in 2015 to carry out cooperation in “Internet plus medical services”; by jointly developing “WeChat plus outpatient medical services” platform with the help of mobile phone, and by jointly developing and establishing “Hospital Official WeChat Account”, the Hospital developed such means as “WeChat plus outpatient appointment diagnosis and treatment”, “WeChat plus medical check-up information consultation” and “WeChat plus fee payment for outpatient services” to improve outpatient treatment procedures, explore the application of “WeChat plus outpatient medical services” in appointment registration and time-phased treatment, and reduce visitor flows in on-site registration

and waiting time for diagnosis; by the use of WeChat pay, the Hospital solved the dilemma of patients’ waiting for fee payment and correspondingly solved the problems of short treatment time and doctors’ being influenced by onlookers, and finally resolved the “Three-Long & One-Short” dilemma, which further improved the service efficiency in outpatient services, enhanced outpatient service quality and improved patients’ satisfaction.

1.3 Research Methods

1.3.1 Introduction

In view of the general dilemma in outpatient services in China’s public hospitals, this research brings about hospitals’ research on doctor-seeking management, and analyzes the reasons for the “Three-Long & One-Short” dilemma in outpatient services based on literature review of changes in China’s medical reform. Through the literature review, it gets to know the means to solve the dilemma and the ways to improve services, especially the application of “Internet plus” in hospitals, and further raises the research orientation: “Internet plus” medical services based on the total quality management theory; based on the literature review and survey, it analyzes and raises that whether the use of “WeChat plus outpatient medical services” can solve the “Three-Long & One-Short” dilemma in outpatient services, so as to enhance satisfaction of outpatient services (the research question and content); and based on the literature review, it determines the theoretical basis and framework of the research.

By the use of the case study method, this research collects data and carries out statistical analysis through questionnaire investigation, interview and group discussion during the case study and implementation of “WeChat plus outpatient medical services” in T Hospital. This research report is based on the analysis results and conclusion, which provides reference and experience for solving treatment dilemma and improving outpatient service quality.

1.3.2 Literature Research Method

A thorough literature review has to be made at the beginning of the research and then research questions or goals should be determined after deep consideration. This research conducts a literature review of historical changes in China’s medical systems, evolution of doctor-seeking models in China, current doctor-seeking models in Europe and the U.S.A., application of “Internet plus” in hospitals, and related theories such as total quality management theory so as to understand the current conditions and trends of the research as well as improve design and solutions of the research.

1.3.3 Case Study Method

The case study method is one of methods for social science research. In management science, a case is the reappearance and description of a management issue and decision procedure as well as the depiction and analysis of a management practice and its complicated situation. Therefore, case studies are the important methods for empirical analysis (Sun, 2014).

Yin (1984) defines a case study as an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident, and researchers use a large amount of cases and evidence to carry out research.

Generally, based on business phenomenon, case studies raise research questions and theoretical propositions, carry out field survey, collect data, compile and analyze cases, and finally deduce a conclusion and put forward future subjects. A related concept is often mentioned in case studies: individual case. An individual case is a fact or a set of events that provides a question or a succession of questions for readers to think and try to deal with it; it is regarded as a piece of tool that triggers thought, judges and correct actions (Sun, 2014).

A case study is an empirical inquiry whose meaning lies in answering the questions of “why” and “how” (Yin, 1994; Stake, 1995), instead of the question of “should be”.

Based on the over-crowdedness in outpatient services and “Three-Long & One-

Short" doctor-seeking dilemma in China's public hospitals, this research uses case study method to collect and analyze data, write the research report and explore the use of "WeChat plus outpatient medical services" as one of the means to solve the "Three-Long & One-Short" doctor-seeking dilemma under the technology background of "Internet plus", which provides reference and experience for improving outpatient service quality.

1.3.4 Questionnaire Investigation Approach

Questionnaire investigation is a piece of data-collecting tool that depends on respondents' self-report and is beneficial to get quantitative data. This research adopts the structured questionnaire to conduct an investigation among outpatients and medical staff. It starts from the following three aspects to understand the functions and effect of "WeChat plus outpatient medical services" platform, so as to analyze that whether it can improve outpatient service quality and effectively solve the "Three-Long & One-Short" dilemma in outpatient services.

1). The questionnaire investigation is used to know cognition degree, expectation and demands of treatment groups (customers) and medical staff on "WeChat plus outpatient services".

2). The questionnaire investigation is used to understand usage level and proficiency degree of treatment groups (customers) and medical staff on "WeChat plus outpatient services" platform.

3). After customers and medical staff acquaint themselves with the "WeChat plus outpatient services" platform, the questionnaire investigation is used to understand the evaluation of customers and medical staff on the platform's solution for the "Three-Long & One-Short" dilemma, and to understand that whether the satisfaction of patients and medical staff has improved and which aspects require further improvement.

1.3.5 Interview and Group Discussion

Interview is a method where an interviewer asks for information from an

interviewee through conversation. This research chooses customers, project staff and medical staff for individual in-depth interview and group discussion to know whether the research can improve medical services and to understand the improvement directions.

1.3.6 Statistical Analysis Method

A method that can discover profound meanings in data is provided in statistics. By the use of principle of statistics, the acquired data can be comprehensively processed so as to reveal internal quantitative laws of things. The SPSS software is used in this research to conduct statistical analysis on the survey data.

1.4 Research Structure

Based on theories and empirical analysis, this research is divided into seven parts. The structure of this research is shown in Figure 1-2.

Chapter one: introduction. This part includes the introduction togeneral background and dilemma in the research, research contents and goals, research methods, the structure of this research and chapter summary.

Chapter two: research background and research problems. Based on relevant literature review as well as the analysis on the reform of China’s medical systems and on the evolution of medical services patterns, this part mainly includes three stages in China’s health service development and reform of medical systems. It analyzes the historical reasons and current conditions of doctor-seeking dilemma in China. On the basis of the literature review of medical and healthcare systems outside China and comparative analysis of medical services pattern at home and abroad, this part works on the dilemma in and relevant reflections on China’s medical system reform, and then raises the research problems and research questions based on the previous analysis. The last section of this part is chapter summary.

Chapter three: literature review and theoretical framework. This part mainly includes related theoretical literature review, theories in process reengineering, the

relationship between total quality management (TQM) and business process re-engineering (BPR), theories in customer satisfaction, Internet-based medical services, theoretical framework analysis of the research and the establishment of conceptual model, and the chapter summary.

Chapter four: empirical research on “WeChat plus outpatient medical services”. This part includes the background of hospitals’ appointment diagnosis and treatment in China, establishment and implementation of “WeChat plus outpatient medical services” platform in T Hospital, and chapter summary.

Chapter five: data analysis of the questionnaire survey. This part includes descriptive analysis, one-way analysis of variance, logistic regression analysis of influence factors of patients’ perception of service quality improvement, overall evaluation of patients’ perception of service quality, and chapter summary.

Chapter six: research discussion and summary. This part discusses whether the “Three-Long & One-Short” dilemma can be solved by the use of “WeChat plus outpatient medical services” platform, analyzes the effect of “WeChat plus outpatient medical services” platform on the hospital’s service quality, analyzes correlative factors influencing patients’ perception of service quality improvement, summarizes deficiencies, and gives a chapter summary.

Chapter seven: conclusion, suggestions and limitation in the research. This part includes research conclusions, research contributions, research contributions, research limitations, and future research directions.

Figure 1-2 Research structure (Chapters 1 and 2)

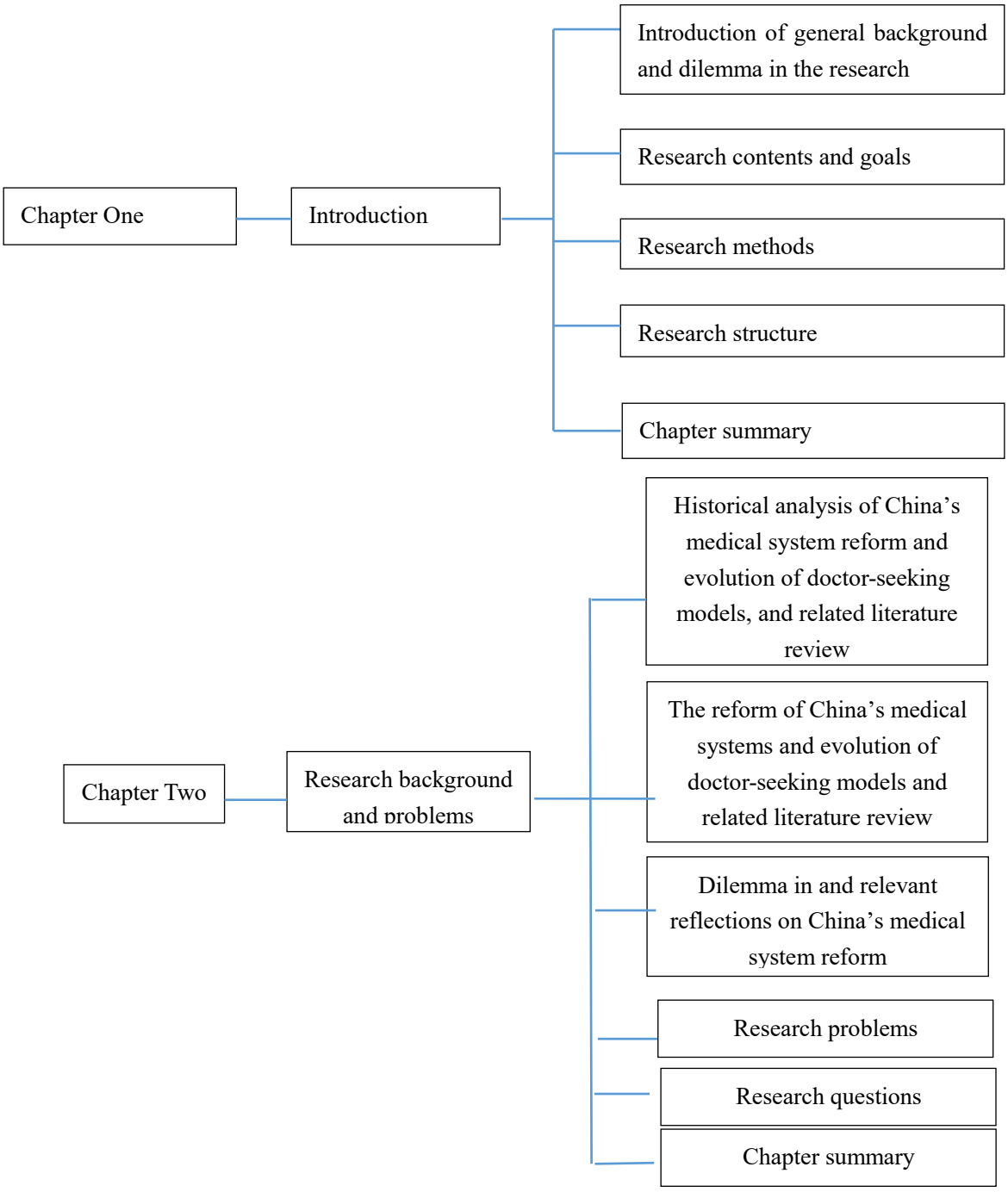


Figure 1-3 Research structure (Chapters 3 and 4)

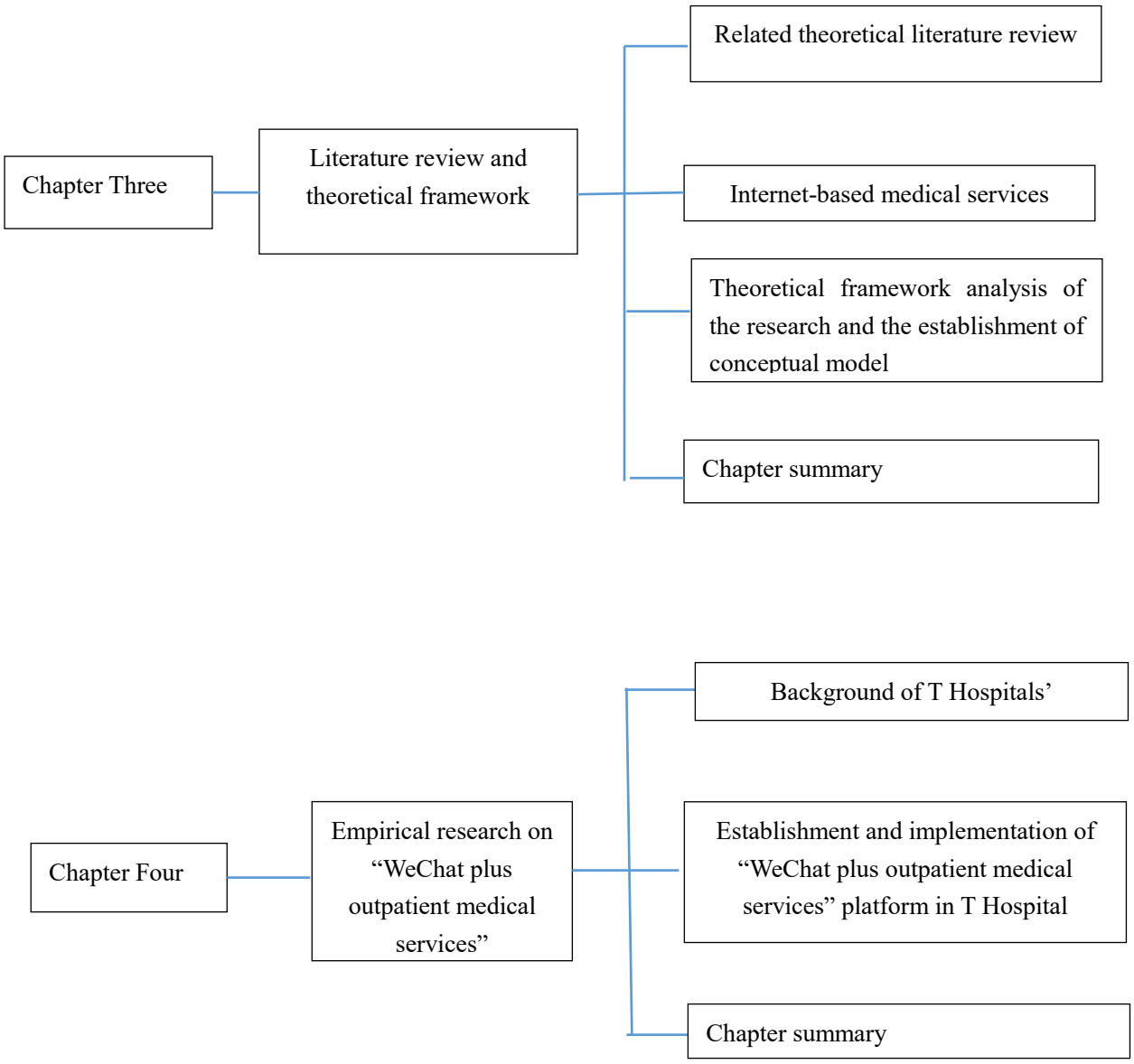
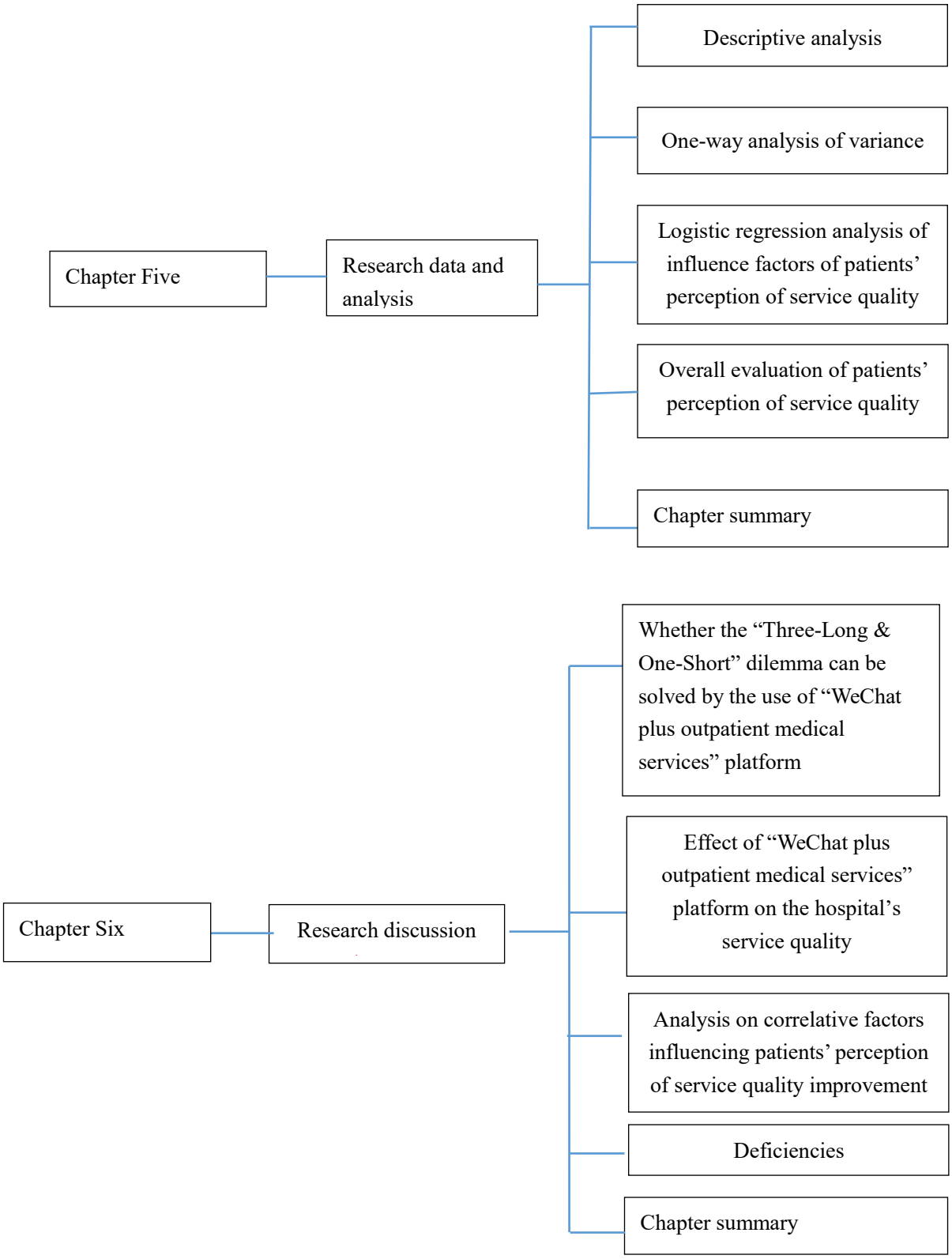
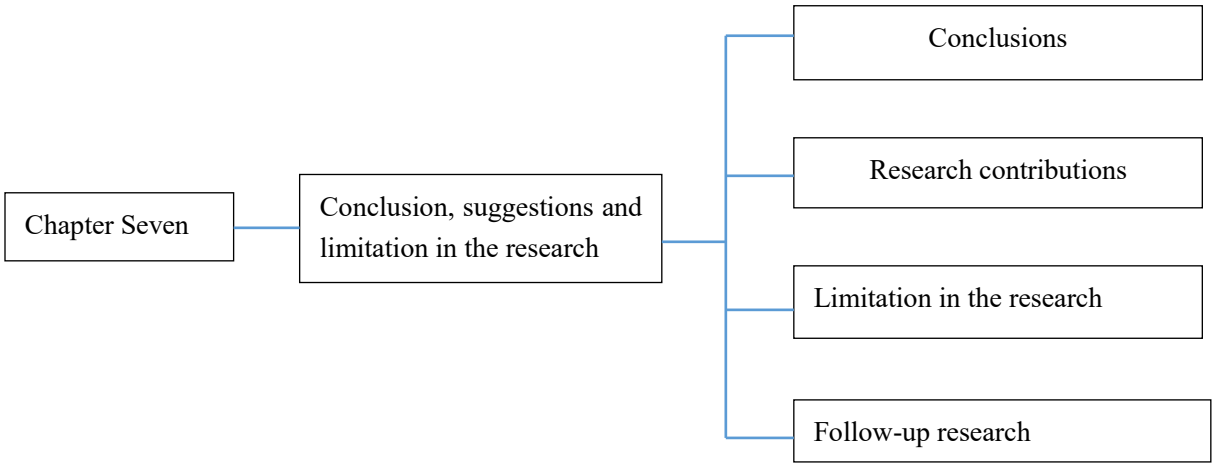


Figure 1-4 Research structure (Chapters 5, 6 and 7)





1.5 Chapter Summary

The research background is sketched in this chapter and over-crowdedness and the “Three-Long & One-Short” dilemma (namely, long registered time and charging time, long time for getting medicine, long waiting time and short treatment time) in outpatient departments in China’s large-sized public hospitals are also introduced. Based on the total quality management theory, the methods, goals and meaning of the use of “WeChat plus outpatient medical services” to solve the dilemma are raised. This research is composed of seven chapters, mainly including introduction, the relationship between the history of China’s medical system reform and the evolution of doctor-seeking models, related theoretical analysis and literature review, empirical research of the use of T Hospital’s “WeChat plus outpatient medical services” to solve the “Three-Long & One-Short” dilemma, research result analysis and discussion, conclusion, suggestions, and limitation of the research.

Chapter2: Research Background and Research Problems

Earth-shaking changes in the development of health undertakings have taken place since the founding of the People’s Republic of China (hereinafter referred as China) in 1949, and at the same time, the country has followed zigzag courses. With the continuous economic development, the medical system has also been reformed. Changes also took place in China’s doctor-seeking models during this reform.

2.1 The Reform of China’s Medical Systems and Evolution of Doctor-seeking Models and Related Literature Review

2.1.1 Introduction

The development of China’s health undertakings and the reform of medical systems are accompanied by the country’s economic development. Some scholars believed that China’s medical reform began in 1978 (Li, Jiang, & Chen,2008).

In order to have a better review of the development history of China’s health undertakings, to describe the evolution of China’s doctor-seeking models and the root causes of the “Three-Long & One-Short” dilemma in outpatient services, we the research group believe that the development of health undertakings is closely related to the economic development. Based on the69 years’ history since China’s founding, the development course of China’s health undertakings can be divided into three stages.

The first stage: 1949-1979. This is the early stage for China’s economic development.

The second stage: 1978-2008. This 30-year period witnessed China’s reform and opening up, high-speed development of the country’s economy as well as the growth of health undertakings and fast improvement of health standards.

The third stage: 2008-2018. The past 10 years is a period for China’s economic adjustment and stable development, for the remarkable success in the reform of medical systems as well as for the virtuous cycle and continuous improvement and optimization. After 10 years of reform and understanding, China’s medical health systems and the development of medical undertakings will be in line with the international practice

(Appendix 3, Figure 5).

2.1.2 The First Stage: The First 30 Years after the Founding of China (1949-1979)

2.1.2.1 Rural Cooperative Medical System

During the first 30 years since the founding of the People's Republic of China (hereinafter referred as China), improved basic medical insurance systems have been established and many rural areas have been accessible to rural cooperative medical system; urban areas also have access to the labor-protection medical care for employees and publicly-funded medical care for civil servants. The three-tiered network system and hierarchical medical system have been established to meet the people's demands for medical health services.

The People's Republic of China was founded on October 1, 1949.China then was impoverished and backward and its medical health level was extremely low, with the rural population accounting for 80% of the country's total (Zhang, Zhao, & Li, 2006). Except for a few doctors of traditional Chinese medicine and individually-owned traditional Chinese medical pharmacies, there were few medical health facilities, contributing to the rampancy and spreading of infectious diseases and endemic diseases as well as an average life span of less than 35 years (Zhang, Zhao, & Li, 2006).

Chinese government has devoted tremendous and effective efforts to changing the backward conditions and severe situations, improving people's health and prolonging the average lifespan. The government developed the guidelines which stipulated that the health services were to serve vast majority of the worker-peasant-soldier students, that prevention should be stressed, that both Western medicine and Traditional Chinese Medicine (TCM) should be utilized, and that priority of health promotion should be placed in rural areas. The three-in-one medical health service system, featuring three-tiered medical health network in counties, townships and villages, village doctor teams (barefoot doctors) and cooperative medical systems, was established in China's rural areas. The so-called three-tiered medical health network refers to medical health agencies in counties, townships and villages where villages are equipped with village health clinics (stations), townships with health centers (rural hospitals) and counties with county hospitals, thus achieving a full health network coverage (Zhang, Zhao, & Li, 2006).

As for village doctor teams (barefoot doctors), it means to select appropriate rural

educated youth and provide them with half-year medical expertise training and continuous further education, so that they acquire prevention and healthcare knowledge, traditional Chinese medicine knowledge and skills to treat minor diseases as well as provide rural residents with village-level primary medical healthcare services (Zhang, Zhao, & Li, 2006).

The cooperative medical system is a cooperative collective medical healthcare system in response to the call of the government and under the support of rural collective economy, featuring rural financing and mutual help (Man, 2006).

In 1955, a historically well-known collective medical healthcare system, in which rural residents paid charges for medicine while charges for services and prevention and healthcare were free of charge, was established in the united health station in Mishan Village, Gaoping County, Shanxi Province. Under this system, rural residents paid health subsidies on a voluntary basis and producer cooperatives complemented public welfare funds, indicating the formal emergence of cooperative medical system of insurance nature in China's rural areas. In November of the same year, the Ministry of Health of the People's Republic of China constituted a united research group, which believed that such a pioneering step "laid a reliable, socialist, and organizational basis for the prevention and healthcare in rural areas" (Zhang, 1992).

In June 1956, *Model Guidelines on Agricultural Production Cooperatives* was passed at the Second Session of the First National People's Congress, giving the responsibility to collectives at the legal level for the first time to get involved in the medical securities of rural residents and to ensure that all people had the access to medical care by the use of mutual-aid cooperative medical system (Wu, 2015).

In August 1958, the Central Committee of the Communist Party of China (CPC) passed the *Resolutions Regarding Issues of Establishing People's Communes in Rural Areas.* Driven by the commune movement, the development of China's rural cooperative medical and healthcare system was accelerated (Wu, 2015).

In November 1959, the Ministry of Health of the PRC held a National Rural Health Conference in Jishan County, Shanxi Province, affirming the people's commune member collective healthcare and medical system, giving some specific suggestions and using the term "cooperative medical" for the first time (Wu, 2015).

On February 2, 1960, the CPC Central Committee transmitted the *Report on the National Rural Health Field Conference in Jishan, Shanxi* based on the document (60) No. 70 released by the CPC Central Office, and required local governments to

implement in accordance with the report. Since then, the cooperative medical healthcare system has been promoted throughout the country, realizing a coverage rate of 46% in 1962 (Zhou & Gu, 1994).

On June 26, 1965, Chairman Mao Zedong proposed that the focus of medical and health work should be put into rural areas. In September 1965, the CPC Central Committee endorsed the *Report on Putting the Focus of Health Services to Rural Areas* released by the Ministry of Health of the PRC and stressed that efforts should be devoted to advancing the development of rural cooperative medical system (Cai, 1997).

In 1968, Chairman Mao Zedong approved the experience of Leyuan People's Commune in Changyang County, Hubei Province in adopting the cooperative medical system and praised highly the benefits of cooperative system. In order to implement Chairman Mao's instruction, governments at all levels put the implementation of the cooperative medical system on the important agenda to promote the rapid development of the system (Cai, 1997).

In 1975, the rural cooperative medical coverage reached84.6% of administrative villages in China (World Bank, 1984).

In 1978, the cooperative medical system was incorporated into the Constitution (Wu, 2015).

On December 23, 1979, five ministries and commissions of the PRC, including Ministry of Health, Ministry of Agriculture and Ministry of Finance, jointly issued the *Rural Cooperative Medical Charter (Draft)* and defined the rural cooperative medical system as a socialist medical system that was established by people's communes with the help of collective forces on a voluntary and mutual-aid basis, which was the collective welfare undertakings for commune members (Wu, 2015).

Barefoot doctors played an important role in popularizing health knowledge, carrying out patriotic health movements, implementing planed immunization and new methods of delivery, implementing cooperative medical system and treating minor diseases. Urban hospitals and licensed doctors were no substitute for the role of barefoot doctors in rural areas. In rural areas, barefoot doctors, whether day or night, were on call at all times and they were dedicated, without caring about pay. Statistics show that, by 1980, the production teams equipped with barefoot doctors accounted for 93.7% of China's total production teams with the number of barefoot doctors reaching 1.46 million. Averagely, there were 2.1 barefoot doctors in every production team, of which 41.5% received training for over six months and 24.3% were able to deliver (Li & Wang,

2001).

A rural health development path with Chinese characteristics and featuring low income, high yield and extensive health by an impoverished state has been blazed through the efforts of barefoot doctors and cooperative medical system, which effectively dealt with medical problems in undeveloped areas and caught the attention of international organizations. United Nations Women's and Children's Foundations expressed in the Annual Report (1980-1981) that China's barefoot doctor model provided primary care for rural areas and a model for underdeveloped countries to improve their medical health levels. The international community generally believes that the barefoot doctors and cooperative medical system are similar to the appropriate technologies (namely, ARI and DRT) that were advocated by World Health Organization (WHO). WHO has drawn and concluded this valuable experience into *Alma-Ata Protocol* (Zhang & Zhang, 2009).

The situation of lack of doctors and medicine in China's rural areas have been greatly improved through the exploration and practice of rural cooperative medical system during the 30 years after the founding of the People's Republic of China; the infant mortality, maternal mortality and human mortality all decreased sharply with the average life span rising from 35 years old to 71 years old (Zhang, Zhao, & Li, 2006).

According to a report of World Bank in 1996, the expenses for cooperative medical services at that period in China only accounted for about 20% of the country's total health expenses but they were used to deal with the medical security problems of rural residents that accounted for 80% of the total population. The rural cooperative medical system has attracted the general attention of third world countries and was praised by World Bank and WHO as "a Chinese Model that delivered the maximum health benefits with the minimum investment" and "the only model for developing countries to deal with the health expense problem (Wu, 2015).

As previously mentioned, the development of China's cooperative medical system is shown at Appendix 2, Table 1.

At this stage, the diagnosis and treatment procedures under the rural cooperative medical system are shown as Appendix 3, Figure 2.

2.1.2.2 Enterprises' Labor-protection Medical Care

The labor-protection medical system is a social security system aiming at protecting employees' health and providing them with access to medical subsidies due

to disease or non-work related injury and disability. It was based on the *Labor Insurance Regulations of the People's Republic of China (Draft)* adopted by the Government Administration Council in 1951 (Liu, 2009).

The labor-protection medical system is an enterprise medical insurance system that provides free medical services for employees and half-fare medical services for employees 'family, and that collective enterprises above county level implement the system by reference. The expenses are disbursed from production costs based on employees' salary and the nationally-stipulated ratio (Li, 1991). Labor-protection medical funds are a part of employees 'welfare funds, which should be used for a specific purpose and under the unified management (Tang, 1991).

The diagnosis and treatment procedures under the employees' labor-protection medical system are shown as Appendix 3, Figure 3.

2.1.2.3 Urban Publicly-Funded Medical Care

The publicly-funded medical care is a social security system aiming at safeguarding civil servants and providing free medical prevention services within the system for beneficiaries through medical health departments. It is based on *Directive on Implementing Publicly Funded Medical Care and Prevention for Nationwide State Employees in All Levels of People's Government, Parties, Groups and Affiliated Public Institutions* adopted by Government Administration Council in 1952 (Qi, 2006).

The publicly-funded medical care only covers workers, retirees in all levels of government agencies, public institutions, other parties, mass organizations and their immediate family (including children under 18 years old, teenagers and workless in-home old man) as well as college students and disabled soldiers of Grade II, Second Class or above who have retired. The funds should be allocated by the national financial departments to health administrations at all levels. The principle of special funds for a specific purpose and under unified management should be followed. But the funds should not be allocated to individuals in capita. The expenditure standards are based on employees' actual demands for medicine, state financial resources and medical units' available resources to determine the annual budget quota for each individual; and the funds will be allocated to administrations for publicly-funded medical care, and local finance departments should complement the over-expenditure (Wu, 2014).

In this case, the first diagnosis under the urban publicly-funded medical care was carried out in street health centers. If more medical services were needed, patients could

seek medical services in district-level hospitals or municipal hospitals by virtue of the referral bill.

The doctor-seeking procedures under urban publicly-funded medical care are shown as Appendix 3, Figure 4.

On the whole, at this stage, Chinese citizens enjoyed the publicly-funded medical care or labor-protection medical healthcare system for which the government, enterprises and individuals were all responsible, as well as hierarchical medical system provided by street health centers, enterprises' medical rooms, district-level hospitals, enterprises' hospitals and municipal hospitals. There are provincial hospitals and university affiliated hospitals that are subordinated to Ministry of Health of the PRC in provincial capitals, which are responsible for the treatment of intractable cases reported from municipal hospitals. In this case, the hierarchical medical system was relatively well implemented.

In the first 30 years after the founding of New China, the country's medical health and security system was relatively sound and well implemented. Employees in state-owned enterprises and large-sized collective enterprises in both urban and rural areas and their family enjoyed the labor-protection medical system that was formulated by the country; and civil servants in government agencies and workers in public institutions in cities, counties and towns as well as their family enjoyed the national publicly-funded medical care; at that time, China's economy and transportation were backward and there was a lack of doctors and medicine in rural areas; rural residents, accounting for 80% of China's total population, got access to the medical securities thanks to the establishment of rural cooperative medical system and the primary healthcare provided by village doctors. Obviously, an improved hierarchical medical system, where minor diseases were treated in health stations (centers), major disease in district-level hospitals, enterprises' hospitals or county-level hospitals and serious diseases in urban large-sized public hospitals, was formed throughout the country, featuring an ordered and well-structured doctor-seeking model. As a result, 800 million Chinese people enjoyed the right to get access to relatively equitable health securities and over-crowdedness in large-sized public hospitals no longer existed.

2.1.3 The Second stage: 30 years of Reform and Opening up: 1978-2008

2.1.3.1 Introduction

The convening of the 3rd Plenary Session of the 11th CPC Central Committee in 1978 lifted the curtain of China’s reform and opening-up（Appendix 3,Figure5）.

During the 30 years after the implementation of reform and opening-up policy, unprecedented development has taken place in China’s medical health undertakings. From 1980 to 2005, the number of medical agencies in China increased from 180,553 to 308,969; the number of health technicians in every one thousand people grew from 2.85 to 3.49 and the number of beds in medical agencies for every one thousand people increased from 2.02 to 2.45; the total health expenses increased from 14.3 billion yuan to 865.9 billion yuan; per capita medical health expenses grew from 14.51yuan to 662.3 yuan; and the ownership of medical equipment also increased sharply. The reform of medical health system and the construction of medical security system have been constantly improved (Li, Jiang, & Chen, 2008).

With the considerable growth of medical health undertakings and the continuous improvement of people’s living standards, however, all sectors of society became increasingly dissatisfied with the medical industry, contributing to the complaint of “difficulties and high expenses in seeking medical services” and the phenomenon of “reducing and returning to poverty because of illness”. The “Three-Long & One-Short” dilemma in hospitals became the root for difficulties in seeking medical services. Therefore, an analysis on the history of medical reform during the 30 years is of great necessity

The reform of medical health from1978 to 2008 can be divided into three stages:

The first stage: from late 1970s to early 1990s;

The second stage: from the early 1990s to the early 21st century;

The third stage: from 2003 when the battle against SARS began to 2008.

2.1.3.2 The First Stage: from Late 1970s to Early 1990s

The ten-year Cultural Revolution broke out in China from 1966 to 1976, having a great impact on national economy. On the one hand, the downward economic pressure was high, and on the other hand, the population increase and changes in age structure led to unmanageable medical expenses and increasingly heavy government burdens.

(1) Decline in Rural Cooperative Medical System

China began a course of economic system reform and opening-up after the 3rd Plenary Session of the 11th CPC Central Committee.

Because of the economic system reform in rural areas, the rural people’s commune

system was transformed into the household contract responsibility system; when rural residents acclaimed their ownership of land once again, the agricultural production became obviously decentralized and de-collectivized; the cooperative medical system, which was based on the collective economy of people's commune, was affected and its financing sources broke; the unification of and balance between "financial rights" and "authority of office" failed to be realized in the reform of national fiscal system; governments at the grassroots level, due to fiscal difficulties, were unable to provide effective supply for the rural medical security system; governments' support for cooperative medical policies was transformed into laissez-faire attitudes; there were faults and deviation in the direction of public opinion, putting rural medical agencies in a difficult situation (Wu, 2015).

The Rural Cooperative Medical Charter (Draft), which was jointly issued by five ministries, including Ministry of Health of the PRC, in December 1979, was overthrown in the reform of economic system. The coverage of rural cooperative medical system, which was based on people's communes, decreased from 84.6% in 1975 (based on a report of World Bank) to 5% in 1985 (Li, Jiang, & Chen, 2008).

In the face of tremendous changes of rural economic conditions and the rapid collapse of cooperative medical system, however, the central government did not introduce any guidance document on the direction of cooperative medical system (Li, Jiang, & Chen, 2008).

At the closing ceremony of National Health Directors' Conference on January 24, 1985, Chen Minzhang, the then Vice Minister of Health, announced that Ministry of Health of the PRC would no longer use the indefinite phrase of "barefoot doctors", a hangover from the Cultural Revolution. From then on, those who passed the examination and was qualified as feldshers would become village doctors and those who failed to be qualified as feldshers would be called as medical corpsmen. The medical teams would be further consolidated in the reform so as to improve their professional skills. This decision marked the withdrawal of "barefoot doctors" from the historical arena (Zhang, & Zhang, 2009).

Being unable to earn money through the public distribution of collective economy as they did before, most barefoot doctors became village doctors who charged rural residents for services fees and expenses for medicine, which increased the burdens of rural residents. Due tothe economic development, rural labor force flows to urban areas. The conventional rural cooperative medical system also failed to effectively meet the

medical demands of this migrant population (Wu, 2015).

Till then, the rural cooperative medical system and the system where barefoot doctors carried out primary healthcare had basically collapsed.

Based on the research of Ministry of Health of the PRC, the proportion of China's administrative villages where the cooperative medical system was implemented sharply decreased from 90% in 1980 to 5% in 1985, and the administrative villages in rural areas where the cooperative medical system was implemented accounted for only 4.8% of the total administrative villages in China in 1989 (Wu, 2015).

90% of Chinese rural residents paid their own medical expenses (Wang, 2001).

As a result, the rural residents, accounting for 70% of China's population at that time, suffered a "neutral-gear period" lasting for 20 years in medical securities until the promotion of new rural cooperative medical system (Li, Jiang, & Chen, 2008).

The collapse of rural cooperative medical system was the cause for the transformation of doctor-seeking models in China's rural areas, for the collapse of three-tiered medical coverage in rural areas and of hierarchical medical system. It was also one of the reasons for rural residents' complaint of "difficulties and high expenses in seeking medical services" as well as one of the important factors contributing to the "Three-Long & One-Short" dilemma in seeking medical services.

The collapse of rural cooperative medical system directly resulted in the transformation of doctor-seeking models in China's rural areas, which is shown as Appendix 3, Figure 6.

(2) Difficult Situation of Enterprises' Labor-protection Medical System

Enterprises had undertaken the labor-protection medical expenses of urban workers for a long time and these enterprises were overwhelmed, which influenced not only production development and workers' collective welfare but also workers' medical treatment and life when they suffered major diseases.

During the transformation of planned economy into market economy, the main orientation in the reform of enterprises' economic system was to enlarge autonomy of enterprises and many state-owned enterprises (SOEs) were transformed into joint-stock enterprises or enterprises with multiple operating models. As a result, some hospitals owned by large-scale SOEs were sold or marketed due to restructuring of enterprises or cost control; and employees in these enterprises, once being able to seek medical services in enterprises' medical rooms or seek outpatient services or be hospitalized in enterprises' hospitals, would have to seek medical services in township or urban public

hospitals.

Only a few large-scale SOEs still preserved factory and mine medical rooms or workers' hospitals.

Since the 1980s, some enterprises, together with local authorities, has spontaneously begun to explore the reform of conventional workers' medical security system, such as fixed medical expense quota, reimbursement of over-expenditure based on certain proportion and the link of medical expense payment with personal interests, manifesting the transition from the publicly-funded medical care to the appropriate self-paid system (The Third Research Department, Party History Research Center of the CPC Central Committee, 2008).

At this stage, the diagnosis and treatment procedures under the labor-protection medical system are shown as Appendix 3, Figure 7.

(3) Gradual Reform of the Publicly-Funded Medical Care

Since the publicly-funded medical care is coordinated by the national and local financial departments, the reform of economic system exerts less influence on it. With the increase of population and expenses for publicly-funded medical care, it was hard for the national finance to prop up the publicly-funded medical care and thus the reform of publicly-funded medical care gradually began.

On April 28, 1984, Ministry of Health of the PRC and Ministry of Finance of the PRC jointly issued Notice of Further Strengthening Management of Publicly-Funded Medical Care, and pointed out that the reform of publicly-funded medical care should be carried out proactively and carefully, initiating a new stage for the government's exploration on the reform of conventional publicly-funded medical care(The Third Research Department, Party History Research Center of the CPC Central Committee, 2008).

On March 25, 1988, approved by the State Council of China, a research group for the reform of medical system, which was led by Ministry of Health of the PRC with eight ministries and commissions involved, was established to guide the medical reform pilots. In July 1988, the group introduced Vision on Workers' Medical Insurance System (Draft). In 1989, Ministry of Health of the PRC and Ministry of Finance of the PRC jointly issued Notice of Management Methods for Publicly-funded medical care, illustrating the 13 specific self-paid items within the scopes of publicly-funded medical care. In March 1989, the State Council endorsed Key Points in the Reform of Economic System by State Commission for Restructuring the Economic System (1989) and noted

that four cities, including Dandong, Siping, Huangshi and Zhuzhou would conduct pilot reform of medical insurance system, and that Shenzhen City and Hainan Province would carry out comprehensive pilot reform of social security system(The Third Research Department, Party History Research Center of the CPC Central Committee, 2008).

At this stage, changes took place in the doctor-seeking model of medical groups who enjoyed the publicly-funded medical care under the reform of publicly-funded medical care but the three-tiered network model in urban publicly-funded medical care was still maintained. The reform in some places was carried out at a relatively fast space and the public hospitals were transformed into a place of enterprise-oriented operation and management, contributing to the end of urban street health centers and district-level hospitals. The doctor-seeking model is shown as Appendix 3, Figure 8.

(4) Enterprise-oriented Operation of Public Hospitals

In China's economic reform, enterprises took "enlarging the autonomy" as their reform pilot. In late 1970s, the reform of medical health was initially "conducted by the use of enterprise management methods to administer hospitals" (Li, Jiang, & Chen, 2008).

In the 1980s, most medical agencies in China implemented multiple responsibility systems, including fixed medical expense quota, economic calculation, more pay for more work, management by objective and other corporate management models. Based on a report of People's Daily on 44 hospitals in Beijing on December 9, 1979 (Anonymity, 1979), a new situation where everyone was concerned about the operation of hospitals arose in hospitals where economic management was implemented; medical staff had fixed objective and quota and they would be awarded if they exceeded the quota, which changed the phenomenon that patients were not accessible to available hospital beds; the more patients they treated in outpatient and inpatient departments, the more hospital income and personal income would be.

In 1985, the State Council of China endorsed Report on Policy Issues in Health Reform, which was drafted by the Ministry of Health of the PRC, and pointed out that we must carry out reform, adopt more liberal policies, streamline administration and delegate power to the lower levels and pool multi-channel financing to broaden the path for the development of health undertakings and to do a good job in health work. It was believed that this was the official start of the comprehensive reform of China's medical system (Li, Jiang, & Chen, 2008).

At the same time, in terms of financial compensation mechanism, the country sharply decreased the ratio of financial compensation and increased the ratio of business income. The average business income in hospitals in 1987 grew by 4.1 times compared with that in1980, accounting for 73.5% of the total income in hospitals (57.34% in 1980).The balance budget appropriation paid by the state increased slightly every year but its proportion in the total average income decreased year after year, which stood at 23.87% in 1980 and 10.18% in 1987 (Li, Jiang, & Chen, 2008).

Such reform would naturally result in competition among hospitals. Since large-scale public hospitals enjoyed advantages in talents and resources, they of course stood at a favorable and leading position in contest for source of patients and in creating income. As such, the above-mentioned urban street health centers and district-level public hospitals had relatively weak competitiveness. The lack of government guidance in hierarchical medical system as well as the weakened role of original hierarchical medical system in the wave of market economy led to the loss of patient sources in street health centers and district-level public hospitals. Meanwhile, insufficient governmental funds resulted in non-sustained operation and closedown of street health centers as well as loss of medical staff or incorporation of medical staff into district-level hospitals. District-level public hospitals in some places also closed down or merged.

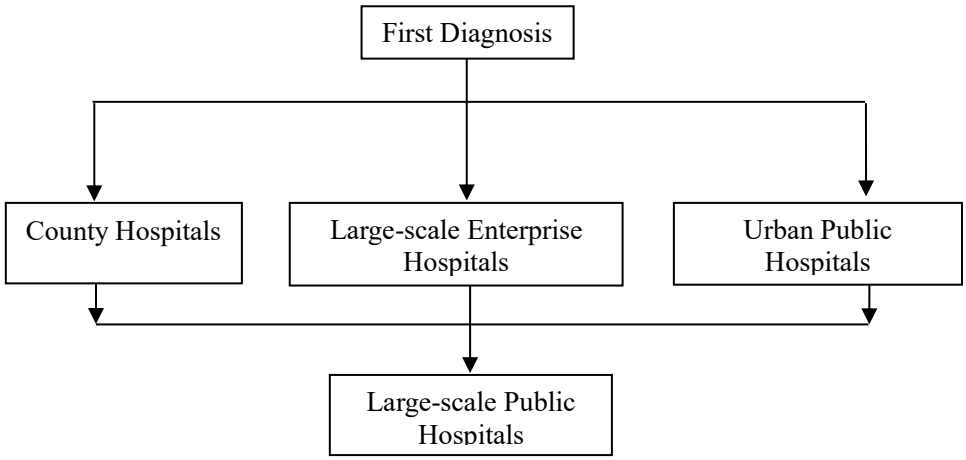
At the same time, since public hospitals needed to create income so as to cover the shortage of insufficient governmental financial supports, they adopted a competition mechanism to encourage medical staff to treat more patients and implemented the distribution mechanism of more pay for more work, contributing to the gradual increase in the number of outpatients and inpatients; due to the reform of medical system, the groups once enjoying publicly-funded medical care and labor-protection medical system had a higher rate to pay medical fees at their own expense. The majority of rural residents became a group who paid medical services at their own expense because of the collapse of rural cooperative medical system. As a result, people would naturally choose a large-scale public hospital with high standards to see a doctor when they needed medical services. Many patients believed that since they had to pay medical services at their own expense under the same charging standards, they would rather go to a big hospital to find an experienced expert to cure their disease once for all. Therefore, the number of outpatients in public hospitals increased steadily.

As such, the "over-crowdedness" and "Three-Long & One-Short" dilemma

gradually came into being in outpatient departments of large-scale public hospitals.

Therefore, fundamental changes took place in the diagnosis and treatment procedures, which are shown as Figure 2-1.

Figure 2-1 Diagnosis and treatment procedures in public hospitals from late 1970s to early 1990s



Source: The Author

In early 1990s, the three-tiered medical health network and the hierarchical medical system, which were established during the first 30 years after the founding of New China, gradually withdrew from the market during the reform of economic system. Looking back, many people clearly realized that this was a great lesson drew from the development of China's medical health undertakings. It was also one of the root causes for the public's dissatisfaction with medical system and complaint about "difficulties and high expenses in seeking medical services".

In the 1990s, the collapse of three-tiered medical health network and the hierarchical medical system in China's urban and rural areas directly led to the over-crowdedness and "Three-Long & One-Short" dilemma in urban public hospitals.

2.1.3.3 The Second Stage: from Early 1990s to Early 21st Century

In April 1990, the reform scheme for publicly-funded medical care in Siping, Jilin Province was introduced; in November 1991, *Provisional Regulations on Workers' Medical Insurance in Hainan* was adopted and implemented in 1992; in September 1991, Shenzhen Medical Insurance Bureau was founded and it issued *Provisional Regulations on Workers' Medical Insurance in Shenzhen* and *Rules for the Implementation of Workers' Medical Insurance* in May 1992.In 1994, China's State

Commission for Restructuring the Economic System, Ministry of Finance, Ministry of Labor and Ministry of Health jointly issued *Opinions on Pilot Reform of Workers' Medical System* and after the approval of State Council, the pilot reform was conducted in Zhenjiang, Jiangsu Province and Jiujiang, Jiangxi Province, which was known as "Pilot in Zhenjiang and Jiujiang" (The Third Research Department, Party History Research Center of the CPC Central Committee, 2008).

With the in-depth development of the reform of economic system, China has introduced a series of macro policies for deepening the economic reform. In 1992, the 14th National Congress of the CPC determined that the goal of the reform of China's economic system was to establish a socialist market economic system.

In 1994, China implemented the reform of financial and taxation system and began to implement the revenue sharing system. The implementation of this policy contributed to the insufficient health investment by local government and imbalance among different areas, and it was even more difficult for county governments in underdeveloped areas to ensure health investment. From 1991 to 2000, although the absolute value of governmental investment in rural health increased, the proportion decreased from 12.5% to 6.5% (Li, Jiang, & Chen,2008).

In 1995, the *Decision of CPC Central Committee on Major Issues Concerning the Reform and Development of State-Owned Enterprises* was adopted at the Fifth Plenary Session of the 14th CPC Central Committee, expressing that one of the important content in the reform of state-owned enterprises was to transform the publicly-funded medical care and labor-protection medical system, which were based on enterprises, into the socialized medical insurance.

In 1997, the issuing of *Decision of the CPC Central Committee and the State Council on Public Health Reform and Development* marked the beginning of the coordinated reform of medical securities, medical health services and drug distribution system. The five-year period from 1996 to 2000 witnessed the rapidest growth in per capita health expense since the reform and opening-up and it was in this period that the complaint about "high expenses in seeking medical services" gradually arose (Li, Jiang, & Chen,2008).

In December 1998, the State Council of China issued *Decision of the State Council on Establishing the Urban Employees' Basic Medical Insurance System*. It was required that a basic medical insurance system covering all urban workers should be established throughout the country by 1999. With the issuing of this document as a symbol, the

establishment of China's urban workers' medical insurance system entered a stage of comprehensive development (The Third Research Department, Party History Research Center of the CPC Central Committee, 2008).

At this stage, while the urban workers' medical insurance system was being constructed, the publicly-funded medical care was being gradually reformed. The publicly-funded medical care was gradually transformed and finally incorporated with the workers' medical insurance system all over the country.

During the 20-year period from the 1980s to 2000, the rural cooperative medical system experienced a tortuous development process of collapse-relapse-recovery-exploration. The severest consequence resulting from the decline of rural cooperative medical system was that the vast majority of rural residents became a group who paid medical services at their own expense. The medical supply system became market-oriented, and at the same time, medical expenses increased sharply; the medical demands of rural residents failed to be met; rural medical services were inefficient and in short supply; it became prominent that rural residents had difficulties in seeking medical services and they were reduced and returned to poverty because of illness (Wu, 2015).

Due to the establishment and gradual improvement of urban workers' medical insurance system as well as the loss of three-tiered medical network and hierarchical medical system, people's doctor-seeking models were completely changed. They were gradually used to directly going to county-level and district-level public hospitals or large-scale public hospitals to treat minor diseases, and thus the outpatient visits increased sharply.

As the reform and opening-up has led to the improvement of people's living standards, people's requirements on medical services have become higher and higher. In particularly, the rural population who paid medical services on their own expense was dissatisfied with the diagnosis and treatment level of local county hospitals. Considering that they need to pay medical services on their own expense, they would leave the county where they lived and went to urban public hospitals for medical services even they suffered minor diseases and poured into urban large-scale public hospitals for medical services when suffering major diseases. Therefore, the number of outpatients and inpatients of public hospitals in many cities both doubled. Given that China had a large population and there were many rural migrants working in cities, the flow of this group as well as its leading role for the stay-at-home family contributed to

marketplace-like situation in the outpatient hall of urban public hospitals. The “Three-Long & One-Short” phenomenon became a normal in the outpatient hall of urban large-scale public hospitals.

Based on *China Statistical Yearbook (2001)*, in 2000, the visits to outpatient and emergency departments in county-level hospitals or above reached 1.14 billion (National Bureau of Statistics of the People's Republic of China, 2001).

At this stage, the doctor-seeking model and procedures are shown as Appendix 3, Figure 9, Appendix3, Figure 10, Appendix3, Figure 11, Appendix3, Figure 12:

Rural residents (pay on at their own expense):

1. First diagnosis—county hospitals

2. First diagnosis—urban public hospitals

Workers’ medical insurance:

1 First diagnosis—medical rooms—workers’ hospitals—urban public hospitals (still exist in some large-scale state-owned enterprises).

2. First diagnosis—district-level public hospitals or urban public hospitals (for most enterprise workers).

Urban socialized medicine:

1. First diagnosis—district-level public hospitals—municipal-above public hospitals

2. First diagnosis-- municipal-above public hospitals

Urban publicly funded medical care:

1. First diagnosis—district-level public hospitals—municipal-above public hospitals

2. First diagnosis-- municipal-above public hospitals

2.1.3.4The Third Stage: from Combating SARS in 2003 to 2008

The fight against SARS (severe acute respiratory syndrome) in 2003 was a turning point in China’s medical and healthcare reform. This battle had enabled the government to be fully aware of the important influence of public health policies and medical security on the national economy.

The occurrence of SARS in 2003 highlighted that it was significant for the government to lead public health service and the reform of the medical and healthcare systems. As a result, the government rethought the position of the medical and health services and decided that strengthening the government’s responsibilities should

become the guiding principle of medical and healthcare reform.

In January 2003, the General Office of the State Council of the People's Republic of China (the PRC) transmitted the Opinions on Establishing a New Rural Cooperative Medical System which made definite provisions for such aspects as the objectives, basic principles, financing channels, and levels of overall management of the New Rural Cooperative Medical System (NRCMS), marking the beginning of the implementation on a trial basis of the NRCMS (Wu, 2015).

In May 2003, Ministry of Human Resources and Social Security (MOHRSS) of the PRC (the former Ministry of Labor and Social Security of the PRC) promulgated the Guidelines on Including Urban Workers in Flexible Employment into Medical Insurance (the Third Research Department of the Party History Research Center of the Central Committee of the Communist Party of China, 2008).

At the end of 2005, the number of people participating in basic medical insurance nationwide was 137.83 million (Ministry of Labor and Social Security of the PRC & the National Bureau of Statistics of the PRC, 2005).

On January 10, 2006, the 7 ministries and commissions including the National Health Commission of the PRC (the former Ministry of Health) jointly issued the Notice on Accelerating Pilot Work of the New Rural Cooperative Medical System, proposing that the number of pilot counties nationwide in 2006 should exceed 40% of the total number of counties in the country, and in 2007 it should expand to around 60%.It was also proposed that in 2008, the NRCMS should be introduced basically into the whole country and in 2010, the aim that the NRCMS should basically cover all rural residents in China should be accomplished (the Third Research Department of the Party History Research Center of the CPC Central Committee, 2008).

On March 27, 2006, the State Council of the PRC issued the Several Guidelines of the State Council on Solving the Problems of Migrant Workers and proposed to solve the social security problem for migrant workers. In May 2006, MOHRSS of the PRC (the former Ministry of Labor and Social Security of the PRC)published the Notice on Special Expansion of the Medical Insurance for Migrant Workers and addressed the medical insurance for rural migrants working in urban areas (the Third Research Department of the Party History Research Center of the CPC Central Committee,2008).

In April 2007, Premier Wen Jiabao of the State Council of the PRC presided over the State Council executive meeting and decided to carry out the basic medical insurance system for urban residents (the Third Research Department of the Party

History Research Center of the CPC Central Committee, 2008).

By this time, with the economic development brought about by the reform and opening up, Chinese citizens' medical security had gradually restored to a certain level and the goal of providing basic health security for all had been accomplished.

While the reform of medical insurances for urban employees and residents was continuously improving and the total size of medical service was rapidly expanding, that the citizens had difficulties in receiving medical services had become an increasingly obvious and prominent social problem. The government had adopted the medical and healthcare reform as a solution to the social problem accumulating for over twenty years. To this end, the government had promoted the improvement of social medical security system, substantially increased investment in public health, strengthened the construction of the capacity of providing medical and healthcare services of rural areas, enhanced transfer payments, increased government investment in medical institutions, further promoted basic medical insurance for urban residents and the NRMCS, and strengthened the management of pharmaceutical manufacture and distribution, which had led to leapfrog development of medical and healthcare services nationwide.

At this stage, the development of public hospitals had been further enhanced. Local governments invested their limited health expenditure into the infrastructure construction of large public hospitals so as to meet the demands for health emergency respofigurense and emergency treatment in urban public hospitals. At the same time, hospital beds were increased in order to fit the growing number of patients in urban public hospitals.

In the meantime, the number and the scale of large public hospitals had been improved. Large public hospitals with more than 2,000 to 3,000 beds had seen a substantial increase. Due to the long-term implementation of market-oriented and enterprise-style management models, the public hospitals were siphoning off more and more patients, causing that the public hospitals got crowded with outpatients and there were not enough hospital beds for inpatients. Although the government tried to publicize and re-implement the hierarchical medical system, vigorously promoted the construction and improvement of community health service centers and had the hierarchical medical system tilt in favor of community health service centers and district-level public hospitals in terms of medical insurance payment, public hospitals still attracted citizens who were accustomed to go to large hospitals for medical

treatment even when suffering a minor illness and felt large hospitals “trustworthy” because of the professional skills and advanced medical equipment of public hospitals.

In October 2017, the 17th National Congress of the Communist Party of China further proposed that “health provides the foundation for people’s all-round development”, marking a new height of government’s awareness of the significance of medical and healthcare work. Although the government carried out hierarchical medical system and increased the investment in medical and healthcare services, the financial subsidies to public hospitals were far not enough to meet the increase in the cost of public hospital expansion. Hospitals still followed the enterprise-style management model and encouraged medical personnel to generate revenue, resulting in that large public hospitals, with the advantages of complete hard infrastructure and better medical skills, had attracted more patients to seek medical treatment and hospitalization and the number of patients in large hospitals had been rising year after year. The government had not yet perfected the mechanism and system for addressing the phenomena of “three long times and one short time” that it took a long time for citizens to wait for registration, payment and treatment while the time for medical treatment was short. The problem of citizens having difficulties in receiving medical services had also not yet been fundamentally resolved.

At this stage, the government tried to re-establish the hierarchical medical system. However, the establishment and capacity building of community health service centers had not been perfected, which resulted that the proportion of individual payment excluding reimbursement was still relatively high, and there hadn’t been much difference between the payment rates of medical institutions at different levels although the medical insurance system had been basically set up. As a result, it was impossible to fundamentally change citizens’ habitual preference for seeing a doctor in large hospitals or promote the implementation of the hierarchical medical system.

The pattern of medical services is shown as Appendix 3 - Figure 13, Figure 14, Figure 15.

NRCMS:

1.Initial diagnosis and treatment —— community health service centers or hospitals at central small-town level —— county-level hospitals

2. Initial diagnosis and treatment——county-level hospitals

3. Initial diagnosis and treatment—— urban public hospitals

Social medical insurance:

1. Initial diagnosis and treatment —— medical rooms in factories or companies —— staff hospitals —— urban public hospitals

2. Initial diagnosis and treatment —— district-level public hospitals or urban public hospitals

Free medical service in urban cities:

1. Initial diagnosis and treatment —— (street) community health service centers —— district-level public hospitals —— public hospitals at municipal level or above

2. Initial diagnosis and treatment —— district-level public hospitals —— public hospitals at municipal level or above

3. Initial diagnosis and treatment —— public hospitals at municipal level or above.

2.1.4 Achievements of Medical Reform and Development of Medical Services Pattern in the Past Ten Years from 2008 to 2018

In 2003, per capita gross domestic product in China exceeded 1,000 US dollars for the first time. In 2012, the per capita income of rural residents reached 7,917 RMB and people’s livelihood generally reached a comparatively well-off level, which provided a basic guarantee for the increase in funding for the NRCMS and the urban medical insurance system (Wu, 2015).

In January 2009, the executive meeting of the State Council passed the Opinions on Deepening the Reform of the Medical and Healthcare System and the Implementation Plan for Deepening the Reform of the Medical and Healthcare System (2009-2011), marking that the plan of a new round of medical reform was formally published. By the end of 2012, the rate of participation in the NRCMS nationwide reached 98.1%.The financial subsidies to the NRCMS from the government at various level shad also increased from 20 RMB per person per year in 2003 to 240 RMB in 2013 (Wu, 2015).

As of the end of January 2012, 24 of China’s 31 provinces, autonomous regions and municipalities had canceled free medical service and adopted medical insurance. Free medical service for civil servants in seven provinces including Shandong, Guangdong, Jiangxi, Jiangsu, Hubei, Guizhou and Shanxi had not all been canceled. This incomplete reform remained the great difference between the medical insurance treatment of different groups of people. Looking at the reimbursement rate only, the reimbursement rate from free medical service for civil servants was more than 90% and that from basic medical insurance system for urban employees was over 70% with those

from the NRCMS and basic medical insurance system for urban residents even lower, about 60% in recent years (Li, 2012). Moreover, the free medical service features "a low deductible and a high ceiling line of reimbursement" while the deductible of basic medical insurance system for urban employees is high and the ceiling line of reimbursement is 6 times as much as their average annual salary (Guangzhou Municipal Human Resources and Social Security Bureau & Bureau of Finance of Guangzhou Municipality, 2010).

Guangdong is China's largest province in terms of economic development. During the period from 2006 to 2010, the Provincial Government of Guangdong invested 42 billion RMB to promote the reform of the medical and healthcare system. In 2010, the main health indicators of the residents in Guangdong Province ranked among the best in China. The average life expectancy of the residents in Guangdong Province reached 75.3 years, which was 2.3 years higher than the national average number, suggesting that the health of the residents in Guangdong had improved significantly. In 2015, medical institutions in Guangdong received 789 million visits totally and the number of inpatient discharges was 14.39 million. The number of large public hospitals reached 103, ranking among the highest in the country and there were 105 national key clinical specialists. Guangdong adhered to improving the service capabilities of county-level hospitals as the breakthrough, and promoted the establishment of a hierarchical medical system and a system of urban public hospitals' one-on-one assistance in county-level hospitals. In 2015, the hospitalization rate within the counties in Guangdong reached 80% (Editorial Committee of Guangdong Health and Family Planning Statistical Yearbook, 2017).

In order to promote the implementation of the hierarchical medical system, the government adjusted the reimbursement rate from medical insurance, so as to encourage the citizens to go to community health service centers for minor illnesses and go to hospitals for serious illnesses, which had received results of a certain degree. The following example of Guangzhou City, Guangdong Province is used for illustration.

The reimbursement rate from medical insurance of Guangzhou in 2010 was stipulated as following (Bureau of Finance of Guangzhou Municipality & Guangzhou Municipal Human Resources and Social Security Bureau, 2010):

(1). Personal account of medical insurance paid for outpatient emergency expenses and the expenses below the deductibles.

(2). The social pooling funds paid for the expenses above the deductibles for

hospitalization expenses and below the ceiling line of social pooling funds of basic medical insurance and the rest of expenses shall be paid by the individuals.

(3). The rate of medical insurance payment for hospitalization expenses for in-service employees were 93% in community health centers, 88% in primary hospitals, 86% in secondary hospitals, and 84% in tertiary hospitals (large public hospitals with 500 beds or more) respectively.

(4). The rate of medical insurance payment for hospitalization expenses for retirees were 96.5% in community health centers, 94% in primary hospitals, 93% in secondary hospitals and 92% in tertiary hospitals (large public hospitals with more than 500 beds) respectively.

It can be seen that in 2010, because the expenses of outpatient and emergency treatments were basically individual payment excluding reimbursement and there was not much difference between the rate of medical insurance payment for hospitalization expenses in hospitals at various levels, the then medical insurance policy did not change the patients' preference for large hospitals when seeking medical treatment or promote the implementation of hierarchical medical system.

From January 1st, 2015, new policies on the medical insurance system for urban employees of Guangzhou have been implemented, stipulating that social pooling funds are open and the government will provide the expenses of outpatient and emergency treatments with reimbursement with maximum monthly reimbursement of 300 RMB (Guangzhou Municipal Human Resources and Social Security Bureau, 2014):

(1). The reimbursement rate for medical services at designated community medical institutions is 80%.

(2). The reimbursement rate after referral to other designated medical institutions and designated specialized medical institutions within 30 days of receiving medical treatment at designated community medical institutions is 55%.

(3). The reimbursement rate after referral to other designated medical institutions and designated specialized medical institutions within 30 days of receiving medical treatment at non-designated community medical institutions is 45%.

It can be seen that at that time, the government had taken advantage of the payment system of medical insurance to promote the implementation of hierarchical medical system in outpatient services.

So far, in Guangzhou, the new rural cooperative medical system has been integrated with urban residents' medical insurance system, achieving equal medicare

reimbursement between rural residents and their urban counterparts (General Office of The People's Government of Guangzhou Municipality, 2014).More details are shown in Table 2-1.

Table 2-1 Benefit distribution of risk pooling of outpatient and emergency services in Guangzhou (public hospitals)

Hospitals		Reimbursement rate		
Insured person		Secondary and tertiary hospitals	Community hospitals and designated basic-level hospitals	Ceiling line of Reimbursement
Employees	In-service employees and retirees	55%（referral within 30 days of treatment at basic-level hospitals,45%（without referral）	80%	300 RMB per person per month
Urban and rural residents	Juveniles and current students	50%（referral within 30 days of treatment at basic-level hospitals,40%（without referral）	80%	1000 RMB per person per year
	Non-employees,senior citizens, rural residents	0%	60%	600 RMB per person per year

Source: The Author

2.2 Literature Review of Medical and Healthcare Systems in Countries outside China and Comparative Analysis of Medical Services Pattern at Home and Abroad

The medical and healthcare systems in countries outside China, especially those in Europe and the United States, have already had a relatively complete structure. Their corresponding medical services patterns inevitably differ from that in China.

2.2.1 Current Status of Research on Hierarchical Medical Systems and Family Physicians outside China

At present, the most representative medical and healthcare systems outside China are those in the United Kingdom, the United States, and Singapore. They have a lot of experience for China to learn from.

2.2.1.1 Hierarchical Medical System and General Practitioners in the United Kingdom

The United Kingdom is one of the first countries in the world to implement a hierarchical medical system. The healthcare system in the United Kingdom is called the National Health Service (NHS). It is government-led and provides quality and low-cost medical services for all citizens in the United Kingdom. The NHS in the United Kingdom is divided into three levels. The primary medical institutions are the community health service centers with general practitioners (GPs) or general nurses providing primary care for the residents. The secondary and tertiary medical institutions are public hospitals and mainly receive patients in a critical condition referred by the community health service centers or patients in need of treatment of medical specialists. The most prominent feature of the NHS in the United Kingdom is that GPs play an important role as the "gatekeepers" in the implementation of the hierarchical medical system. Therefore, the training of and the threshold for GPs are very strict (Liang & Zhang, 2015).

The purchaser of medical services in the United Kingdom is the government who cooperates with GPs through the third-party primary care trusts (PCTs) (Zhang & Yang, 2015). Through the medical insurance system, the United Kingdom government guides patients to orderly receive medical treatment. Except in special circumstances, residents who directly go to secondary or tertiary medical institutions for medical services without a doctor's referral will not receive reimbursement from the medical insurance. At the same time, GPs' remuneration comes from the medical services purchased by the government. Medical expenses are not paid directly by patients to GPs. Therefore, GPs have no conflict of interest with the medical institutions at various levels to which patients are referred. The hierarchical medical system in the United Kingdom is mature and rigorous. The referral medical institutions at the upper and lower levels promote each other and develop together (Li & Lin, 2006).

The general practitioner system is a unique part of the United Kingdom's medical and healthcare system and is also considered to be worthy of being learned by various countries. The United Kingdom adopts a system in which general practitioners (GPs) offer initial diagnosis and treatment to patients and they will establish a lifelong health record from birth to death for every resident who signs with them. As a public health service provider, a community health service center mainly consists of 3 to 6 GPs, 2 nurses, 1 healthcare assistant and 1 manager. To ensure the quality of medical services

provided by GPs, the government stipulates that the number of residents signing with each GP cannot exceed 2,000 (Anonymity, 2017).

Most of the residents’ diseases can be resolved through the initial diagnosis and treatment in the community while only less than a quarter of patients need to be referred to a higher-level hospital (Cao, 2017). The training of GPs is very strict and demands high standard. After graduation from medical school, the potential GPs have to participate in a 2-year Foundation Programme for general training so as to obtain the medical qualifications of practitioners. Then the potential specialist doctors and the potential GPs will attend their respective specialist training. Besides participating in a 3-year general practitioner training, the potential GPs should get the Certificate of Eligibility for GP Registration (CEGPR) after assessment and be registered as a member of the Royal College of General Practitioners of the United Kingdom before they can qualify for independent practice. Correspondingly, GPs enjoy a relatively high remuneration.50%of their income comes from the payment from the government according to the number of people registered with them.30%of the income is from payments for providing specific medical and healthcare services required by the NHS, such as childhood immunisation and women’s health check-ups. The remaining 20% is derived from special medical services such as night visits, minor surgeries and check-ups (Anonymity, 2017).

2.2.1.2 Hierarchical Medical System and General Practitioners in the United States

The health care services in the United States mainly consist of private health care services and health insurance. The government only provides health insurance for special group while ordinary people need to purchase commercial insurance according to their own needs. The health care service system in the United States is divided into three levels: basic-level community health service agencies, secondary hospitals and tertiary hospitals. The community health service center is responsible for the primary care of patients and the diagnosis and treatment of common diseases and chronic diseases. The secondary and tertiary hospitals are responsible for receiving referred patients and patients with intractable diseases (Zhang & Yang, 2015).

One of the characteristics of the hierarchical medical system in the United States is to give full play to the payment system of commercial insurance. Insurance

companies guide the patient’s habit of seeing a doctor through the difference in payment proportions. Practice has shown that cooperation between large hospitals and community doctors and the full play of commercial insurance have led to good results in the practice of the hierarchical medical system in the United States (Li, Lei, & Wu, 2017).

Unlike the strict system in which GPs provide initial diagnosis and treatment for the patients in the United Kingdom, the United States does not set up a system at the national level, in which patients can only be referred with a referral from GPs. Patients will seek initial diagnosis and treatment in the community mainly out of their trust in GPs or the community clinics (Zhang & Li, 2005). Most hospitals in the United States have outpatient departments in which patients in good economic conditions can directly see a doctor without a referral from GPs or an appointment (Zhang & Li, 2005).

2.2.1.3 Hierarchical Medical System and Family Physiciansin Singapore

The medical and healthcare service system in Singapore consists of a public healthcare system and a private healthcare system. The public healthcare system consists of public hospitals and polyclinics. The private healthcare system consists of private hospitals and private clinics (Chen, Lin, & Zhang, 2012).

In Singapore, primary care is mainly provided by 2,400 private clinics and 18 public polyclinics while inpatient services are mainly provided by public general or specialized hospitals (specialty centers), and a small number of private hospitals also provide inpatient services (Yu, Feng, Fu, Liu, & Yao, 2014). The polyclinic is a typical kind of public basic-level healthcare institutions in Singapore. Polyclinics are wholly owned by the government, supervised by the Ministry of Health of Singapore and operated by the public healthcare groups (Pu & Dai, 2017).

Generally, residents in Singapore prefer seeing family physicians in polyclinics first. If they need more specialized healthcare services and should be referred to a higher-level hospital, a referral from family physicians is required. Otherwise, they will not be able to enjoy the government’s preferential benefits. In the health care reform, the Singapore government emphasizes the protection of the health of the citizens through preventive health care plans, encourages the promotion of a healthy lifestyle and makes people responsible for their own health through public health education, and also provides preventive and planned immunization services through polyclinics (Zhou, 2010).

Singapore’s family physicians mainly include general practitioners (GPs) in polyclinics and registered doctors qualifying as family physicians. The former provide primary outpatient services while the latter need to be appointed in advance and offer more specialized services including consultations, inquiries, and follow-up care (Pu & Dai, 2017). At present, about 65% of the operating costs of polyclinics are funded by government grants which generally take the form of macro budgetary subsidies. In addition, the management costs of the polyclinics are shared by the healthcare groups and the headquarters of Ministry of Health of Singapore through appropriation (Henkin, 1974).

In Singapore, residents have relatively great freedom in choosing family physicians for medical treatment and they do not need to pay much personal expenses. As a result, the relationship between patients and doctors is not as close as that in the United Kingdom. The Singapore government directly provides the citizens with subsidies through setting up programmes and schemes including Chronic Disease Management Programme and Marriage and Parenthood Schemes, all of which are subsidized by the funds of Medisave.

2.2.2 Hierarchical Medical System and Family Physicians in China

In recent years, the Chinese government has vigorously promoted the hierarchical medical system and the family doctor system, and the relevant systems and mechanisms have been gradually improved.

2.2.2.1 Hierarchical Medical System in China

The hierarchical medical system is the most prior in the basic medical and healthcare system in China (Xi, 2016). In the hierarchical medical system, there are four features of the pattern of medical services. Firstly, patients are expected to receive initial diagnosis and treatment at grassroots medical institutions for common health issues. Secondly, “two-way referrals”, a mechanism among medical institutions for patient referrals, means that patients are expected to see a doctor in the community medical institutions for minor illnesses and will be referred to higher-level hospitals for major illnesses. Thirdly, for acute and serious diseases, patients can directly see specialists in higher-level hospitals and after the acute and serious diseases turn into chronic diseases or minor illnesses, they are expected to receive medical treatments back to the community medical institutions. Fourthly, medical institutions at higher and

lower level receive patients according to the degree and urgency of the diseases they have and strengthen coordination between each other. As an important carrier for promoting the hierarchical medical system, the medical treatment partnership system currently has four more mature models. The first model is to establish medical groups in cities. The second model is to establish the Health Care Alliance (HCA) in the counties. The third is to establish trans-regional alliances for various specialties. The fourth is to develop a telemedicine network in remote and impoverished areas.

The implementation of hierarchical medical system depends on the functional positioning of different medical institutions. The grass-root medical institutions mainly consist of community health service centers in the cities and village clinics in rural areas. They provide treatment and rehabilitation and nursing services for patients diagnosed with chronic diseases and in stable conditions, patients in recovery, patients with senile diseases and patients with advanced cancers. County-level hospitals mainly provide medical treatment for patients with common or frequently-occurringillnesses, give emergency treatment to critically-ill patients and refer patients with intractable diseases to higher-level hospitals. The functional positioning of secondary medical institutions is mainly receiving patients with acute diseases and in recovery, patients in postoperative recovery and critically-illpatients in stable conditions referred by tertiary hospitals. The tertiary medical institutions mainly provide medical treatment for critically-illpatients and those with intractable diseases (General Office of the State Council of the PRC, 2015).

At present, China implements a system in which residents receive initial diagnosis and treatment at grassroots medical institutions including those in the community. If more specialized medical services are needed, residents can go to higher-level medical institutions with a referral from the doctors in the community medical institutions so that they can enjoy certain reimbursement.

2.2.2.2 Family Doctors in China

The implementation of the family doctor system in China is later than that in foreign countries. Relevant supporting policies are still needed to promote its implementation. In May 2016, seven ministries and commissions including the Medical Reform Office of the State Council of the People’s Republic of China, the National Health Commission of the PRC (the former National Health and Family Planning Commission) and the National Development and Reform Commission of the PRC

jointly issued the Guidelines on Promoting Contracted Family Doctors Services (the Guidelines). The Guidelines drew on the experience of other countries and regions and summarized the implementation of contracted family doctors services in various regions in China. It is a system of top-level design that promotes contracted family doctors services, marking the official launch of the work of contracted family doctors services in China (Liu, 2018).By the end of 2017, more than 95% of prefecture-level cities, districts and county-level cities had carried out the promotion of contracted family doctor services. In the country, the number of citizens contracted with family doctors reached 500 million, accounting for 35% of the national population, and over 65% of key targeted groups had contracted with family doctors (National Health and Family Planning Commission of People’s Republic of China, 2017).

Having drawn on the successful experiences of other countries and regions and taken into account the real situation in China, China has so far gained some successful experiences in the practices of the contracted family doctors services nationwide, such as the community health service center model in Shenzhen, the exclusive family doctor model in Shanghai and the community health service team model in Beijing (Li, Fu, Mao, Wang, & Yao, 2015). However, problems also exist in the implementation of the family doctor system. There exists imbalance in the practices of family doctors services in various regions with great differences between regions and between urban and rural areas. The capacity of grass-root medical institutions is insufficient, and GPs are lacking. The participation rate of residents is low because they lack trust in the grass-root medical institutions. There are some other problems including a lack of sound compensation mechanisms, a lack of competitive mechanisms, and imperfect incentive mechanisms (Ling, 2015).

2.3 Dilemmas Facing the Current Healthcare System Reform in China and Relevant Reflections

In October 2017,the report delivered at the 17th National Congress of the Communist Party of China(CPC) (Political Bureau of the CPC Central Committee, 2007) pointed out that China would establish a basic medical and health care system and improve the health of the whole nation. China would center on rural areas, attach equal importance to traditional Chinese medicine and Western medicine and would set up a healthcare service system covering both urban and rural residents.

In November 2012, the report delivered at the 18th National Congress of the CPC (Political Bureau of the CPC Central Committee, 2012)pointed out that China should improve the medical insurance system that covers the whole population, establish a mechanism to provide insurance and aid in treating major and very serious diseases, improve the rural medical and health service network at county, township and village levels and the system of urban community health services, deepen reform of public hospitals, and encourage the development of private hospitals.

On December 13th, 2014, during an inspection at the health center of Shiye Town, Zhenjiang City, Jiangsu Province, President Xi Jinping said that some large hospitals in big cities were overcrowded, always busy like “fighting a war”. It was a problem that should be effectively resolved (Xi, 2014).

In October 2017, it was pointed out in the report delivered at the 19th National Congress of the CPC that China should carry out the Healthy China initiative and establish distinctively Chinese systems for providing basic healthcare, and quality and efficient healthcare services.

It can be seen that the past decade has witnessed the rapid development of China’s medical and healthcare services. From the establishment of the rural medical and health service network at county, township and village levels to the establishment and improvement of the system of urban community health service center, and then to the reform of public hospitals and the establishment of a quality and efficient system of healthcare services, it was a process featuring rapid development and improvement. However, the development is still imbalanced and insufficient with some new problems in it need to be gradually corrected and fixed. For example, on the one hand, the government wants to promote the hierarchical medical system based on the improvement of the rural medical and health service network at county, township and village levels. But it means that the common people have to change their habitual preference for medical services of large hospitals so as to adapt to the hierarchical medical system. The government has also increased the amount of medical insurance payments. While the government deepened the reform of public hospitals and limited the size of and the number of beds of the public hospitals, public hospitals had attracted more patients with the number of visits doubling in some large public hospitals especially in big cities because the local governments had increased investment in public hospitals and improved their environment and services. Recently, the number of beds in the First Affiliated Hospital of Zhengzhou University in Henan Province has

exceeded 10,000, and the number of surgeries even has exceeded 1,400 a day (Medical Community, 2018).In the Century Forum produced by the Phoenix TV of Hong Kong, the speaker Zhu Hengpeng said that "the First Affiliated Hospital of Zhengzhou University is so busy that it seems to be the largest health center" and directly pointed out a wrong tendency of the medical reform.

Currently, it can be observed that the number of outpatient visits of large public hospitals is constantly increasing, causing that outpatient departments become more and more overcrowded. Although the construction of the rural medical and health service network at county, township and village levels and the system of urban community health service centers have been improved, the number of people who seek medical treatment at the community health service center is still very small. Because since the reform and opening up 30 years ago, patients have become accustomed to see a doctor directly in large public hospitals for minor illnesses like a cold. People also worry that doctors at community health service centers cannot provide medical services as quality as that of large public hospitals. Even if the amount of medical insurance payment is lower than that at the community health service centers if they go to large public hospitals for medical treatment, the patients are still willing to go to large public hospitals, because there is little difference in the ratios of individual payment excluding reimbursement. This is one of the reasons why public hospitals are "overcrowded" and the phenomena that it takes a long time for citizens to wait for registration, payment and treatment while the time for medical treatment is short have arisen in the public hospitals.

For example, there are 120 hospitals in which the medical expenses are paid by the Qingdao Municipal Bureau of Human Resource and Social Security, Shandong Province. But from 2003 to 2013, the medical expenses in 8 of these hospitals and the number of patients they received accounted for 60% to 70% of the total amount of Qingdao. The business of these 8 large public hospitals was twice the sum of that of the rest of the hospitals. Since the new medical reform, the situation in China is that the number of large public hospitals, the number of beds in large public hospitals and the number of hospitalized patients are increasing, presenting the worst situation of the medical market in health economics (Zhu, 2018).

Why public hospitals are "overcrowded" and why the phenomena that it takes a long time for citizens to wait for registration, payment and treatment while the time for medical treatment is short have arisen in the public hospitals? What are the underlying

reasons?

The research team believes that the key reason is the immobility of Chinese doctors since long. For a long time, Chinese medical students have been assigned to a certain hospital or community health service center after graduation, and basically are not allowed to go into private practice. As a result, the doctors who are assigned to the community health service centers after graduating from the medical schools are far inferior to the doctors assigned to large public hospitals in terms of the medical skills and the rate of receiving continuing education. Consequently, the remuneration of doctors at community health service centers is much lower than that of doctors in large public hospitals and their opportunities for in-service training are much less, leading to frequent personnel changes and even resignations of doctors in community health service centers. This kind of vicious cycle has caused that the patients do not recognize the services of the community health service centers, which further pushes patients to go to large hospitals even for minor illnesses.

In the past three years, China has vigorously promoted the hierarchical medical system, improved the remuneration of medical personnel in community health service centers and implemented the family doctor system. At the same time, China also promotes standardized training for residents. All medical school graduates must go to large public hospitals for standardized training for three years. After passing the assessment and obtaining a standardized training certificate for resident practitioners, they can choose where to work, which has improved the fairness of residents' training. In this way, the medical skills and the stability of doctors in community health service centers have been relatively enhanced.

In the past two years, China has also gradually liberalized the policy of "multi-site practices by physicians". Although it has not been implemented in a lot of public hospitals in many provinces and so the mobility of doctors is still limited, an important step forward in policy reform has been taken.

The research team holds that the system providing contracted family doctors services and the hierarchical medical system can be implemented in a real senseonly when the doctors can freely practice either as contracted family doctors or contracted doctor to large public hospitals or large private hospitals. Because in this way, the patients can trust and freely choose their own family doctors, thereby changing their habitual preference for medical services in large public hospitals and so the phenomenon of "overcrowded" large public hospitals can be really resolved.

2.4 Research Topics

To sum up, in the current system and mechanism, the number of outpatient visits of large public hospitals remains high, and the phenomena of “overcrowded” large public hospitals and of “three long times and one short time” have lasted for a relatively long period.

The dilemma of “three long times and one short time” faced by the patients when they seek medical treatment refers to that it takes a long time for citizens to wait for registration, payment and treatment while the time for medical treatment is short.

The research on how to solve the dilemma of “three long times and one short time” in the outpatient services of large public hospitals is not only of great significance, but also of urgency of the times.

The research team holds that currently, the only solutions are to improve hospital services, carry out a system of appointments, improve the procedures for medical services and enhance the efficiency of medical services. Therefore, this research proposes a study on Internet Plus healthcare services based on the theory of total quality management so as to explore whether the model of “WeChat Plus Outpatient Medical Services” can be used to solve the dilemmas of “overcrowded” hospitals and of “three long times and one short time” in outpatient services of large public hospitals.

2.5 Research Questions

On April 12th, 2018, it was broadcasted on the Morning News of China Central Television that Premier Li Keqiang of China convened an executive meeting of the State Council of the PRC. He determined the measures to develop the Internet Plus healthcare so as to alleviate the problems in seeking medical treatment and improve the health of the people. He said that China would accelerate the Internet Plus health care development which would improve the efficiency of medical services, save the patients from going to many places for medical treatments, provide convenience for the patients and offer more people the access to quality medical resources. In the meeting, it was determined to accelerate the provision of online services such as appointment for medical treatment and enquiries about the results of check-ups by secondary hospitals or above, and strengthen the supervision of the quality of medical services and the information security (General Office of the State Council of the People’s Republic of

China, 2018).

This research conducted a case study based on the "T" hospital aiming to answer the following research questions:

RQ1: Whether the model of “WeChat Plus Outpatient Medical Services” used by the “T” hospital can solve the problem of “three long times and one short time” in medical services?

RQ2: How should the “T” hospital teach the patients and its medical staff to use the “WeChat Plus Outpatient Medical Services” to solve the problem of “three long times and one short time”?

RQ3: Whether the patients will become more satisfied with the “T” hospital after it has implemented the model of “WeChat Plus Outpatient Medical Services”?

RQ4: Whether the medical staff will become more satisfied after the “T” hospital has implemented the model of “WeChat Plus Outpatient Medical Services”?

2.6 Chapter Summary

This chapter describes the history of the reform of the medical system and the development of the pattern of medical services since the founding of the People’s Republic of China and also conducts a comparative analysis of the medical systems at home and abroad. In this way, this chapter explains the causes of the dilemma studied in this research and the historical facts that have existed for a relatively long period of time. The chapter also expounds the significance and the urgency of the research on the dilemma of “three long times and one short time” in outpatient services of large public hospitals. It is put forward that the current solution to this dilemma in medical services can only be to improve hospital services, carry out appointments for medical treatment, improve procedures for medical services and enhance the efficiency of medical services. Furthermore, since this research conducts a study on Internet Plus healthcare services based on the theory of total quality management, the research topic and research questions of whether the model of “WeChat Plus Outpatient Medical Services” can be used to solve the dilemmas of “overcrowded” hospitals and of “three long times and one short time” in outpatient services of large public hospitals are advanced.

Chapter 3: Literature Review and Theoretical Framework

3.1 Theories in Total Quality Management

Our research on Internet medical services is based on theories in Total Quality Management (TQM). Relevant theories include TQM, Business Process Reengineering (BPR), and Customer Satisfaction (CSAT).

3.1.1 Introduction

Joseph M. Juran, the renowned American expert in quality management said that, “My belief is that historians in later decades will look back on the 21st century as the Century of Quality, much as the 20th century has been the Century of Productivity” (Juran, 2013).

In March 1982, Dr. Joseph M. Juran visited China and gave a lecture in the auditorium of Beijing-based Capital Iron and Steel Company. In his lecture, Juran pointed out that the good or bad quality of the products is defined by users or customers in the market (Juran, 2013).

Juran regards quality as fitness for purpose (Juran, 2013). He believes that both products and services should fit its purposes to satisfy the demands of the customers and improve their satisfaction as well as sales revenue. Meanwhile, this fitness can avoid poor quality and performance, which facilitates to reduce error rate, customer dissatisfaction, and cost.

In ISO 9000:2000 Quality Management Systems Fundamentals and Vocabulary, an international standard, International Organization for Standardization (ISO) defines quality as “degree to which a set of inherent characteristics fulfills requirements” (Chen, 2014). Therefore, a product or service that better fulfills the requirements of the customers has a higher quality.

3.1.2 Quality Management

Juran (2013) points out that quality management is a series of operations to realize the fitness of the organization, which includes planning, organizing, leading, and

controlling. These operations include the process of formulating quality policies and quality objectives, planning for quality, quality control, quality assurance, and quality improvement.

Dr. Juran believes that to achieve satisfactory quality, organizations should start with building visions, policies, and objectives. In the process of quality management, the process of planning for quality, quality control, and quality improvement formulates the main contents of quality management, which is also called as the Juran Trilogy (Juran, 2013). The Juran Trilogy represents the general principle required in producing high-quality products and providing high-quality services.

The general principle followed by quality management is suitable for organizations of all types, including companies, institutions, enterprises, government departments, schools, and hospitals.

Another typical process model of quality management is the PDCA cycle, which is a process generally applied to improve quality and will be further elaborated into concrete management procedures. The PDCA cycle includes four steps, namely, plan, do, check, and action (Chen, 2014).

3.1.3 Concept of Total Quality Management

Total quality management is achieved by constantly enriching and developing theories and practices of quality management, which is a management method and approach to focusing on quality with all employees participating and continuous improvement to better serve the society.

In the ISO 8402:1994 international standards, TQM is defined as “A management approach of an organization, centered on quality, based on the participation of all its members and aiming at long-term success through customer satisfaction, and benefits to all members of the organization and to society.” (Chen, 2014)

Enterprises implementing TQM universally acknowledge the advantages of this method. The remarkable results of implementing TQM can be summarized as high quality, low cost, high returns, customer loyalty, and employee empowerment.

3.1.4 The Formation and Current Development of Theories in TQM

3.1.4.1 The Proposal of Total Quality Management

Total quality management (TQM) was first proposed by Dr. Armand V.

Feigenbaum, head of the quality control department at the US General Electric Company in his book, Total Quality Control, published in 1961. Immediately, this theory has been applied in different countries and brought remarkable results (Li, 1998).

3.1.4.2 The Three Stages of Development in Quality Management

The first stage: quality inspection. After the second industrial revolution, supervisors in the factories not only focused on increasing quantities of the products but also paid attention to improving quality of the products. Frederick Winslow Taylor, father of scientific management theory, is the first to bring quality inspection into practice. He suggested separating the production and inspection of the products and setting up fixed inspectors as foremen to inspect quality of the products. As the production scale has been expanding, capital firms set up management systems appointing specific responsibilities to specially-assigned persons, including personnel for planning, operating, and quality inspection. Meanwhile, in the system, professional inspectors or test departments will be assigned to examine quality of the products. This is a feedback control method of quality management through strict inspection procedures (Yi, 2003).

The second stage: statistical process control. The early method of back-testing on quality just picked out and counted the substandard products, which cannot reduce the incidence rate of substandard products in the manufacturing process. In view of such circumstances, some famous statisticians in the US suggested to apply statistics in the manufacturing process to solve these problems. W.A. Shewhart from Bell Labs was a representative of the above technicians, who put forward the concept of defect prevention and the method of control chart to control quality. Shewhart believes that apart from the final examination, the process of quality control should include the prevention in the production. However, Shewhart’s theories have not been valued at that time.

During the Second World War, many civil companies in the US started to produce military supplies. However, these companies could not pre-control quality of the product, which led to frequent failures. To guarantee the quality of military supplies, these American companies employed professional engineers to formulate a wartime standard of quality control in production on the principles of mathematical statistics, which has made great achievements (Yi, 2003).

The third stage: total quality management. In the mid and late 20th century, with

the emerging campaign of consumer rights, there has been an intensifying competition in the global market, which drew the international society to attach importance to quality of the products. Behavioral science theory proposed in the 1960s laid emphasis of individuals’ importance in management and analyzed quality issues from a systematic perspective. After theories in TQM have been suggested in 1960s, different countries have their own innovation based on the actual national conditions, which has made fruitful achievements (Yi, 2003).

3.1.4.3 The Development of TQM in Different Countries

(1) Japan

There was an economic recession in the postwar Japan and the country was also facing the great challenges of satisfying the domestic demands of consumers. Japan rebuilt its postwar economy before 1950. In July 1950, Dr. Deming gave lectures on quality management in Japan and promoted the American experience of quality management. This brand-new method of quality management was praised highly in Japan, which started a craze of quality control in Japan (Yu, 2012).After 1960s, based on the actual situations inside the country, Japan redefined the concept of quality control into company-wide quality control (CWQC), which emphasizes to education and training and internal audit. As quality management has been promoted, QC group, a creative quality organization started to prevail in Japan. The group focuses on independent management system and control quality by applying statistic tools (Liang, 2010). Because of the quality revolution carried out in 1950s, quality of the products in Japan has reached the level of the western developed countries in 1970s. Japanese started to consider quality control as a science and total quality management has been further developed during this period (Ar, 2012).

(2) The US

Taylor’s theories of scientific management provide scientific guiding theories for factories to improve their production efficiency but lay little emphasis on quality of the products. After the Second World War, the manufacturing industries in the US have come to the peak. However, in 1970s, US’s predominance in the global market was threatened by foreign countries, and quality of the Japanese products started to surpass the US products. The prevalence of total quality management originated by the early 1970s (Schier, 2002). Well-known scholars of quality control in the US include Joseph M. Juran, Philip B. Crosby, and W. Edwards Deming. Juran contributed to total quality

management by introducing the Pareto principle into quality control and proposed the Juran Trilogy (quality planning, quality control, and quality improvement) and the concept of fitness of quality. He dedicated to laying the theoretical foundation and suggesting basic methods for TQM (Han, 2009). Crosby suggested the concept of zero defects. He pointed out that quality should be guaranteed at the first time and he emphasized the continuous improvement of quality management. Moreover, he founded the Crosby Quality College, which became the largest TQM consultancy worldwide in the 1980s (Krüger, 2001). Deming's 14 points for management lays a solid theoretical foundation for TQM in the 21st century. He was the first to suggest the concept of PDCA cycle and Deming Prize, named after Deming, remains to be the top honor of quality management in Japan at present (Petersen, 1999).

(3) Germany

After the Second World War, to raise its productivity, Germany formulated a national product recognition standard for quality management and the improving quality of the products is considered important to raise the national productivity (Krüger, 1999).

Quality control institutions have been significant in promoting TQM in Germany and the most authoritative institution is the Deutsche Gesellschaft für Qualität (DGQ), which not only promotes and carries out the ISO 9000 policies and standard, but also plays a positive role in the training of professional talents in quality control (Yang, 1997). Apart from focusing on the strict control on the quality standards, Germany also attaches importance to formulating development plans from a national level, which provides policy support and talent base for improving quality of the products. Statistics show that the rapid rise of postwar economy in Germany is closely connected with its strict quality standards. In 1990s, the sales volume of German brands ranked first among western developed countries (Research group from Shanghai Academy of Quality Management, 2011).

(4) China

The research on quality management in China started in 1950s. The year of 1978 witnessed the pilot work of total quality management in Beijing. After a successful trial, TQM has been widely spread and applied nationwide (Liu, 1990).

In 1880s, with the guidance of the government, TQM succeeded to be promoted and applied in large and medium-sized industrial enterprises (Song, 1989). After 1990, China started to implement ISO9000 quality standards and certification system on

quality system. Product Quality Law of the People’s Republic of China issued in 1993 marks that the quality work in China has started to be institutionalized and legalized. Hitherto, total quality management has made remarkable achievements in China, which has become one of the most successful and influential models of introducing foreign cultures into China after the reform and opening-up.

3.1.4.4 The Application of TQM in Medical Institutions

Theories in TQM is a management model applied in enterprises and the application of TQM theories in medical institutions remains to be on the stage of exploration in China at present (Han, Li, Gao, & Ma,2006). Applying TQM in medical institutions aims at promoting hospitals to construct a safe, effective, and satisfying medical environment that focusing on the patients. Moreover, the application targets at improving administrative efficiency and service attitude, reducing medical costs, improving the hospital quality, and beautify the overall environment (Yu, &Zhang, 2006). By applying statistics to control quality, TQM quantifies quality inspection. Moreover, through the basic working method of TQM, which is the quality control cycle of PDCA, TQM attaches significance to continuously improving quality in the process of the control.

The application of TQM management method in medical institutions has achieved great progresses. In 1992, Taiwan introduced the concept of TQM into the management of medical institutions and there are several hospitals and clinics in Taiwan have passed the verification of ISO9002. At present, the government in Taiwan has required that all hospitals should fully implement TQM (Xu, 2004). Bethlehem Hospital in Aachen, Germany is one of the earliest hospitals participating into the TQM pilot work in Germany. Since experimenting TQM mode in 1999, the hospital has achieved positive results in terms of simplifying the administrative structure, improving work efficiencies in all departments, promoting the standards with a top-down approach, implementing quality control in a scientific way, and continuously as well as dynamically improving quality (Xia, 2004). In her research, Qin found that implementing TQM in healthcare work can effectively improve patient satisfaction and reduce the incidence rate of errors as well as conflicts in the healthcare. Therefore, she suggested to widely promoting the application of TQM (Qin, 2015).

There are also various research results of applying TQM theories in medical industries outside China.

By interviewing 12 administrators in three hospitals, Andrea Chiarini and Claudio Baccarani found that through specific implementation paths, TQM theories and Lean Management Theories can improve patient satisfaction and hospital performance (Chiarini & Baccarani, 2016). Through in-depth interview with administrators who carry out TQM theories, Ali Mohammad Mosadeghrad noticed that the implementation effect of TQM depends on administrators’ abilities to accept and adjust the values and concepts in professional medical institutions. Plus, the biggest obstacle to successfully implement total quality management is the problem among human resources, culture, and strategies (Mosadeghrad, 2016). UcheNwabueze stressed that by controlling some implementation phases and factors in advance, TQM can ploy a positive role and the most important thing is to reshape the attitude and break the rules. Therefore, administrators in the hospitals themselves should believe that TQM is necessary (Nwabueze, 2014).

TQM has been universally acknowledged in improving quality of medical services and the competitiveness of the hospitals. How to better implement TQM in hospital administration has become a research focus of management experts in the hospitals.

3.2 Theories in Process Reengineering

3.2.1 Introduction

According to PetroniiArbitiSatyricon, it is recorded that in AD65, the Roman General Gaius Petronius once said that although they have trained hard, they have to reorganize in every formation. Later, they gradually realize that they always choose reorganizing to cope with various conditions. Reorganizing is so amazing that although it reduces their efficiency and morale, they remain to feel that we have made progress.

In 1993, Peter F. Drucker pointed out that reengineering is a new idea worth following.

At present, business process reengineering (BPR) has been widely applied in the administration of enterprises. To improve efficiency, BPR has been proved to be effective in many enterprises.

Likewise, the improvement of medical procedures in a hospital not only improves efficiency but also improves the medical experience of the patients.

3.2.2 The Concept of Process

Process is defined as one or a series of continuous regular operations that are implemented in a deterministic way, which results in the realization of specific results; one or a series of continuous operation (Oxford, 1978).

The simplest process consists of a series of separate tasks and an input turns into an output after the process. The process will treat the inputs by transforming or transferring into outputs or just looking after it to let it pass and the inputs will be output in its original form (Scherr, 1992).

Process can be inspected from its scale and its scope. The scope of a process refers to the number of organizational units that the process goes though, such as business sectors or function departments (Peppard & Rowland, 2003). A single department can be called as narrow scope while multiple departments can be considered as wide scope. Meanwhile, the scale of a process depends on its service contents. Some processes just consist of several simple tasks while some may cover numerous complicated and interrelated tasks (Peppard & Rowland, 2003).

3.2.3 The Concept of Business Process Reengineering

Services in the hospitals are provided through a series of highly complex processes. Hospitals can be regarded in the same way as enterprises, both futures can be planned and developed through strategic processes, including strategic planning, developing products or services, and exploring other new processes. The daily function of organizations can be realized through operational processes, including customer satisfaction, customer support, and payment management. Meanwhile, the implementation of strategic processes and operational processes can be supported through enabling processes, such as the administration on human resources and information systems. Processes on every layer can be split to the lower level until the processes are divided into single task.

3.2.4 The Relationship between TQM and BPR

TQM also emphasizes the significance of processes in improving quality. Dr. W. E. Deming (1986), one of the most renowned masters in quality control pointed out that "Based on my experience, it is estimated that a majority of problems and opportunities to improve, with a percentage of 94%, belongs to the system. Problems caused by

special reasons just account for no more than 6%." The system in Deming's words is the same as processes, which is the way to complete the work instead of focusing who is doing the job. TQM mainly focuses on talents and technologies instead of processes but TQM and BPR are similar in focusing on customers. In the process of emphasizing quality, TQM covers more customers into the process (Peppard & Rowland, 2003).

By applying principles of BPR, hospitals reorganize and redesign the medical procedures for the patients, covering more patients into the new medical procedures to improve the medical experiences, improve the medical performance as well as the quality of medical services, and increase the patient satisfaction.

3.3 Theories in Customer Satisfaction

3.3.1 Introduction

The ISO9000 standards define customer satisfaction as customer’s perception of the degree to which the customer’s requirements have been fulfilled (Chen, 2014). Customer satisfaction is a process of psychological feeling, which is a perception and evaluation both subjective and objective. The process also covers diverse requirements and expectations. Table 3-1 lists definitions of customer satisfaction (Jiao, 2017).

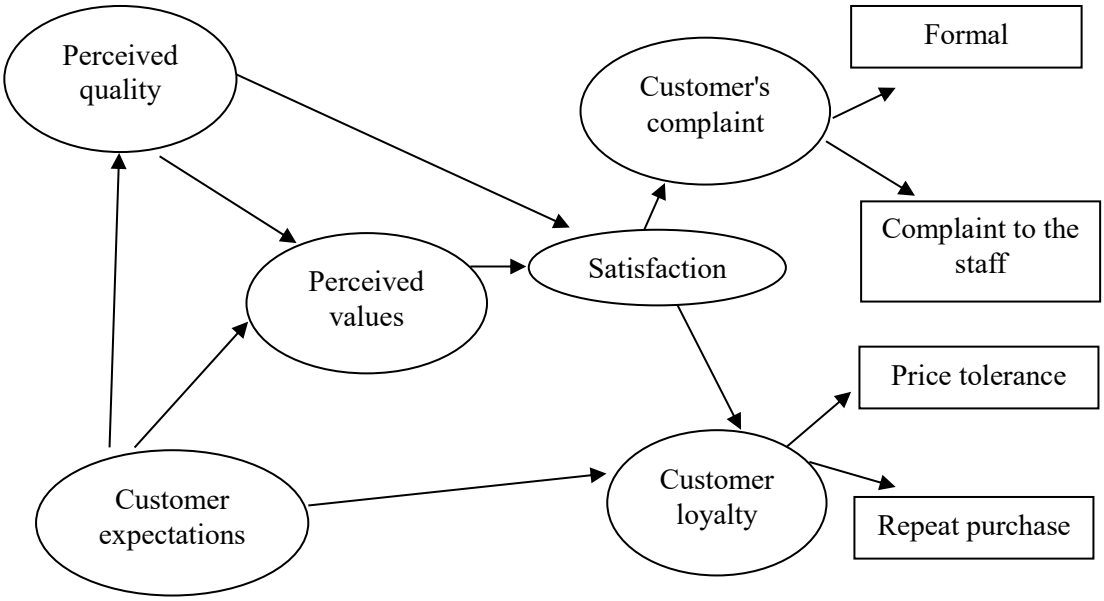
3.3.2 Customer Satisfaction Factors

Customer satisfaction is determined by three factors, namely, customer perceived quality, customer expectations, and customer perceived values (Chen, 2014). Figure 3-1 shows the customer satisfaction model.

Table 3-1 Summary of researchers on customer satisfaction, their times, and the definitions of customer satisfaction(Collected by Jiao, 2017)

Cardozo (1992)	Evaluation on the products should be included into customer satisfaction.
Westbrook (1991)	The inductive definition of customer satisfaction is the satisfaction produced by the subjective judgment of the customer on the products.
Engel (1995)	Customer satisfaction is a comparison of assessment before and after the consumption.
Parasuraman (1994)	Customer satisfaction is a function that calculates quality of the services as well as products and prices.
Ostrom and Iacobucci (1995)	The high or low customer satisfaction is not absolute, which is supposed to be determined by the comparison between quality of the products or services the customers obtain and the cost of gains and purchasing.
Oliver (1993)	Customer satisfaction is judgment of customers on products and services.
Churchill (2009)	Customer satisfaction is the degree that the products or services fulfill the requirements of the customers.
Veljković and Marinković (2010)	Customer satisfaction originates from the situations that the quality of products and services should be constantly improved, which is forced by the fierce competition and high demands from the modern consumers.
Falkenreck (2011)	Perception and innovation are significant component and characteristics of customer satisfaction.
Rajic and Dado (2013)	Customer satisfaction represents quality of the services and customers' behavioral intentions.
Jeonghoon and Hansuk (2013)	Brand loyalty is the result of customer satisfaction and the concept of customer satisfaction includes customers' level of satisfaction on the brands.
Keiningham (2014)	Customer satisfaction includes customer loyalty, consumption habits of the customers, market shares, and customer satisfaction. This can help enterprises providing services for the niche market.
ŠusterErjavec (2015)	Customer satisfaction originates from customer loyalty.
Pinto (2015)	Customer satisfaction dates to the promotion of social media and quality of the services.
Kaur and Sharma (2015)	The definition of customer satisfaction in information environment originates from the six dimensions of quality of the e-services: Namely, information, design, individualization, security, accessibility, and reliability.
Pulles (2016)	The primary component of customer satisfaction is the satisfaction to suppliers of the services and attraction to the customers.
Makanyeza, Macheyo, & Toit (2016)	Customers' perception of the necessity of the products, the perceived value, and emotional attitude are key components and characteristics of customer satisfaction.

Figure 3-1 Customer satisfaction model

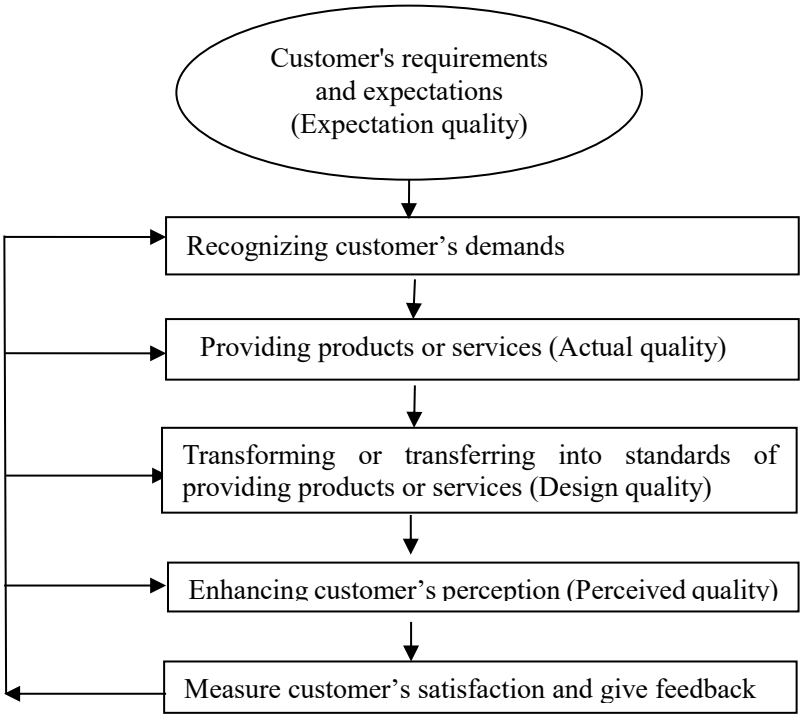


Source: Chen (2014)

3.3.3 The Process to Realize Customer Satisfaction

Customer's requirements are transformed or transferred into customer's satisfaction through a systematic process (Chen, 2014). Figure 3-2 shows the process to realize customer satisfaction.

Figure 3-2 The process to realize customer satisfaction



Source: Chen (2014)

The difference between the expected quality and the actual quality of the services the customer receives shows factors that influence customer satisfaction and provides references for administrators to improve customer satisfaction.

3.3.4 Customer Satisfaction Models

3.3.4.1 KANO Model

In 1979, Professor Noriaki Kano from Tokyo Institute of Technology published an article called Motivator and Hygiene Factor in Quality, in which he firstly introduced the standards of satisfaction into the field of quality control. Kano Model measures customers’ demands from three levels. The first one is the basic demands, which refers to the demands that the customers are bound to have. The second one is the expected demands, which means that the providing services and products should meet the quality expected by the customers. The third one is the attractive demands, which refers to the function of the services or products that exceeds the expectation of the customers (Luor, Lu, Chien, & Wu, 2015).

3.3.4.2 SERVQUAL Model

In their work A Conceptual Model of Service Quality and Its Implication for Future Research, coauthors Parasurama, Zeithaml, and Berry proposed the theory of service quality gap. The SERVQUAL Model measures customer satisfaction from five dimensions of service quality, namely, tangibility, reliability, assurance, responsiveness, and empathy. SERVQUAL Model emphasizes to measure customer satisfaction by the theory of differences between customer perception and the service quality expected by the customer instead of measure customer satisfaction from various dimensions comprehensively (Parasuraman, Zeithaml, & Berry, 1985).

3.3.5 Theoretical Models of Customer Satisfaction Evaluation

Customer satisfaction index (CSI) is a model based on the principle of customer satisfaction. By combining factors that influencing customer satisfaction into a connected network, the model evaluates customer satisfaction, which is a logical structured model created based on the process of consuming products or services.

3.3.5.1 Models of Customer Satisfaction Evaluation outside China

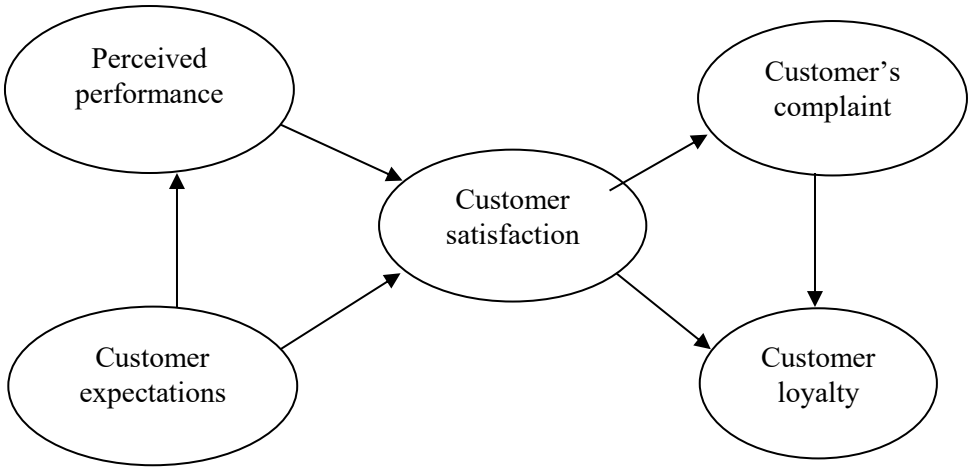
The history of studying customer satisfaction model can be divided into four stages,

namely Sweden (Fornell & Johnson, 1992), the US (Fornell, 1996), (Eklof & Westlund, 1998), and public sectors in the US (ASCI, 1985).

(1) SCSB Model in Sweden

The Swedish SCSB Model was proposed by Fornell and his colleagues from University of Michigan in 1992, which was the first nationwide CSI model in the world (Fornell & Johnson, 1992). Figure 3-3 shows the framework of the model.

Figure 3-3 The framework of Sweden customer satisfaction barometer (SCSB).

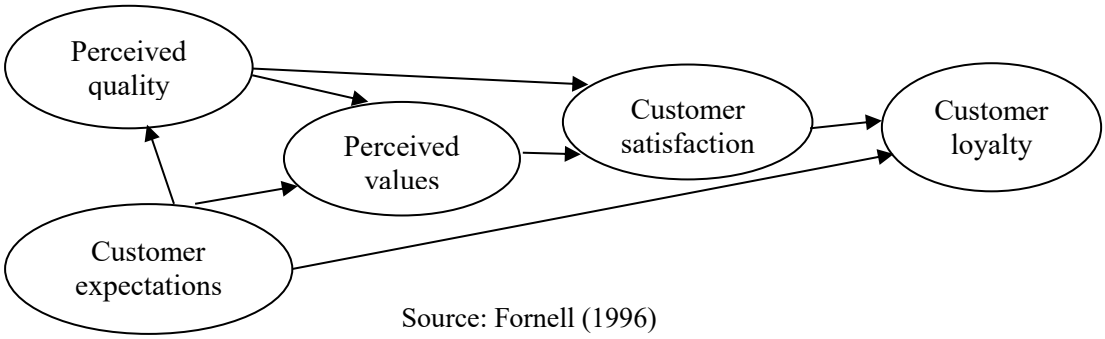


Source: Fornell and Johnson (1992)

(2) The ACSI Model in the US

In 1996, Fornell proposed American Customer Satisfaction Index (ACSI) model based on his research on the Swedish SCSB model (Fornell, 1996). Figure 3-4 shows the framework of the model.

Figure 3-4 The framework of American customer satisfaction index model.



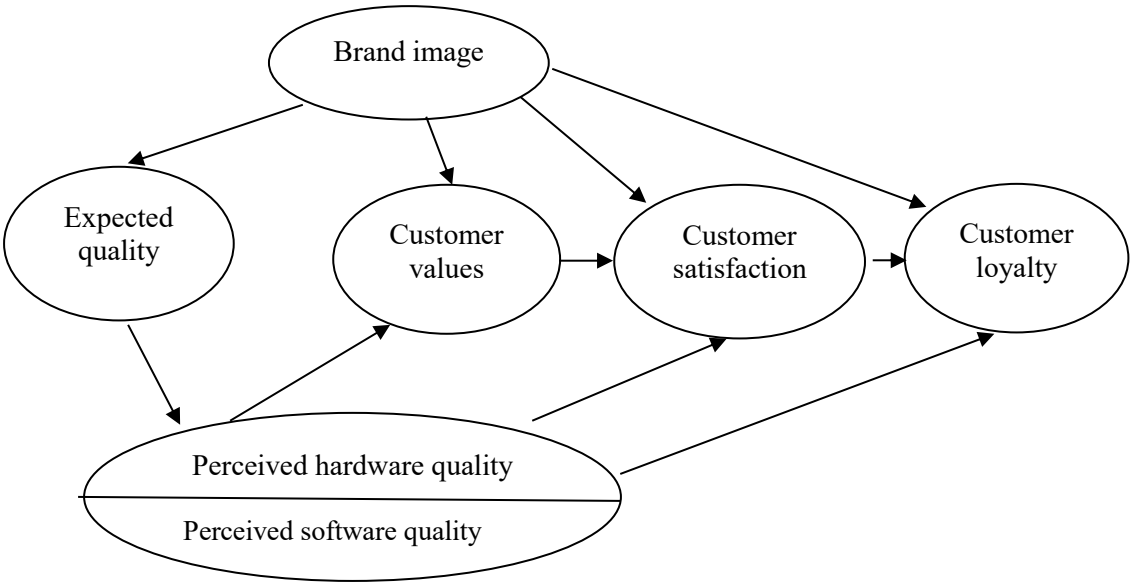
Source: Fornell (1996)

(3) The European Customer Satisfaction Index (ECSI) Model

In 1999, Eklof and his colleagues proposed ECSI model based on the ACSI model

(Eklof & Westlund, 1998). Figure 3-5 shows the framework of the model.

Figure 3-5 The framework of ECSI model.

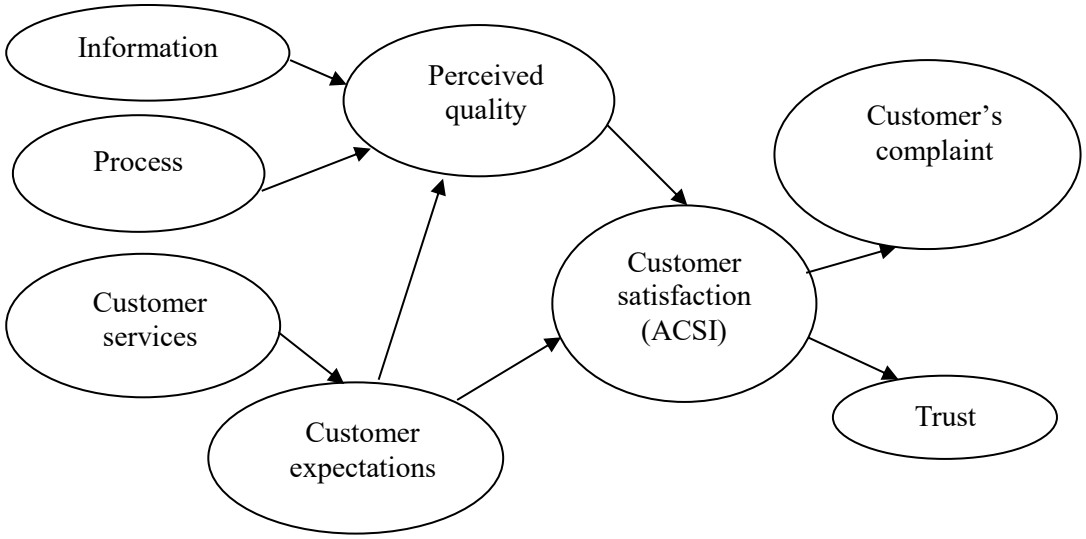


Source: Eklof and Westlund (1998)

(4) The ASGI Model

After 1980, the ACSI model has been applied to public sectors around the US, which resulted in the establishment of ASGI model (Wingo, 1985; Fierman & Carvell, 1995). Figure 3-6 shows ASGI model.

Figure 3-6 The framework of ASGI model.

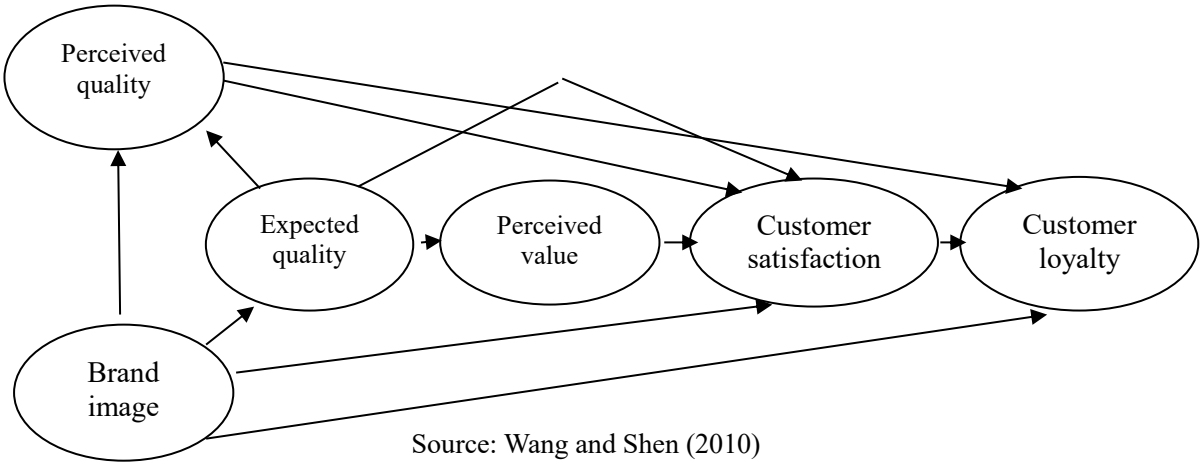


Source: ASCI (1985)

3.3.5.2 Theoretical Models of Customer Satisfaction Evaluation in China

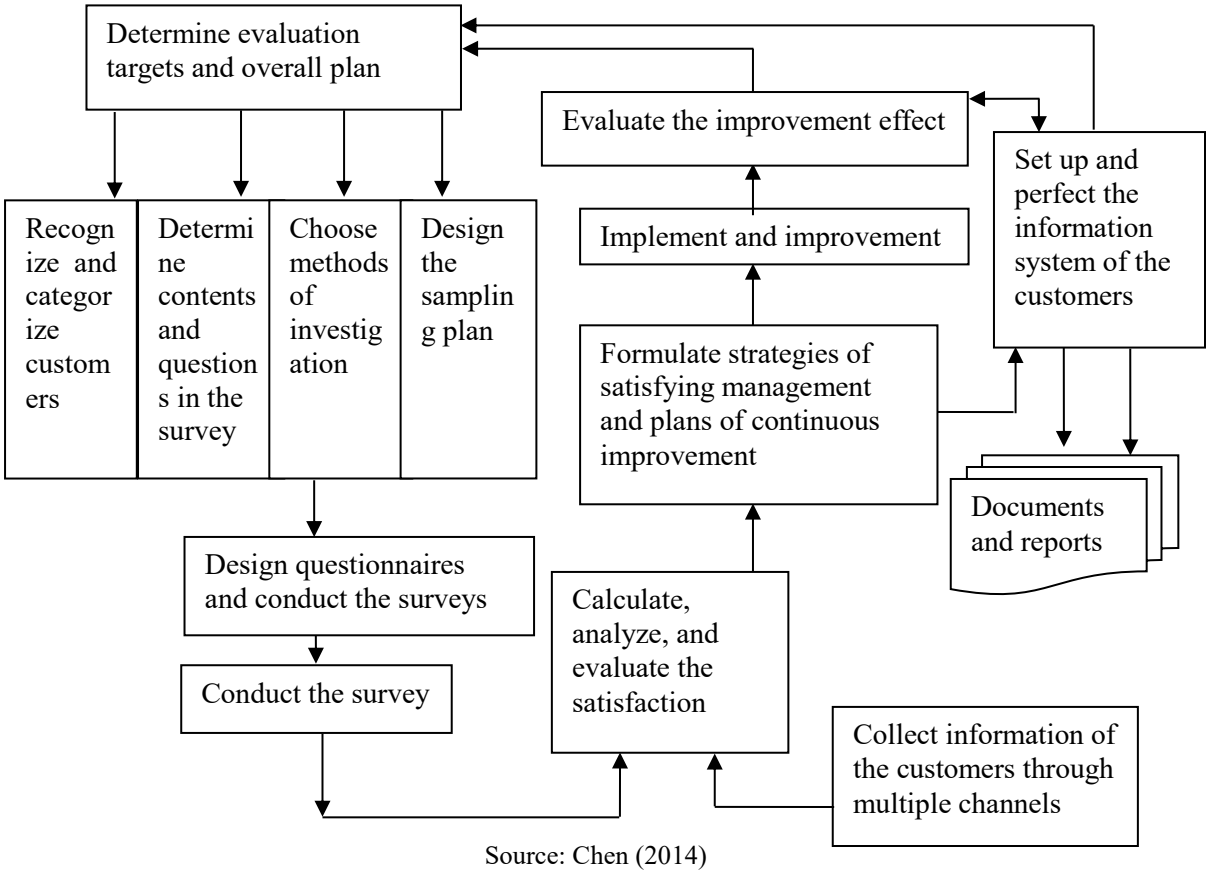
Based on the above models, Chinese Customer Satisfaction Index is constructed by Tsinghua University on China's actual conditions. The most representative model, the CCSI model, is proposed by the School of Management in Tsinghua University. Figure 3-7 shows the framework of the model (Wang & Shen, 2010). Tsinghua University's evaluation of customer satisfaction is shown in the figure 3-8 (Chen, 2014).

Figure 3-7 The framework of CCSI model



Source: Wang and Shen (2010)

Figure 3-8 Evaluation on customer satisfaction by Tsinghua University



Source: Chen (2014)

3.3.6 Statistical Analysis on Customer Satisfaction

Customer Satisfaction Index

To determine the level of satisfaction, the model applies econometric model and sampling statistics, which results in quantitative indicators that are aggregated or recursive, reflecting the index of satisfaction.

Enterprises start from the target of improving customer satisfactory, applying average values or weighted average to calculate satisfaction when they only compare the changes of satisfaction in various periods (Chen, 2014).

The calculation methods may be different based on the various purposes and comprehensive satisfaction index is to emphasize the score of overall efficacy with a simple number.

3.4 Internet-Based Medical Services

3.4.1 The Concept of Internet-Based Medical Services

Internet-based medical services is the name of a new-type medical and healthcare service industry that is supported by the Internet by means of information technology (including mobile communication technology, cloud computing, Internet of things, and big data) and integrated with traditional medical and healthcare services (Meng, Yin, & Liang, 2016).

3.4.2 The Proposal of Internet-Based Medical Services

The Internet-based medical services originate in America, which develop from remote medical consultation. In 2013, the Affordable Care Act (ACA), known as the Obamacare, implemented by the Obama administration, brought value-based healthcare as the reference for the government to compensate and pay by means of medical insurance, which promotes the explosive growth of Internet-based medical services (Lai, &Chen, 2017). In the US, as a typical medical approach to control the expenses, Internet-based medical services can save one billion US dollars annually. It is estimated that Internet-based medical services will save 30 billion US dollars for the whole medical system in the US by 2017(Meng, Yin, &Liang, 2016).

3.4.3 The Current Development of Internet-Based Medical Services outside China

The US: A new round of craze of Internet-based medical services prevail the US. After ACA has been released, the service value-oriented medical payment mode becomes the mainstream, which makes Internet-based medical services a key concern of the society (Meng, Yin, &Liang, 2016).

The mature application of Internet-based medical services in the US has covered the whole medical services. Apart from the long-distance medical services targeting remote regions, including stroke care, intensive care, diagnosis for infectious diseases and department of dermatology (such as TeleDoc), there are other seven services, namely services based on the communication between doctors and patients (such as Health Tap) , services based on chronic diseases management (such as BlueStar), services based on healthcare management (such as Fitbit), services based on remote monitoring on patients discharging from hospitals (such as Helius), services based on communication between doctors (such as Epocrates References), services based on the data consolidation among medical and healthcare institutions, services based on the optimizing sales of medicine (such as Walgreens) (Meng, Yin,& Liang, 2016).

The rapid development of Internet-based medical services in the US is benefited from flexible practice of physicians, the developed commercial insurance system, and the relatively sound legal and regulation system in the US (Meng, Yin, &Liang, 2016).

In supervising service behavior, by enhancing the registration of the physicians and confirming the identity of both physicians and patients, the US ensured the qualifications of physicians serving in the Internet-based medical service system. In applying technology, referring to the principle of monitoring medical equipment, the US supervises the wearable devices and mobile terminals from three categories, paying special attention to monitor the equipment and application that involving life safety. In protecting the data security and privacy of the users, the US issued special acts such as The Health Insurance Portability and Accountability Act and Health Information Technology for Economic and Clinical Health Act, which stipulates information of eighteen types as private information, defined the details including detailed operation of digitalizing medical information, duties and responsibilities of the users, and rights of owners of the information. Moreover, these acts also formulate corresponding punishments and corrective measures based on the negative degree of the privacy leaks. In reimbursing medical insurances, 29 states in the US have formulated telemedicine

act. The federation and 48 states have planned corresponding compensation for telemedicine, which provides guidance for commercial insurance companies to cover tele-medical services into reimbursement (Kulkarni & Malouin, 2016).

The result of a research conducted in Poland shows that the proportion of population participating online healthcare projects has risen rapidly from 41.7% in 2005 to 66.7% in 2007. Nearly half of the citizens in Poland use Internet to collect the necessary health information, which far outnumbers citizens using other medias, including TV, news, and broadcast (Magdalena, 2015). By investigating citizens in seven European countries, researchers found that, users use the Internet to read health information mostly, which follows by choosing doctors and preparing for making an appointment with the doctor. Researches show that using the Internet is a supplement of medical services instead of a replacement (Iveta, Dumitru, Chronaki, Bujnowska-Fedak, Andreassen, & Silvina, et al., 2007). A research conducted in Norway shows that users use the Internet mostly to acquire health information, which is followed by ordering medicine and other products related to health. This also proves that it is possible for the Internet to promote the health of the citizens. Meanwhile, it should be noted that the incorrect health information will enlarge the social gap to acquire health information (Psychol, 2009). In countries such as Israel with a highly developed medical and healthcare system, most medical and healthcare services can be supported by various technologies, such as electronic health records and personal health records, biometric identification, tele-medical equipment, and wired as well as wireless Internet applications focusing on the consumers (Weiner, 2012).

3.4.4 Development of Internet Plus Healthcare in China

3.4.4.1 The Background of Internet Plus Healthcare in China

China's telemedicine started its development in 1980s. The former Ministry of Health issued and introduced such notice and measures on healthcare: Notice on Strengthening the Administration on Telemedicine Consultation in 1999; Measures on Administration of Medical Treatment and Health Information Services Over the Internet in 2001; and Administrative Measures for Internet Medical and Health Information Services in 2009 (the original Measures issued in 2001 was abolished). In 2014, the National Health and Family Planning Commission (NHFPC) formulated the Opinions on the Promotion of Medical Institution Telemedicine Services (Wang &

Zheng, 2016), which is tailored for telemedicine. The development of telemedicine has laid a solid foundation for the smooth development of China's internet healthcare (Ma, 2013).

On March 5, 2015, at the Third Session of the Twelfth National People's Congress, Premier Li Keqiang put forward the "Internet Plus" action plan for the first time in the report on the work of the government, aiming to advance the integration of mobile Internet, cloud computing, big data, Internet of Things, and modern manufacturing industry to promote the sound development of e-commerce, industrial Internet, and Internet finance so as to guide Internet companies in expanding the international market (Li & Yang, 2016).On March 30, 2015, the "Cloud Service Plan for Health China" was strategically proposed in the Outline for the Planning of the National Medical and Health Service System (2015-2020), which requires active application of such new technologies as mobile Internet, cloud computing and Internet of Things to promoting comprehensive health information services and smart medical services (General Office of the State Council, 2015); In July of the same year, the State Council published the Guiding Opinions on Actively Promoting the "Internet Plus" Action Plan, pointing out that we should vigorously promote the emerging consumption mode with Internet as carrier that combines online and offline interaction, accelerate the development of such emerging internet-based services as medical care, healthcare, pension, education, tourism and social security, innovate the mode of government service, and improve the government's capability of scientific decision-making and management level (General Office of the State Council, 2015); On April 12th, 2018, Premier Li Keqiang presided over the convening of the Standing Committee of the State Council where the Opinions on Promoting the Development of "Internet Plus Healthcare" was adopted, calling for strengthening the supervision of the quality and safety of medical service under Internet healthcare from three aspects, namely, clarifying behavioral margin, reinforcing responsibility and enhancing regulatory capacity, and actively releasing policy dividends to deepen the integration of "Internet Plus Healthcare" (General Office of the State Council, 2018).

3.4.4.2 Status Quo of the Development of Internet Plus Healthcare in China

The development of internet healthcare in China has experienced three stages. The first stage aims at saving patients' time and improving hospital efficiency through

optimizing the medical treatment process. The second stage, or medical team collaboration, focuses on establishing cooperative relations between doctors to enable them to better allocate time and share experience and brands (Cong, Yang, Meng, & Gu, 2014). The third stage is to improve the efficiency of the whole medical business chain including medical treatment, medicine and medical insurance (Li & Yang, 2016).

At present, China's Internet healthcare is at the end of the first stage and the beginning of the second stage. And Internet Plus Healthcare in China is instantiated in such respects as appointment treatment, waiting reminder, premium payment. Also, as doctors are increasingly gaining understanding of the Internet, from the promotion of personal brands to online health consulting services, the concept of medical group gradually prevails. Some doctors form some Internet-based teams, providing such services as health consultation, catamnestic follow-up and clinical reservation services (Wang, 2014).

The development of Internet healthcare in China takes on the following characteristics:

(1). Rapid channeling of social capital into Internet healthcare and the increasingly intense industrial competition (Li & Sun, 2016)

In 2016, the market size of Internet Plus Healthcare in China reached 22.3 billion RMB, and the B2C market of medical e-commerce hit 20.3 billion RMB. It is expected that the market growth rate will maintain at around 40% (Meng, Yin, & Liang, 2017). BAT (Baidu, Alibaba and Tencent) has begun to arrange online healthcare in recent years: Baidu has already made strategic investment in "Healthy Road"; Alibaba started from medicines to construct pharmaceutical e-commerce, through which it expanded from medicine O2O to medical O2O, thus establishing a complete closed-loop of pharmaceutical ecology; Tencent acted as a lead investor with an investment of 100 million USD in guahao.com after it had invested 70 million USD in clove garden (Li, 2014). Corresponding with the rapid development of the market is always the relatively hot capital. In China, the total investment and financing in the first three quarters of 2016 was 2.08 billion USD, and the number of investments and financing transactions was 178 (China Information World, 2017). (2). Intensive introduction of relevant policies

In 2015, "Internet Plus" was included into the report on the work of the government for the first time, and then the "Internet Plus" action plan formulated by the State Council promoted the Internet Plus Healthcare as one of the 11 special actions

(General Office of the State Council, 2015). Since then, the government has actively introduced a series of policy documents to push forward the development of Internet Plus Healthcare. In June, 2016, the general office of the State Council promulgated the Guiding Opinions of the General Office of the State Council on Promoting and Regulating the Development of Healthcare Big Data Applications, which requires exploring the new mode of Internet Plus Healthcare, promoting the interconnection and integration of the healthcare information system and the public healthcare data to eliminate the isolated islands of information, so as to create a development environment that advances the safety, standardization and innovative application of healthcare big data, and foster the development of new industrial formats (General Office of the State Council, 2015).

At the same time, national departments and local governments at all levels have introduced supporting measures to promote the healthy development of Internet Plus Healthcare. In October 2016, in the outline of "Healthy China 2030" blueprint, the liberal practice of doctors was put on the national agenda for the first time. Therefore, the free flow and full competition of doctors were promoted (the Central Committee of the Communist Party of China & General Office of the State Council, 2016). In March 2017, NHFPC published new Administrative Measures for the Registration of Practicing Medical Doctors, fully opening multi-point practice system of doctors (NHFPC, 2017).

(3). The Internet medical business model is still in the stage of market inspection and no mature development path has yet been to form (Li & Sun, 2016).

At present, there are still some questions about the degree of recognition of Internet healthcare by patients, profit model, and information security. Nevertheless, a number of representative enterprises with certain market competitiveness have been established in the health management, self-diagnosis, self-treatment, and hospital visit sessions of Internet healthcare (Li & Sun, 2016).

(4).The impact of information on traditional medical institutions promotes the reform of traditional health institutions.

With the impetus of "Internet Plus", local governments actively develop regional medical information platforms based on electronic medical records and the planning of information construction for medical institutions at all levels, ultimately achieving the sharing of information and data. Traditional medical and health institutions transform and explore the medical cluster-based cloud hospital, set up a system for consultation,

referral service and collaboration that integrates mobile Internet, sensing technology, big data technology, as well as other multiple functions, building a top-down framework between grass-roots communities and first-class hospitals at grade 3, such as Ningbo Cloud Hospital (Li & Sun, 2016).

However, the development of China's Internet Plus Healthcare is still facing many challenges. The specific points are summarized as follows:

(1) The lack of related policies, laws and regulatory measures.

In terms of the novel "Internet Plus Healthcare", there are many policies, laws, and regulations that need improvement. For example, there are hidden dangers in users' personal information and health privacy protection. Also, the collection, transmission, storage, and processing of a large amount of data containing users’ privacy between different terminals and platforms have brought data security risks (Li & Sun, 2016).

The application of big data will inevitably give rise to risks of disclosure of patients' safety and privacy information, and the existing irregularity and incompleteness of information supervision and protection measures in the Internet Plus Healthcare industry are another hidden danger that cannot be overlooked in the vigorous development of this industry.

(2).The issue of paying Internet healthcare with medical insurance

Medical insurance only compensates for the expenses incurred by diseases instead by rehabilitation nursing, chronic diseases and health management (Li & Sun, 2016). In the long run, the mode of Internet medical service can slow down the increase of medical expenses. However, without the support of medical insurance, the development of "Internet Plus Healthcare" for the general public will be constrained (Zhu, 2015).

(3).The existing solidified benefits in the medical and health industry, and the measures to encourage doctors and hospitals to participate in Internet healthcare (Li & Sun, 2016).

The existing medical and health service industry has formed a relatively stable interest pattern and an operation mode, and the participation of Internet companies is bound to affect the existing interest pattern. Also, such industry has its own particularities: the barriers and resource monopolies brought about by the professionalism of medical technology have caused certain difficulties for market entrants. Under the current situation, medical staff should also work for the development of Internet companies since it is difficult to establish and promote the operation mode of "Internet Plus Healthcare" by relying solely on the Internet industry

and its capital.

(4).The personnel system has yet to breakthrough

The widespread shortage of professionals is the weak link that hinders the development of Internet healthcare. At present, public hospitals in China are public institutions, and as physicians are unit employees, they are not able to conduct freelance practice, nor can they rely on the market to determine their labor value. Although the country has relaxed the restrictions on doctors' practice, it still takes a long time for doctors to shift their identity from unit employees to freelance doctors, and the advantageous resources of public medical institutions have also deterred current medical workers from entering the Internet industry with uncertainties.

(5).Difficulties in eliminating the isolated islands of information

The Internet healthcare without data support cannot truly reflect its core values. However, the current medical information system is still fragmented and isolated, which is an obstacle that cannot be neglected in the development of "Internet Plus Healthcare". Yet, hospitals do not actively cooperate with the data docking of Internet companies for the protection of internal information and patients’ privacy.

3.4.4.3 Development Trend of Internet Plus Healthcare in China

(1). Closed-loop service.

The Internet Plus Healthcare will undoubtedly improve the situation of fragmented data and isolated business systems generated by existing medical services and their management. Closed-loop service has gradually become the mainstream mode of Internet healthcare service by improving the low efficiency of the split independent services, patients’ experience and medical efficiency (Liu & Chen, 2016).

(2). Online sales of prescription medicines.

In May 2014, the Measures on the Supervision and Administration of Internet Food and Drug Business publicly solicited opinions and formulated relevant provisions on the standards, formats, and validity periods of online sales of prescription drugs. This measure provided "Internet Plus" companies with policy basis to access the pharmaceutical market, and promoted the establishment and development of a drug distribution system characterized with "separation of clinic from pharmacy", affording policy guarantee for the online sales of prescription drugs in the future. Also, the gradual liberalization of online prescription drug sales will bring a broader market space for pharmaceutical e-commerce (Liu & Chen, 2016).

(3).The online payment of medical insurance.

Medical insurance control fee is an important means to effectively control the unreasonable and overly rapid growth of medical expenses, and also a significant embodiment of the implementation of various measures of medical reform. Therefore, the online payment through medical insurance becomes one of the crucial trends in the development of Internet healthcare (Liu & Chen, 2016). In April, 2016, Wuhan Central Hospital achieved the online payment of medical insurance regarding patients' appointment, registration, medical treatment, report checking, and appointment settlement with the help of facial recognition technology. Hence the docking of Internet healthcare and medical insurance took a new step (People.cn-Hubei, 2016).

(4). Greater accuracy of medical services

Under the Internet environment, medical services are gradually presented in a digital form, which not only greatly enhances efficiency, but also increases the communication between patients and doctors. The use of medical information big data can accurately display the entire process of changes in patient conditions and treatment outcomes, thus providing decision basis for precise treatment. Such services will accurately forward patients’ requirements of medical service to doctors, and accurately provide the medical service items to patients, thus realizing two-way accuracy in the process of medical communication and truly achieving accurate treatment (Yu, Zhang, & Zhao, 2016).

(5). Health management will promote the development of personalized healthcare

The real revolution brought about by the Internet Plus Healthcare is the transformation of the health-care model from cure of disease to disease prevention. Through such advanced technologies as cloud computing, Internet of Things, and big data, the collection, calculation, and analysis of health data can be achieved, thereby providing customized health management services for the sake of disease prevention. At present, self-diagnosis, self-administration, extra hospital rehabilitation (chronic disease management) and supervision and management are the primary demands of users. Currently, health management on the market mainly provides users with health statistics, health information and community services through mobile apps and wearable devices.

3.5 Theoretical Framework Analysis of the Study and the Establishment of Conceptual Model

Any enterprise does not exist in isolation but is closely related to social environment and operates in an open system. Hospital is also an open medical institution that provides medical services for the general public and is closely related to the social environment and people. Managers can only pursue excellent performance and higher quality by focusing on the unfulfillmentof internal services of hospital and finding out the links that cannot be effectively managed, so as to respond to the changes in the surrounding environment, changetheir ideas in a timely manner, improve behavioral patterns, and continue tobe better.

3.5.1 The Environment and Change Facing Management Today

Since the 1980s, the world’s political and economic situation and the international environment have undergone major changes, and peaceful development has become the theme of the world. With economic globalization and market competition, the economies of various countries have developed rapidly, and the development of Chinese economy and social changes has even attracted worldwide attention. Gradually, people's consumption demand has become more diversified, the market increasingly fragmented and the service mode increasingly revolutionary. Due to the progress of technology, especially the rapid development of information technology and Internet technology, the world has witnessed great changes. In the past, traditional production organizations were isolated from enterprises and consumers. At present, as long as there is a "Hit" - clicking the mouse, the needs of customers will be immediately transmitted to the network systems of enterprises, thus realizing the mode of "customized service". Also, the development of economy has given rise to the improvement of living standard and education level, and the social values of harmony between man and nature has been formed on a gradual basis. With green economy and industry turning into the theme of social development, the service philosophy of information technology will be changed, hence making green service possible.

This shows that the development of economy promotes the changes of technological updating, and the changes of technology enhance the harmony between man and nature, embodying green service and vice versa.

To provide high-quality service, we must first meet the requirements of customers,

and each customer has his own specific needs, preferences and personalization. In order to gain competitive edges in market competition in this age of Internet, we must offer better price, higher quality, more considerate service with faster speed. Yet the renewal of service concept is inseparable from individual learning and organizational learning. Also, the development of information economy and knowledge economy leads to the fact that the generation and sharing of knowledge has become the necessity of enterprise development. Knowledge becomes the main source of value creation and the basic strength of enterprise innovation, while the constant innovation of creating value for customers puts hospitals in an invincible position.

Therefore, change, customer, and competition are three important forces that drive and influence companies (including hospitals) and affect social and economic activities (Chen, 2014).

3.5.2 Business Management and Total Quality Management Goals

A company is a social economic organization engaged in business activities covering all fields such as industry, agriculture, finance, and services (Chen, 2014). Operating companies involves a wide range of economic activities and functions, including technology, business, accounting, finance, security, and management.

Management refers to the process in which managers of certain organizations coordinate their activities through the implementation of plans, organizations, leadership, and control, and lead people to achieve the organizational goals (Chen, 2014). All concrete activities in this process, namely, the implementation of management activities, have achieved the goal of enterprise management.

To succeed, a company must also have a sound governance structure that properly addresses the issue of incentives and constraints for the enterprise management level.

The creation of high quality products and services that satisfy customers has two important implications for organizations. First, high quality enables organizations to provide products, services, and processes that are superior to their competitors, thus improving their financial performance. Secondly, companies' persistent pursuit of high quality will gradually lead to the formation of an advanced culture of organizational sustainability. Further, activated employees will play a catalytic role in enterprises. They are loyal to their companies and can consciously maintain and comply with the requirements of quality management. Also, they can subjectively and proactively improve their services, so as to promote the development of corporate productivity and

the development of culture.

The goal of a company's total quality management is to create a model of excellent performance. Many service organizations believe that the word "quality" is aimed at the products of companies, but these organizations assert that they cannot provide products as they can only provide services, replacing "service quality" with "excellent service". In order to realize the concept of total quality management, hospitals should provide "excellent service" to patients, thus creating "excellent performance".

3.5.3 European Foundation for Quality Management (EFQM) Excellence Model

In 1992, in recognition of the organizations that had achieved outstanding results in the implementation of total quality management, Europe set up the European Quality Award (EQA) (Chen, 2014).

The European Performance Excellence Model of European Quality Award includes eight core values:

(1). Result-oriented and meeting the needs of employees, customers and stakeholders within the organization;

(2). Be customer-centric and consider customers as the judge of product quality;

(3). The unity of leadership will to effective leading and organization of the unity of purpose and environment within the organization;

(4). The management of process and facts to be coordinated and effectively promoted;

(5). Full participation and development of all employees to tap into their potential and to promote organizational development;

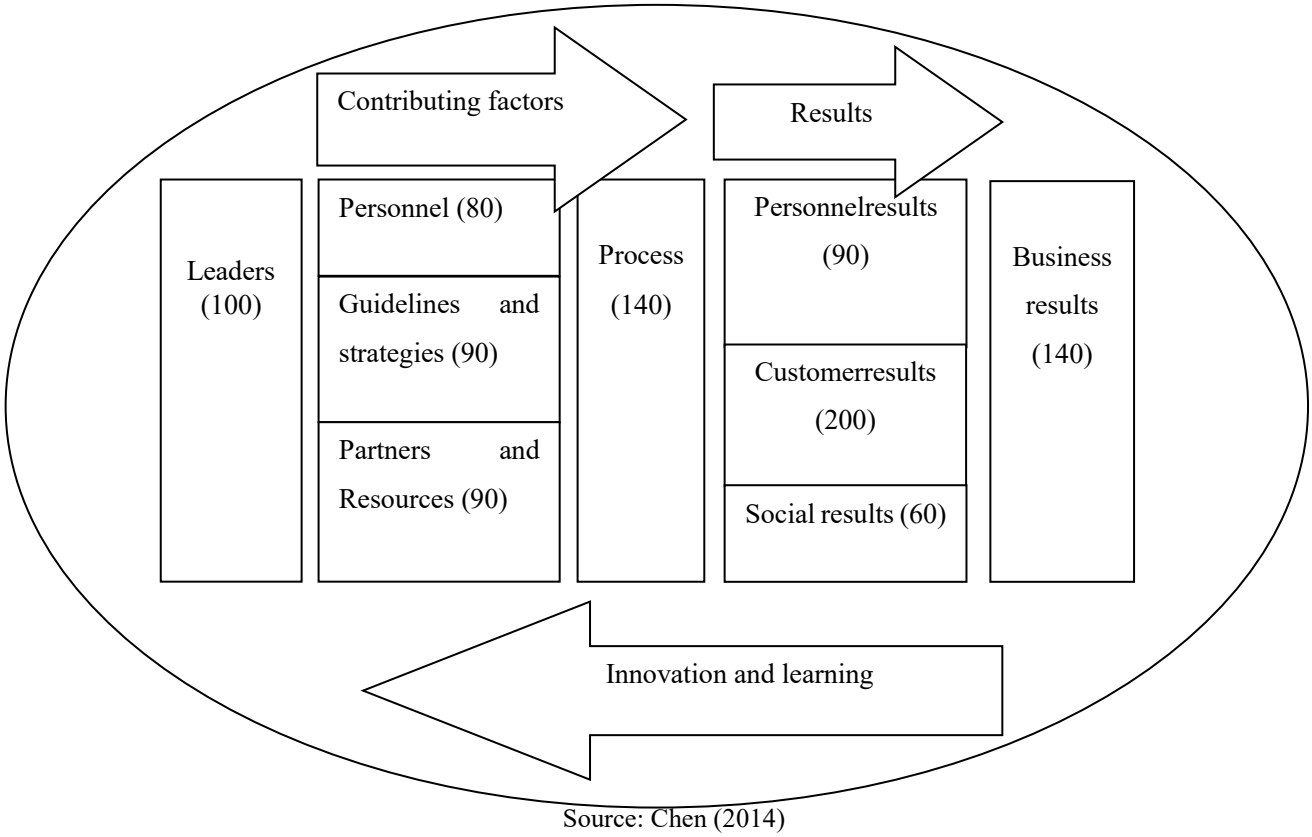
(6). Organizational learning, innovation and continuous improvement to maximize organizational effectiveness.

(7). Partnerships and cooperative organizations to build mutual trust and gain mutual benefit, thus sharing development achievements;

(8). Shouldering social responsibility to achieve legal compliance and to serve the community.

Figure 3-9 below shows the logical model of the European Quality Award (Chen, 2014). It describes the path to organizational excellence from nine aspects and summarizes them into two types of indicators, namely, the contributing factors and the results, of which innovation and learning improvement are contributing factors, so as to achieve the result of excellence.

Figure 3-9 Logical model of the European Quality Award



Source: Chen (2014)

3.5.4 Measurement of Service Quality

Whether the customer is satisfied with the service quality is determined by the experience of the customer of the service. When the customer's perception of the service received exceeds expectations, the service is considered to be of exceptional quality, with the customer showing happiness and surprise. When the service are under expectations, the performance of service is unacceptable. When the customer’s expectations are consistent with perceptions, the quality of service is satisfactory.

3.5.4.1 Quality of service elements

The definition of service quality regards five respects: reliability, responsiveness, assurance, empathy, and tangibility. Reliability: the ability to accurately fulfill service commitments;

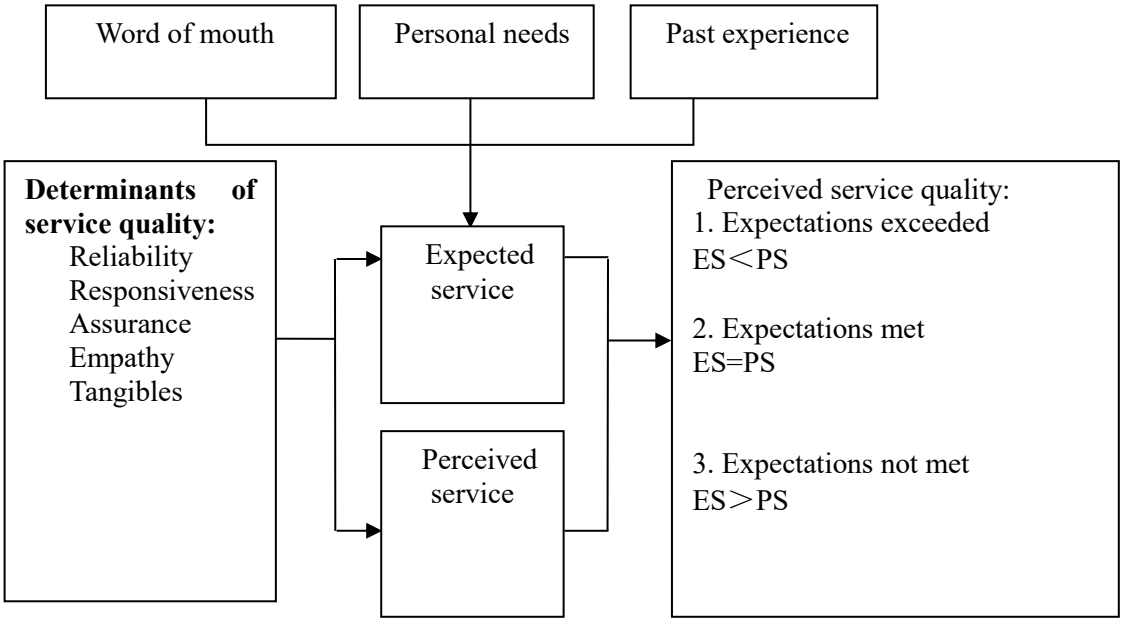
Responsiveness: the willingness to help customers and provide services in a timely manner;

Assurance: employees demonstrate knowledge, confidence and trustworthiness;

Empathy: put yourself in customers’ shoes and pay attention to them.

Tangibles: whether the tangible service environment is satisfying customers. Figure 3-10 shows the perceived service quality (Fitzsimmons, 2003):

Figure 3-10 The perceived service quality.



Source: Fitzsimmons (2003)

3.5.4.2 Service Quality Gap

Service quality gap is the gap between the measurement of service expectation and service perception, and a regular process for service companies or industries to be aware of customer feedbacks. The service quality gap model is shown in Figure 3-11.

It can be concluded that customers' expectation of service is generated through its own experience and the environmental influences. However, managers' perception of customer expectations cannot reflect the actual customer expectations, thus forming the gap between customer expectations and managers' perceptions of these expectations, herein defined as Gap 1. It needs to be improved by conducting market research to facilitate communication, especially the communication with customers and employees, so as to reduce the levels of management, and narrow the gap with customers.

Gap 2 refers to the fact that management does not standardize the quality of service perceived by customers, resulting in inadequate implementation of service standards. This needs to be improved by standardizing the service model through formulating work processes.

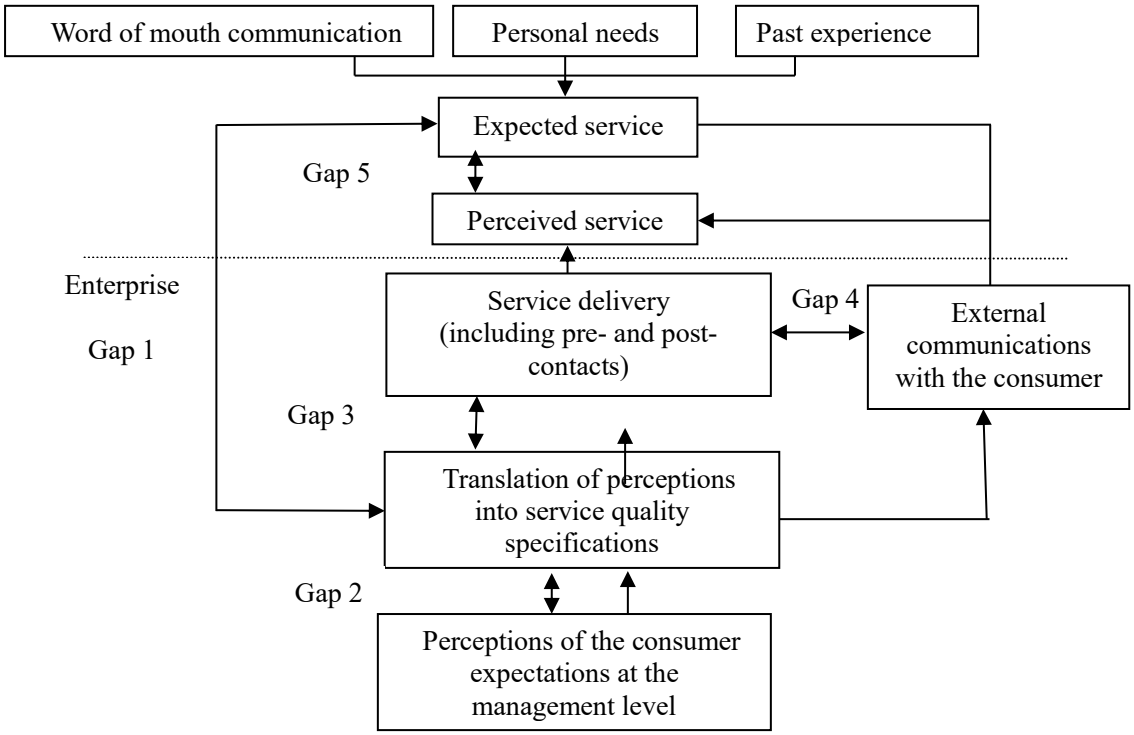
Gap 3 refers to the performance gap of the service that fails to meet the standard of service, which is caused by inadequate staff quality and staff training, the lack of

team management, or irrational processes.

Gap 4 refers to the gap between service performance and service level commitment. It needs to be improved by bettering communication with customers and employees to enhance service quality.

The gap between service expectation of customers and service perception is defined as Gap 5, which is caused by other factors related to service process, that is, it is influenced by the size and direction of other four gaps.

Figure 3-11 The service quality gap model.



Source: Fitzsimmons (2003)

3.5.4.3 Service Quality Measurement

Customer satisfaction is an indicator influenced by many factors, subject to such subjective and objective factors as physical factors, environmental factors, and psychological factors. Therefore, measuring service quality is a challenging task. The influence of service quality is not only limited to direct contact, but it also has the possibility to become long-term influence. For example, medical service not only delivers a service through direct contact, but also affects the quality of life of patients in the future.

A multi-item scale called SERVQUAL has been developed by Parasuraman, Zeithmal and Berry (1985； 1998), to measure the five elements of service quality

(reliability, responsiveness, assurance, empathy and tangibility), which serves as an effective tool to investigate the satisfaction of customers based on the service gap model.

3.5.4.4 Continuous Improvement of Service Quality

PDCA refers to Plan, Do, Check and Action respectively. The PDCA cycle shows that making plans, designing action plans, and implementing them strictly as scheduled. During the process of implementation, we will examine and analyze the results to see whether the plans are feasible and whether the expected results are reached. Then we continue to improve and enter a new cycle.

3.5.5 The Overall Theoretical Framework

Integrating the "quality and customer driven" method with strategic planning activities is crucial to the success of an organization (Juran, 2013). First of all, we should set strategic goals, namely: to solve the dilemma of "three long, one short"(it takes a long time to register, wait for medical consultation and pick up the prescribed medicines while it only takes a short period of time to receive consultation) in hospital to improve patients’ satisfaction.

This study is based on the theory of total quality management and is in accordance with the logical model of European Quality Award. We carry out a service strategy on the basis of total quality management: we develop the "WeChat Medical Treatment Platform of Hospital" with our partners to improve the medical treatment process, reinforce service management and elevate service quality, provide solutions to the above-mentioned medical treatment dilemma --"three long, one short", thus finally achieving satisfactory medical treatment experience for patients. Also, we make full use of the five elements governing service quality, the gap model of service quality, the measurement of service quality and other means to test patients’ satisfaction and the research results. Furthermore, we strive to achieve excellent service level through process control, system management, and the continued improvement of PDCA cycle.

3.5.6 Conceptual Model of Research

Based on the theory of total quality management, the study is carried out according to “The Juran Trilogy” — “quality planning, quality control and quality improvement”. Starting from customers’ requirements and research problems, this study analyzes the causes of the dilemma, puts forward solutions, and reconstructs the medical treatment

process by applying the principle of process re-engineering. The new medical treatment process will be run, monitored and controlled in actual work, inadequacies of which will also be improved. Then the service quality of the new process is measured and the actual results are tested to achieve the goal of improving the satisfaction of customers.

The theoretical framework of this research is shown in Figure 3-12, which is based on the theory of total quality management and starts from customers’ demands to deal with the “Three longs and one short” dilemma of patients. After analysis, it works out 12 links in process re-engineering. Based on the “Juran Trilogy”, namely, “quality planning-quality control-quality improvement”, further consideration is given to the links that require process re-engineering and then improvement measures are put forward, delegating responsibilities to specific departments and stressing the participation of staff members in the hospitals. The strategic process of this research is implemented by learning from the logical model of European Quality Award under the leaderships of hospital directors. By developing WeChat medical platforms with partners, Internet technologies will be covered the whole process of medical treatment. Specific operating procedures will be worked out to improve each link, and through these continuous improvement measures, customers will be provided with high-quality service products, realizing the satisfaction of customers, employees and the society in the end.

This research uses five factors in judging service quality, gap model of service quality, service quality measurement and other means to test the progress and results in the satisfaction of and research on patients by means of questionnaire survey, interview and group discussion. In terms of the “Three Long and One Short” dilemma, the “WeChat plus” medical service action plans are formulated to carry out continuous supervision on the research process. If problems in the research process are discovered, timely solutions will be put forward and process control and system management will be used to infiltrate the concept of PDCA into the whole research, finally delivering excellent services.

3.6 Chapter Summary

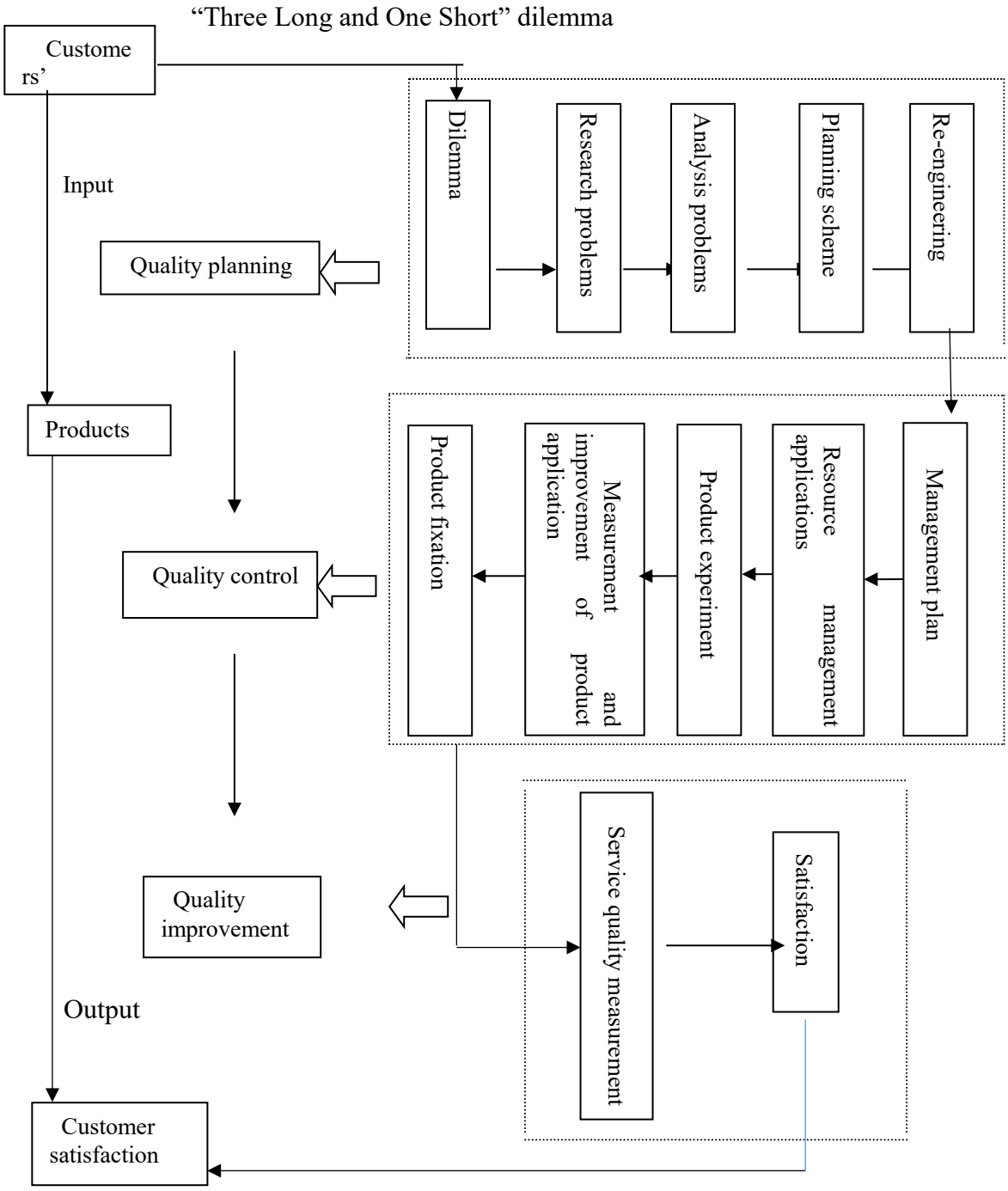
This chapter analyzes the theoretical basis and conceptual model of this study through the description of related theories and literature review. Based on the total quality management theory, this study adopts the approach of business process re-

engineering and the customer satisfaction theory, in accordance with the logical model of European Quality Award and the model of process-based quality management system, to establish its whole theoretical framework and conceptual model.

This chapter conducts an arrangement and review of total quality management, business process re-engineering and theories in customer satisfaction, and consults relevant literature review concerning the history and status quo of the development of Internet plus medical services at home and abroad.

Firstly, this chapter reviews the theories in total quality management, including the concepts of quality and total quality management as well as the origin and development status of the theories in total quality management. Since the proposal of the theory in total quality management by Dr. Armand Vallin Feigenbaum in his book entitled Total Quality Management in 1961, this theory has been immediately accepted and widely applied to all industries in the world. The representative theories in American quality management include Dr. Juran’s Quality Trilogy, Philip B. Crosby’s Zero Defects, and Deming’s 14 Points. In Japan, the quality organization QC group is representative, which is based on Japan’s national conditions. Germany started to establish the quality product certification standard from the national level after World War Twoso as to greatly improve product quality. In China, the representative one is the ISO9000 quality standard and quality system certification in 1990. It has been a long time since the application of theories in total quality management to the medical industry, which have acquired unanimous agreement at home and abroad on their roles in improving medical service quality and hospitals’ competitiveness.

Figure 3-12 Research conceptual mode



Secondly, this chapter reviews the concepts of process and business process re-engineering, and arranges the relationship between TQM and BPR: TQM emphasizes the important role of process in improving quality but focuses on human and technology.

This chapter clarifies and summarizes the definition of customer satisfaction and arranges the customer satisfaction process model and Chen Yuntao's (2014) proposition that customer satisfaction is determined by three factors: customer perceived quality, customer expectations, and customer perceived values. The representative customer

satisfaction models include KANO Model and SERVQUAL Model. The former measures customer satisfaction from three levels: basic demands, expected demands and attractive demands, while the latter measures customer satisfaction from five dimensions of service quality, namely, tangibility, reliability, assurance, responsiveness, and empathy. The representative models of customer satisfaction evaluation outside China include the SCSB Model in Sweden, ACSI Model in the US, European Customer Satisfaction Index (ECSI) Model and ASGI Model. The representative models of customer satisfaction evaluation in China include Chinese Customer Satisfaction Index (CCSI) Model proposed by the School of Management in Tsinghua University, which is establishedbased on China’s actual national conditions and other customer satisfaction evaluation models outside China.

This chapter also consults relevant literature review concerning the concept, development, research status at home and abroad, and development trends of Internet-based medical services. The Internet-based medical services originate in the US and are widely applied in the country. Chinese scholars believe that the rapid development of Internet-based medical services in the US benefits from flexible practice of physicians, the developed commercial insurance system, and the relatively sound legal and regulation system in the US. China’s Internet-based medical services derived from the telemedicine in 1980s and has achieved rapid development in recent years with the help of lots of favorable national policies, featuring rapid channeling of social capital and intensive policy support. However, at present, China’s market of Internet-based medical services is immature and confronted with many development obstacles. Its development shows the trends of closed-loop service, online sales of prescription medicines, online payment of medical insurance, and greater accuracy of medical services, which are of Chinese characteristics.

Chen Yuntao (2014) believes that change, customer, and competition are three important forces that drive and influence companies (including hospitals) and affect social and economic activities. Further considering the early literature regression, this research, by learning from the EFQM Model, measures the outpatient “Internet plus” medical service quality based on the service quality gap model and from the five dimensions of quality, and constructs the theoretical framework of this research based on quality management system model and develops the concept model.

Chapter 4: Empirical Research on "WeChat plus Outpatient Medical Services"

4.1 Background of Hospitals' Appointment Diagnosis and Treatment

As previously mentioned, it is overcrowded in China's large-sized public hospitals, and the outpatient departments are generally trapped in the "Three-Long & One-Short" Dilemma, for which hospital administrators have taken enormous efforts. Meanwhile, the development of information technology and expansion of "Internet Plus" also provide technical support for reforming service procedures and improving medical service in China's public hospitals.

On the one hand, the governments devote greater efforts to promote hierarchical medical system by the implementation of health care insurance and regulation and control of health care insurance fund. On the other hand, the hospitals take advantage of information technology means so as to push forward outpatient appointment services and carry out appointment diagnosis and treatment services. Both of them aim to build sound habits and normal order for seeking treatment, as well as to relieve the problem of over-crowdedness in hospitals and the "Three-Long & One-Short" dilemma.

In the recent years, the hospitals have taken various kinds of appointment diagnosis and treatment services form which patients could appoint the diagnosis on the hospitals' websites through computers, appoint by placing a call to the hospitals' service counters from their land-line phones or mobile phones, appoint at the hospitals' service counters on-the-spot, or make an appointment at the out-patient doctor workstation for the next diagnosis by the doctor in computer after this diagnosis.

In order to support the appointment through phones system, the hospitals are supposed to employ a batch of telephone operators who take charge of answering the appointment calls from patients. What is more, a large number of patients appoint the diagnosis and treatment services that leads to the fact the telephone lines are always busy. The busy telephone lines trigger the dissatisfaction of patients, while the solution of this problem must be employing more operators, also sharply increasing human cost and operation cost.

Besides, on-site appointment, similarly, experience the dilemma for seeking medical services results from a high flow of patients at the hospitals' outpatient departments. Such models of appointment diagnosis and treatment, thus, fail to solve the problems of dilemma for seeking medical services fundamentally.

The hospitals and banks have collaborated on the "bank-hospital one-card-pass" equipment - a kind of self-service terminal, from which installed at hospitals' outpatient lobbies the patients could conveniently make an appointment for diagnosis and treatment services, pay the fees, inquire information and print test results on themselves. The more "bank-hospital one-card-pass" equipment are put into use, the shorter the waiting time of patients to queue up will be cost. On the contrary, some hospitals' outpatient lobbies are not large enough to accommodate much more self-service terminals, and thus, services are not expected to be thoroughly improved. However, these self-service terminals cannot well reduce patient flows in outpatient departments in unit time.

The rise of the model of the appointment diagnosis and treatment through mobile phone apps stems from the continuous modification of telephone system and hospitals' system based on the appointment diagnosis and treatment through land-line phones. It is this model that the patients could appoint and register by the use of the mobile phone app system. Although this system has contributed to the reduction of patient flows registering on-the-spot, it can only be used to appoint and register for the nation has not opened electronic payment yet.

In 2015, Premier Li Keqiang of China's State Council pointed out that "Internet Plus" should obtained energetic development, and Internet finance and Internet businesses also need an expansion and advancement so as to facilitate the rapid growth of China's "Internet Plus" businesses like the bamboo shoots in spring cropping out after rain, as well as accelerate the appearance of diversified forms of "Internet Plus" medical services. Moreover, the application of WeChat Pay has broken through bottlenecks in the improvement of hospitals' appointment diagnosis and treatment services. As an innovation in "WeChat plus medical services" thinking model, it has combined the appointment diagnosis and treatment through mobile phone apps with WeChat Pay and then a new model of the diagnosis and treatment services where patients are able to appoint online and pay online is achieved.

4.2 Establishment and Implementation of “WeChat plus Outpatient Medical Services” Platform in T Hospital

On the basis of “WeChat plus medical services”, the image of “WeChat plus outpatient medical services” was quickly accepted as a way to perfect the outpatient service procedures and studied by those hospitals’ administrators, while the information development operators and banks found a profitable business from this. This research group decided to start the establishment of “WeChat plus outpatient medical services” platform in T hospital in May, 2015 which was expected to optimize the outpatient medical service procedures, and then explore the solution of the “Three-Long & One-Short” dilemma in outpatient services.

4.2.1 Profile of T Hospital

Guangzhou Twelfth People’s Hospital (hereinafter referred to as T hospital) , established in 1970, was a sanatorium focusing on occupational disease prevention and control at that time. In 2000, T hospital moved to urban area of Guangzhou city, and then scaled up as a tertiary comprehensive hospital covering clinical services, teaching, scientific research, prevention, health care, recovery, occupational disease prevention and control, treatment of chemical poisoning casualties, as well as monitoring, inspection and appraisal of toxic and harmful substances. Meanwhile, T hospital, with many titles such as Guangzhou Hospital of Occupational Disease Prevention and Control, Guangzhou Hospital of Otolaryngology Head and Neck Surgery, Guangzhou Treatment Center of Chemical Poisoning and Guangzhou Twelfth People’s Hospital Affiliated with Guangzhou Medical University, was regarded as a teaching hospital of Sun Yat-sen University and other colleges and universities.

1. Basic Profile

At present, T hospital, equipped with 511 sickbeds, has over 900 employees embracing more than 800 professionals, over 140 people with title of a senior professional post, one expert enjoying special allowance from State Council, one Guangzhou excellent expert, two key talents of Guangzhou high level health professionals, and six high technical experts second-class.

2. Hospital’s Departments

The hospital sets up multiple departments including Department of Hematology,

Department of Nephropathy, Department of Vasculocardiology, Department of Endocrinology, Department of Respiratory Diseases, Department of Internal Neurology, Department of Gastroenterology, Department of Oncology, Department of General Surgery, Department of Thoracic Surgery, Department of Urology, Department of Neurosurgery, Department of Orthopedics, Department of Obstetrics and Gynecology, Department of Otorhinolaryngology Head and Neck Surgery, Department of occupational diseases and poisoning, Department of Pediatrics, Department of Traditional Chinese Medicine, Department of Rehabilitation, Department of Ophthalmology, Department of Stomatology, Department of Dermatology and other clinical departments.

3. Characteristics of Professional Departments

Department of Otorhinolaryngology Head and Neck Surgery consisting of Department of Otology, Department of Rhinology, Department of Pharynx, Larynx, Head and Neck Surgery, Discipline of Audiology and other second-degree disciplines, devotes to the research of prevention and treatment of deafness, prevention of noise induced deafness, comprehensive treatment and functional reconstruction of laryngocarcinoma, as well as comprehensive salvage surgery of nasopharyngeal carcinoma. Notably, its minimally invasive treatment of early-stage laryngocarcinoma and functional reconstruction of middle ear are at the leading level in South China. Secondly, it could conduct the comprehensive treatment of sinusitis (medicine plus surgery), anterior skull base surgery and sphenoid sinus surgery in a conventional manner; meanwhile, clinical research and comprehensive treatment of Obstructive Sleep Apnea-Hypopnea Syndrome (OSAHS) are carried out systematically. This department has won several science and technology awards at the provincial or municipal level over the past few years.

Department of Obstetrics and Gynecology, featured by water birth, firstly carried out water birth in Guangdong Province and even South China in 2006 and built the first delivery room of water birth in Guangdong Province. On the other hand, this department provides characteristic services concerning diversified painless parturition, as well as postpartum recovery and physical therapy. Also, experienced midwifes offer 'one-to-one' nursing companion services during delivery.

Treatment System of poisoning is a joint system with Emergency Department, Department of Critical Care Medicine, Department of Poisoning and Testing Center of Poisonous Substances at the core, supported by all clinical departments. Possessing

abundant experience in the aspect of clinical treatment of poisoning, this department has successfully rescued acute poisoning patients with multiple organ failure as the cardinal symptom (for instance, mushroom poisoning) and the success rate of rescue has exceeded 90%.

Department of Occupational Health Surveillance was positioned as the Key Medical Discipline of the 12th Five Year Plan of Guangdong Province, and the Key Medical Discipline Construction Program of Guangzhou City.

4. Research Achievements

In recent years, T hospital has won a first prize, a second prize and two third prize of Guangdong Provincial Scientific and Technological Progress Awards respectively, a second prize and a third prize issued by China Preventive Medicine Association separately, four first prize of Guangzhou Municipal Scientific and Technological Progress Awards, four awards from National Natural Science Foundation of China, as well as many other research achievements.

Table 4-1 T Hospital's outpatient visits and discharges in the past three years

	2015	2016	2017
Total Outpatient Visits (Number of Outpatients)	631204	619396	584558
Daily Outpatient Visits	1729	1697	1602
Discharges	9339	10283	11650

4.2.2 Design Idea of "WeChat plus Outpatient Medical Services" in T Hospital

Firstly, this research group planned and formulated the strategic direction and strategic goals of establishment of "WeChat plus outpatient medical services" platform. From the group's perspective, this platform is designed to optimize outpatient diagnosis and treatment procedures, as well as solve the "Three-Long & One-Short" dilemma (namely, long registered time and payment time, long waiting time for diagnosis, long time for getting medicine and short treatment time), so the design has to be problem-focused. The strategic goals are set to satisfy the customers, benefit the society, upgrade service quality, and finally provide excellent services and remarkable performance by this platform which innovates outpatient diagnosis and treatment procedures, promotes participation of all employees, as well as motivates and excites employees' patient-

centered service awareness. Through the conclusion and analysis of historical evolution of conventional diagnosis and treatment pattern, this research group considers that the goals can be realized by optimizing outpatient diagnosis and treatment procedures and saving time used by these procedures.

As shown in Figure 1-1 and Appendix 3,Figure 1, the diagnosis and treatment procedures are 11 and 6 respectively. The approaches of using the integrated platform of mobile phone "WeChat app" and "WeChat pay" so as to realize the goal of optimizing outpatient diagnosis and treatment procedures are demonstrated as follows:

Firstly, establishment of the "WeChat plus outpatient medical services" platform could simplify procedures of on-site registration and fee payment. With the help of this platform, patients are able to complete the aforesaid procedures by phones outside the hospital that the outpatient diagnosis and treatment procedures gain optimized and eventually the on-site registered time and waiting time for registration are reduced.

Secondly, "WeChat plus outpatient medical services" platform carries out time-phased appointment registration, diagnosis and treatment, which results in reducing aimless patient flows and waiting patients for diagnosis in unit time, and finally saving waiting time for diagnosis. Besides, the resolution of doctors being influenced by onlookers indirectly prolongs treatment time and improves diagnosis and treatment environment and experience.

Thirdly, on the "WeChat plus outpatient medical services" platform, doctor's prescriptions are automatically priced in HIS system after the diagnosis and treatment, so that patients could use their mobile phones' WeChat app to pay medicine fee and examination fee on this platform when leaving the consulting rooms. In this way, the queue time for paying medicine fee is saved, and patients can get medicine from pharmacy directly before leaving or go to the correspondently examining rooms. In this regard, patients' waiting time for getting medicine is decreased indirectly for the problem of over-crowdedness in unit time are solved.

According to the above mentioned thoughts, it is hoped that the "WeChat plus outpatient medical services" platform could be conducive to deal with the "Three-Long & One-Short" dilemma.

In the meantime, on the platform, hospitals will offer more information for educating and popularizing health knowledge in order to increase patients' understanding about diseases; hospitals could make follow-up feedback from patients and supply reservation services like hospitals' catering reservation. What is more, as

the continuous development and function perfection, hospitals are capable of providing much more additional services embracing services for inpatients.

4.2.3 Supplier Selection of “WeChat plus Outpatient Medical Services” in T Hospital

On the basis of the said planning program, this research group decided to select the information developer and the united bank partner through the invitation for bid within the hospital so as to jointly accomplish establishment of T hospital’s “WeChat plus outpatient medical services” platform.

T hospital published the announcement for bidding and requirements on its website, and took the on-site bidding on June 19, 2015 at hospital. Due to “bank-hospital one-card pass” had not been opened at that time, T hospital took “bank cooperative project on mobile Internet plus medical treatment” as the bidding project so as to perfect “bank-hospital one-card pass” construction and “WeChat plus medical services” platform. The construction of this project aimed at getting a co-win result among three parties. In the project, the bank that supplied funds for construction was responsible for project development together with its bidding cooperative partner - the Internet company, while the hospital opened a bank account in this bank who wins the bidding. As a result, the hospital’s cash flows produced through the system came into the aforesaid bank account and bank deposits consequently had been value-added.

As shown in Table 4-2, from the four bank consortia who participated in this bidding, T hospital’s evaluation experts chosen randomly by the bid evaluation committee evaluated and selected Guangzhou Pearl River Branch of Bank of China Ltd. to take charge of establishment of “bank-hospital one-card pass” because of its best offer. Guangzhou Jincheng Mansion Branch of China Merchants Bank won the bidding to preside over the construction of “WeChat plus medical services” platform because it provided “WeChat plus medical services” and gave the best offer. This project had raised 3.46 million RMB in financing, and the whole cost was untaken by the bank partners, as shown in Table 4-2.

Table 4-2 T Hospital's bidding of "cooperative project on mobile Internet plus medical treatment"

Bidders	Bid Price/ 10 thousand RMB	Construction Contents	Winning Bidders	Winning Bidding Contents
Bank of China plus the Great Wall Company	201	Construction of WeChat and Alipay platform for the twelfth hospital, self-service machine for registration and fee payment(bank-hospital one-card-pass), HIS, physical examination, PACS interface development and other services	√	bank-hospital one-card-pass
China Merchants Bank plus Jiangxi Beikang Information Technology Company, Ltd.	145	China Merchants Bank provides construction funds, Jiangxi Beikang takes charge of construction of WeChat, Alipay and app client for the twelfth hospital	√	WeChat service account, service window, and app client
China Citic Bank plus Guangdong Yilianzhong Computer Technology Company, Ltd.	80	Construction of WeChat and Alipay platform for the twelfth hospital, self-service machine for registration and fee payment		
Agricultural Bank of China plus Guangzhou Yifeng Company	55	Construction of WeChat and Alipay platform for the twelfth hospital, HIS, physical examination, PACS interface development and other services		

4.2.4 Construction of T Hospital's "WeChat plus Outpatient Medical Services"

After many times of argument, T hospital started the construction of mobile medical services platform in June 2015.

4.2.4.1 Form a Project Team

With the head of the hospital and the deputy director who is charge of information and medical treatment as the team leader and vice team leader respectively, this project team was united various departments involving department of information, department of medical treatment, department of nursing, finance department, publicity department and others. Moreover, the responsibilities of this team are organizing and coordinating

three cooperative parties, as well as carrying out the project plan, the process control, and the continuously improving full-services.

4.2.4.2 Analysis of Construction Demands

The three parties (namely, the project team, banks and their cooperative Internet companies) repeatedly analyzed demands, argued and discussed the construction ideas and methods, devoting to turning T hospital into a hospital that could provide a convenient diagnosis and treatment environment with short queue time, alleviate the difficulty of seeking medical advices, and let patients use their smart phones to appoint services. Besides, this project intended to change the traditional lifestyle of on-site registration and diagnosis only into a new lifestyle in which patients can get doctors’ advices and any information about health at any time, at home or on the road. Due to the application of mobile communication technology, medical services not only save plenty of time and cost for registration, waiting and traffic, but also efficiently guide people to cultivate a sound lifestyle and turn disease treatment into disease prevention.

The entire construction set the solution of long queue time as the core, brought in the conception of “guided treatment”, as well as upgraded the hospital’s procedures focusing on three links including “before the diagnosis”, “during the diagnosis” and “after the diagnosis”. The goals are supposed to build a convenient diagnosis and treatment service channel with short and even no queue time, establish a effective communication platform between the hospital and patients, encourage patients to go to the hospital in off-peak periods and seek medical advices orderly as well.

T hospital’s mobile medical services platform consists of the WeChat official account platform, the diagnosis and treatment platform in Alipay, and the diagnosis and treatment platform in hospital’s app. For instance, the WeChat official account platform will be illustrated as follows.

Appendix 2, Table 2 analyzes the requirements of diagnosis and treatment procedures argued and determined on August 11, 2015 by the project team.

4.2.4.3 Construction Thoughts

In order to facilitate the hospital’s effective and efficient administration of relevant businesses of mobile Internet medical services which consist of resource management

of appointment registration, back trace of patients' information, financial analysis and management, customer service management and others, it is quite necessary to establish a comprehensive management system combining Neusoft HIS system and mobile Internet platforms (including Guangzhou Jiangkangtong app, WeChat official account platform, diagnosis and treatment platform of Alipay, T hospital app and other platforms) that connecting the hospital, namely, a comprehensive management platform of mobile Internet medical services.

Neusoft HIS system, adopting open-end design, is offered resource management of appointment registration, back trace of patients' information, financial analysis and management, customer service management and other services by the comprehensive management platform of mobile Internet medical services(Appendix3, Figure 16).

1. Resource Management of Appointment Registration Pool

In order to realize registered resource sharing between mobile Internet medical platforms and hospital's on-site registration windows, this system takes advantage of conception of unifying appointment source pool to manage and allocate appointment registration resources uniformly, as well as provide time-phased appointment registration function. What is more, all Internet medical platforms and on-site registration windows share the registration resources by means of competition.

2. Back trace of Patients' Information

Usage of the comprehensive management platform of mobile Internet medical services facilitates supervision of administrative departments and customer service center personnel on the whole mobile Internet medical process because this platform supervises all links involving appointment, registration, making prescriptions, fee payment, printing and getting receipts, inquiring refund, hospitalization deposit and others. This platform builds a set of comprehensive and quick query system so as to raise service efficiency and quality.

3. Unified Payment Management

In this regard, functions of unified financial reconciliation and financial management are provided. The hospital reconciles accounts with the third party platforms (for example, Guangzhou Jiankangtong app and Yijiankang) to ensure the accuracy of financial data. Meanwhile, analysis of financial data also gives database for strategic adjustment of hospital's management.

4. Customer Service Management

This platform supplies relevant customer service functions such as identity

authentication, pushing notification, consultation and guidance for seeking medical advices, and provides customer service and other services in terms of back trace of patients' information.

4.2.4.4 System Functions

Through the joint construction of three parties, "WeChat plus medical services" platform achieves the following system functions shown in Appendix 2, Table3.

This project had raised 3.46 million RMB in financing, and the whole cost was untaken by the bank partners. The financing amount were used in four parts: development of mobile application platform, improvement of HIS system, investment for server storage and other hardware, and relevant expenses of self-service machine of registration, inquiry and fee payment (bank-hospital one-card-pass equipment). Procedures of "WeChat plus outpatient medical services" are demonstrated as Appendix 3, Figure 17, Appendix 3, Figure 18, Appendix 3, Figure 19, Appendix 3, Figure 20, Appendix 3, Figure 21, Appendix 3, Figure 22, Appendix 3, Figure 23, Appendix 3, Figure 24.

4.2.5 Operation and Continuous Improvement of T Hospital's "WeChat plus Outpatient Medical Services"

T Hospital's "WeChat plus outpatient medical services" platform was trialed on January 1, 2016. For the sake of providing good online services, it is necessary for the hospital to dedicate to training staff, make publicity and give guidance to patients and their families.

4.2.5.1 Staff Training

In accordance with plans, the project team trained staff in different batches, with trainees totally up to 743. In order to cultivate staff's interest of new things, and promote them to learn and familiarize usage methods of "WeChat plus outpatient medical services" platform so that they can guide patients well, an incentive policy has been formulated as follows: employees who experience the whole procedure ranging from appointment registration to fee payment and getting medicine will be awarded 100 RMB for each experience. The implementation of this policy is to stimulate every employee to really experience the while procedure and put forward suggestions.

4.2.5.2 Publicity and Guidance to Patients and Their Families

The project team has posted up QR code of hospital’s WeChat official account and application instructions on hospital’s website, at outpatient lobby, in elevators and inpatient wards, organized customer service staff to publicize usage methods and guide patients on the spot, organize health education, as well as guide audience and patients to follow the T hospital’s WeChat official account and operate the whole procedures involving appointment diagnosis and treatment.

4.2.5.3 Interview and Continuous Improvement

During the trial operation, the project team came to outpatient departments and in-patient wards and listened to problems doctors and nurses confronted in operation at regular intervals, as well as collected feelings and advices of patients who have used the platform on the spot. Besides, the project team regularly held team discussion where the latest situation of platform was analyzed, advices of employees were explored, and feedback to patients’ advices was provided. For the problems in the real operation such as on-site refund for patients’ wrong registration and pricing again for adjusted prescriptions, various departments are supposed to consult and solve problems with joint efforts.

1. Continuous Improvement of Finance

For instance, in the operation of “WeChat plus outpatient medical services” platform, system functions were closely related with fee collection of finance department. To further perfect and improve the hospital’s mobile medical service quality, the financial problems found in trial operation mainly consisted of problems of financial statement and reconciliation, problems confronted by fee collectors, problems doctors met in HIS system and problems in other areas.

Specific feedback and answers in Appendix 2, Table 4.

Through the discussion between the project team and Internet companies, financial operation and management procedures are revised mainly according to the aforesaid problems, as shown in Appendix 2, Table 5.

2. Procedural Problems Required to be Revised

(1) Statistical Query >Comprehensive Query of Registration does not query in terms of the start time and end time actually input, and add 1 in the end time.

(2) It is unreasonable that -2 appears in the daily statement of outpatient fee collectors and daily statement of registers of WeChat registration in February 18 because registration withdrawal through WeChat should be writing down cash.

As another example, the original procedure of "diagnosis and treatment first, fee payment second" often led to a situation that patients left without paying. Thus, it is necessary to revise procedures of registration fee, fee collection and others.

3. Restructuring of Outpatient Registration

(1) Existed Ranks of Registration

The present calculation method of registration fee is based on combination of registration ranks and contract units where the standard registration ranks (namely, general outpatient services, outpatient services of vice archiater and outpatient services of archiater) has been divided according to objects into general outpatient services for T hospital's staff, outpatient services of vice archiater for T hospital's staff, general outpatient services on a volunteer basis, outpatient services of vice archiater on a volunteer basis, general outpatient services for the aged, outpatient services of vice archiater for the aged and others. Such ranks of registration and contract units are used to calculate the registered fee.

In order to calculate the registered fee, the ranks of registration which are different from the original have been divided manually into the multiple of objects enjoying discounts. Details see Appendix 2, Table 6.

At present, determination of registered fee is related to ranks of registration which are judged by registers. In fact, doctor's title of a senior professional post determines the ranks of registration without manual operation. For example, Dr. Zhang San, an archiater, is ranked as outpatient services of archiater; however, if it is chosen by operators, general outpatient services – Zhang San may appear which leads to the registered fee of four yuan, not 9 yuan.

The solution to calculation of registered fee would be differentiating ranks of registration and objects enjoying discounts. On the one hand, ranks of registration is classified as standard categories: general outpatient services, outpatient services of vice archiater and outpatient services of archiater; on the other hand, objects enjoying discounts is divided in terms of the actual groups enjoying the preferential treatment into T hospital's staff, the aged, the retired at provincial public expenses, in-service staff at provincial public expenses, in-service staff at municipal public expenses, the retired at municipal public expenses and so on. The identity of groups enjoying the preferential

treatment will be affirmed by operators in the first registration, and then identity will be recorded in patients' information so as to automatically display in next registration (including the future on-line appointment).

(2) Revision of Ranks of Registration

In the light of the new plan, registered fee is not determined by contract units because the former actually correlates to objects enjoying discounts and doctor's title of a senior professional post, instead of contract units. Details of ranks of registration and objects enjoying discounts in the new plan are demonstrated in Appendix 2, Table 7. What is more, the amount charged to an account when register at public expenses would be added in fee collection and then goes through settlement. That means the amount charged to an account is reduced when register, so patients at public expenses are regarded as objects enjoying discounts（Appendix 2, Table 8, Appendix 2, Table 9）.

4. Restructuring of Diagnosis Arrangement and Calling Numbers

(1) Rules of Diagnosis Arrangement（Appendix 2, Table 10）

(2) Rules of Calling Numbers

If patients miss the call, their number will be called in three times repeatedly.

- Diagnosis and treatment time appointed on-line: Monday – Friday.

- Patients appointed the morning diagnosis should arrive at departments ten minutes earlier, and would accomplish diagnosis and corresponding treatment on that morning.

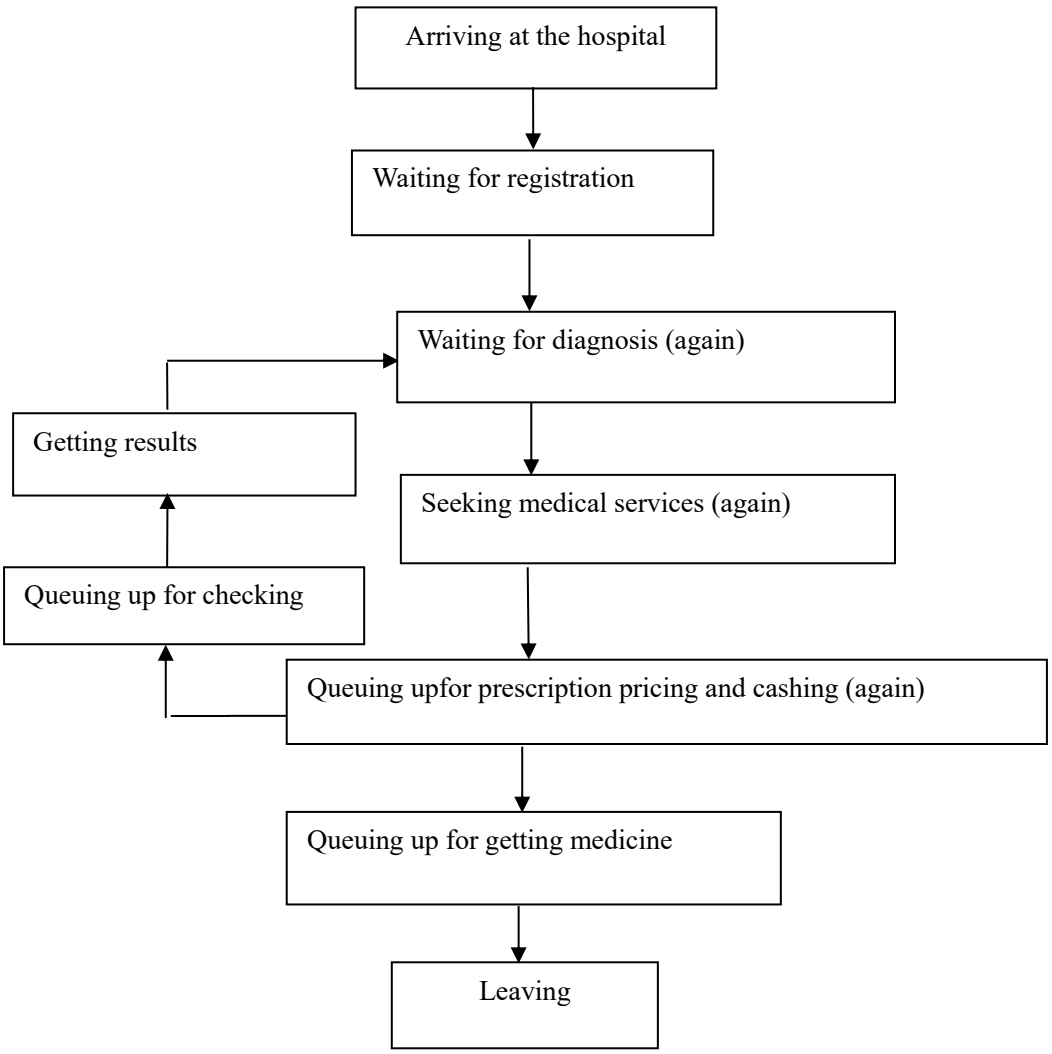
- Patients appointed the afternoon diagnosis should arrive at departments ten minutes earlier, and would accomplish diagnosis and corresponding treatment on that afternoon.

- Appointment registration and outpatient registration are synchronous. Second visits could appoint the doctors directly and come to their departments for seeking medical advices; first visits should type in their relevant information of diagnosis at the customer service department before waiting for diagnosis at outpatient departments.

That means only adjust software functions properly and reformulate feasible procedures and management system, can make a continuous progress in optimizing outpatient diagnosis procedures and reducing queue time. Since usage of WeChat medical platform, patients' diagnosis procedures at T hospital have been simplified to 8 rather than 12, from which registration and fee payment can be operated in WeChat so as to save plenty of time without on-the-spot queuing. Details are shown in Figure

4-1 and Figure 4-2.

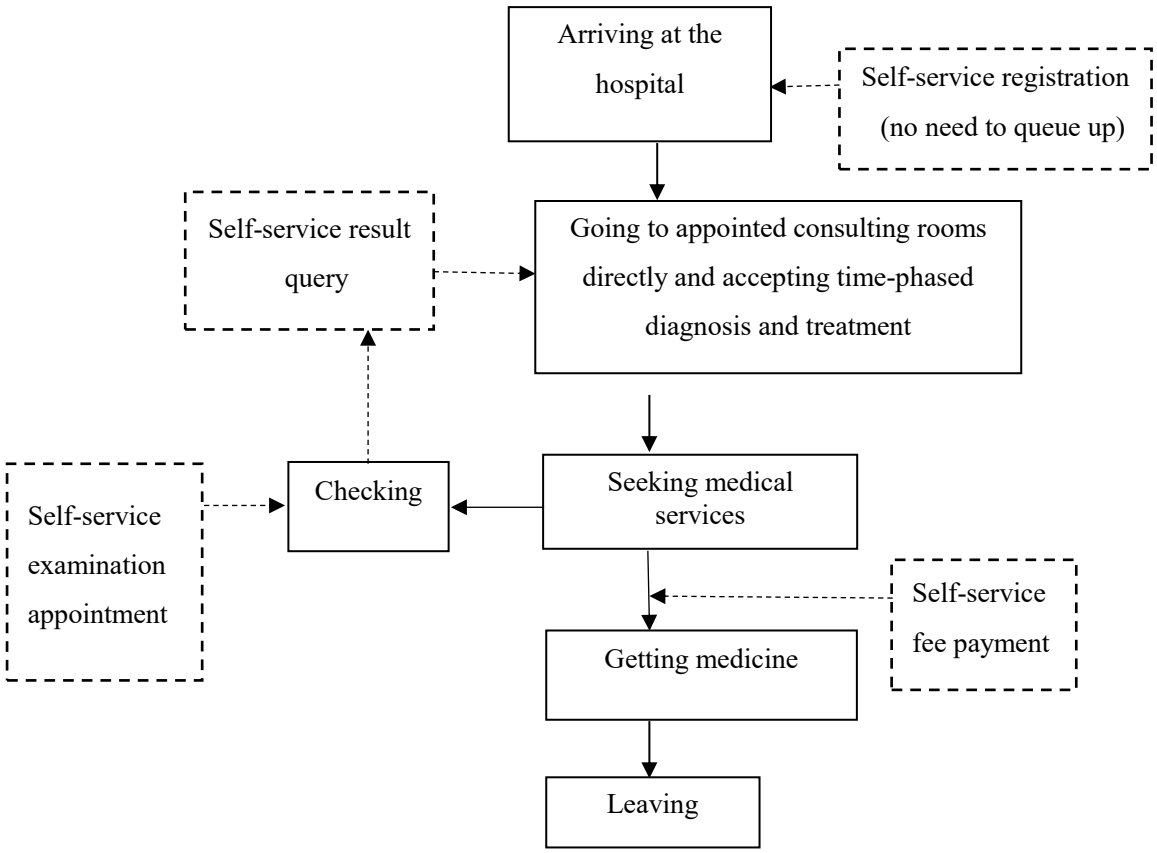
Figure 4-1 Traditional diagnosis and treatment procedures of T hospital (before restructuring)



Source: The Author

Comparing Figure 4-1 and Figure 4-2, diagnosis and treatment procedures of T hospital have obtained improvement obviously, but still have some problems to be modified. For instance, patients still need to queue up for checking and getting medicine; only test results can be queried by WeChat but not examination results; patients of health insurance and at public expenses are unable to pay by WeChat because the interface of health insurance system has not been opened.

Figure 4-2 "WeChat plus medical services" diagnosis and treatment procedures of T hospital (after restructuring)



Source: The Author

4.2.6 Questionnaire Survey of T Hospital's "WeChat plus Outpatient Medical Services"

This survey adopted convenience sampling method to conduct a questionnaire survey to patients and medical staff of T hospital. As a structure questionnaire, this questionnaire was made pursuant to SERVQUAL multiphase inventory method of service quality measurement, which mainly embraces four parts - basic information, patients' expectations, actual services provided by the hospital, and patients' perception of service quality improvement. Patients' expectations and actual services provided by the hospital were measured by five dimensions (namely, tangibles, reliability, responsiveness, assurance and empathy) respectively, in which questions A1-A6 measured the tangibles of service quality, questions B1-B12 measured reliability of service quality, questions C13-C15 measured the responsiveness of service quality, questions D16-D19 measured the assurance of service quality, and questions E20-E23

measured the empathy of service quality.

4.2.6.1 Survey Respondents

T hospital’s patients (including outpatients and in-patients) and staff constituted the primary respondents of this survey.

4.2.6.2 Procedures of Data Acquisition

1. Adopting convenience sampling method to conduct a questionnaire survey to patients and staff of T hospital who are willing to participate in this survey.

2. Before conducting the questionnaire survey, the researchers would communicate with directors of departments, explain purposes and then conduct the survey with permission.

3. It roughly takes 3 minutes to accomplish a questionnaire. Before conducting the questionnaire survey, the researchers would show their identity and explain purposes in order to be understood and support by patients and reduce information errors caused by subjective factors to some extent. Furthermore, the patients would be explicitly informed that questionnaires and data will be confidential so as to promote the conduction of survey.

4. If respondents show their willingness to accept the survey, the researchers will simply explain the questionnaire. During the process of filling out the questionnaire, respondents can ask researchers to explain when they confront any unclear things. After accomplishment of questionnaire, the researchers will collect at once, and then ask respondents one question in the questionnaire to test whether the answers of respondents are the same with the questionnaire. If find the problems, the researchers will timely check with patients, clarify or correct to ensure efficiency of questionnaires. At last, express gratitude and blessing to patients.

5. Two researchers put test data into database respectively, check and process the two groups of data, check and correct problems, as well as delete the invalid questionnaires.

6. This survey adopts software SPSS19.0 to carry out a statistical analysis.

4.2.6.3 Questionnaire Collection

This survey distributed 1050 questionnaires from May to July 2017, and collected 995 questionnaires in which 800 questionnaires were valid, with the valid returned rate of 80.4%.

See details of Questionnaire of “WeChat plus Outpatient Medical Services” in Appendix 1.

4.2.6.4 Testing of Validity and Reliability

1. Reliability Analysis

Reliability refers to consistency or stability of results through more than once tests and measurements, or refers to a sort of index that is used to estimate measurement error to reflect true measure（Wu & Tu, 2012）.

In Likert Scale Method, common testing method of reliability is “Cronbach α” coefficient and Split-half reliability. The higher the reliability of a scale is, the higher the stability of this scale represents.

In the aspect of acceptability of reliability coefficient, Cronbach α coefficient in the factor level had better exceed 0.7. It is grudging to accept the Cronbach α coefficient of 0.6. On the other hand, α coefficient of the general table had better exceed 0.8, and reliability would be higher if exceeding 0.9. Your expectation scale is as Table 4-3.

Table 4-3 Your expectation scale

Dimensions	The Number of Questions	Cronbach’ s Alpha
Tangibles(A1~A6)	6	0.993
Reliability(B7~B12)	6	0.996
Responsiveness(C13~C15)	3	0.99
Assurance(D16~D19)	4	0.994
Empathy(E20~E23)	4	0.995
Total Satisfactory Degree	5	0.997

Source: The Author

In the level of tangibles, the internal consistency α coefficient of questions A1, A2, A3, A4, A5, and A6 is 0.993, which means the internal consistency between the six questions and total satisfactory degree is comparatively high with each question having high reliability.

In the level of reliability, the internal consistency α coefficient of questions B7, B8, B9, B10, B11, and B12 is 0.996, which means the internal consistency between the six questions and total satisfactory degree is comparatively high with each question having high reliability.

In the level of responsiveness, the internal consistency α coefficient of questions C13, C14, and C15 is 0.990, which means the internal consistency between the three questions and total satisfactory degree is comparatively high with each question having high reliability.

In the level of assurance, the internal consistency α coefficient of questions D16, D17, D18, and D19 is 0.994, which means the internal consistency between the four questions and total satisfactory degree is comparatively high with each question having high reliability.

In the level of empathy, the internal consistency α coefficient of questions E20, E21, E22, and E23 is 0.995, which means the internal consistency between the four questions and total satisfactory degree is comparatively high with each question having high reliability.

In the level of patients’ perception of service quality improvement, the internal consistency α coefficient of five dimensions (namely, tangibles, reliability, responsiveness, assurance and empathy) is 0.997, which means the internal consistency between the five dimensions and patients’ perception of service quality improvement is comparatively high with each dimension having high reliability. The actual service scale offered by T hospital is shown as Table 4-4.

Table 4-4 The actual service scale offered by T hospital

Dimensions	The Number of Questions	Cronbach's Alpha
Tangibles(A1~A6)	6	0.988
Reliability(B7~B12)	6	0.992
Responsiveness(C13~C1)	3	0.985
Assurance(D16~D19)	4	0.99
Empathy(E20~E23)	4	0.99
Total Satisfactory Degree	5	0.995

Source: The Author

In the level of tangibles, the internal consistency α coefficient of questions A1, A2, A3, A4, A5, and A6 is 0.988, which means the internal consistency between the six questions and total satisfactory degree is comparatively high with each question having high reliability.

In the level of reliability, the internal consistency α coefficient of questions B7, B8, B9, B10, B11, and B12 is 0.992, which means the internal consistency between the six questions and total satisfactory degree is comparatively high with each question having high reliability.

In the level of responsiveness, the internal consistency α coefficient of questions C13, C14, and C15 is 0.985, which means the internal consistency between the three questions and total satisfactory degree is comparatively high with each question having high reliability.

In the level of assurance, the internal consistency α coefficient of questions D16, D17, D18, and D19 is 0.990, which means the internal consistency between the four questions and total satisfactory degree is comparatively high with each question having high reliability.

In the level of empathy, the internal consistency α coefficient of questions E20, E21, E22, and E23 is 0.990, which means the internal consistency between the four questions and total satisfactory degree is comparatively high with each question having high reliability.

In the level of patients’ perception of service quality improvement, the internal consistency α coefficient of five dimensions (namely, tangibles, reliability, responsiveness, assurance and empathy) is 0.995, which means the internal consistency between the five dimensions and patients’ perception of service quality improvement is comparatively high with each dimension having high reliability.

2. Analysis of Validity - Spearman Correlation Analysis

Correlation analysis aims at finding degree of association between two variables. In statistics, degree of association between two variables is usually represented by correlation coefficient.

Correlation coefficient consists of two characteristics. On the one hand, the larger the absolute value of correlation coefficient is, the stronger the degree of association between two variables is, and vice versa. On the other hand, positive or negative correlation coefficient expresses the positive relation or negative relation between two variables. If the correlation coefficient is positive, one variable will increase (decrease) as the other variable increases (decreases), which is defined as positive correlation; in other words, the two variables has a consequent relationship. On the contrary, if the correlation coefficient is negative, one variable will increase (decrease) as the other variable decreases (increases).

Table 4-5 Correlation coefficient between the five dimensions of service quality and total satisfactory degree

	Tangibles	Reliability	Responsiveness	Assurance	Empathy
Total Satisfactory Degree	0.265	0.318	0.339	0.326	0.38

Table 4-6 Correlation coefficient between the five dimensions of service quality

	Tangibles	Reliability	Responsiveness	Assurance	Empathy
Tangibles	1				
Reliability	0.788	1			
Responsiveness	0.726	0.726	1		
Assurance	0.733	0.753	0.838	1	
Empathy	0.707	0.729	0.796	0.859	1

Table 4-7 Correlation coefficient between the five dimensions of service quality and the project

Dimensions	Questions					
Tangibles	A1	A2	A3	A4	A5	A6
	0.813	0.825	0.702	0.739	0.829	0.817
Reliability	B7	B8	B9	B10	B11	B12
	0.851	0.868	0.838	0.841	0.845	0.804
Responsiveness	C13	C14	C15			
	0.856	0.881	0.893			
Assurance	D16	D17	D18	D19		
	0.833	0.886	0.891	0.854		
	E20	E21	E22	E23		
Empathy	0.901	0.9	0.898	0.853		

From Table 4-5, correlation coefficients between patients' perception of service quality improvement and tangibles, reliability, responsiveness, assurance and empathy of service quality are 0.265, 0.318, 0.339, 0.326 and 0.38 respectively. The absolute

value of the above mentioned five correlation coefficients is about 0.3 which illustrates that there are correlations between patients' perception of service quality improvement and five dimensions of service quality.

Tangibles, reliability, responsiveness, assurance and empathy of service quality are relatively high, and patients' perception of service quality improvement is comparatively high.

From Table 4-6, the absolute values of correlation coefficients among tangibles, reliability, responsiveness, assurance and empathy of service quality are quite high which exhibits a high correlation. Meanwhile, correlation coefficients among five dimensions of service quality are positive value, and that is to say there is a positive correlation among them.

From Table 4-7, the five tables of correlation coefficients between five dimensions and projects, the five dimensions of service quality have a positive correlation with questions of other dimensions. Furthermore, the absolute value of their correlation coefficients range from 0.7 to 0.9, which manifests there is a high correlation between the five dimensions of service quality and questions of other dimensions.

Due to the processed data of questionnaire survey are offered by the hospital, validity test is made only in the actual service scale offered by T hospital. In terms of Spearman data results, this scale has a sound content validity.

4.2.7 Evaluation Analysis of T Hospital's "WeChat plus Outpatient Medical Services" Project

This project was started on June 2015, conducted a trial operation on January, 2016, made interviews for problems happened in the process of project operation, continuously improved according to feedbacks in all aspects, and finally launched on March, 2016. On May, 2017, the questionnaire survey of this project was carried out and project summary and evaluation were accomplished so as to further understand the status quo and weakness of hospital's "WeChat plus outpatient medical services" platform, as well as make preparations for the next analysis and improvement. In this regard, the research group interviewed the staff and leaders who are charge of the "WeChat plus outpatient medical services" platform project, outpatient customer service staff who directly contact patients and directors of relevant assistant functional departments, and held group discussion to summarize the status quo of hospital's

"WeChat plus outpatient medical services" platform operation, sort out prominent problems confronted by patients and hospital's staff, as well as find the weakness of procedure management. On this basis, the research group took expert consultation of directors of relevant assistant functional departments and held brainstorm meetings for the sake of providing referential advices and ameliorated orientation for hospital's "WeChat plus outpatient medical services" platform.

4.2.7.1 Outline of Interview

This interview was a semi-structured interview, referring to maintaining an open style interview atmosphere and prescribing no hard and fast rules for interviewer's language expression. This kind of interview could be more favorable to build a harmonious and relaxing atmosphere that encourages interviewees to truly reflect the problems existed in hospital's "WeChat plus outpatient medical services" platform.

The outline of this interview mainly covers the following five questions:

1. What kind of problems have been reflected by patients in the process of using hospital's "WeChat plus outpatient medical services" platform?

2. Which of the above problems do you think are the most important problems that affect patients' evaluation to the hospital's outpatient medical service quality?

3. What do you think of the reasons of these problems?

4. From your perspective, which of the above problems could increase patients' satisfaction through continuous improvement? Which could not be solved through continuous improvement?

5. Which of the solutions of improving "WeChat plus outpatient medical services" platform do you think are the most pressing tasks?

4.2.7.2 The Status Quo and Problems of "WeChat plus Outpatient Medical Services" Platform Operation

From January 2016 to May 2018, the ratio of T hospital's outpatient registration in WeChat showed a generally upward trend at a constant speed, with the nadir of 3.2 % on January 2016 and the peak of 34.8 % on April 2018. Details see Appendix 2, Table 11 and Appendix 3, Figure 25. That is to say, as the promotion of "WeChat plus outpatient medical services" platform, outpatients gradually accept this new platform for seeking medical advices. Besides, it also reflects indirectly that "WeChat plus outpatient medical services" platform truly brings convenience to patients and gains

patients’ acceptance.

For purposes of providing WeChat plus outpatient medical services with higher quality and improving patients’ satisfaction for seeking medical advices, this research group summarized the present top ten problems in the operation of “WeChat plus outpatient medical services” platform through interviews, which are demonstrated in Appendix 2, Table12.

4.2.7.3 Expert Consultation Form and Group Discussion

Expert consultation forms delivered to 12 experts, with consultation contents as follows:

Analysis of the Status Quo of “WeChat plus Outpatient Medical Services” Platform Operation

1. Aims of Implementation

“WeChat plus outpatient medical services” platform aims at optimizing T hospital’s outpatient service procedures, resolving the “Three-Long & One-Short” dilemma (namely, long registered time and payment time, , long waiting time for diagnosis, long time for getting medicine and short treatment time), improving outpatient medical service quality, as well as increasing patients’ satisfaction.

2. Relevant Conceptions

(1). “WeChat plus outpatient medical services” platform

Literally, “WeChat plus outpatient medical services” platform is a kind of method from which patients can obtain medical services. This platform is built on the basis of popularization of WeChat and advanced electronic information technology. As a result, some tedious and time-consuming procedures can be dealt with online so as to reduce operation time, improve efficiency, shorten invalid time in hospital, and increase patients’ satisfaction.

(2). Total quality management

Total quality management refers to a kind of management method that an organization with quality as its center and staff participation as its foundation, achieves success through satisfying customers and benefiting all members of this organization and the society. The core of that is “improving both product quality and service quality”.

3. Analytical Methods

This survey was carried out anonymously, demands to apply total quality management theory to analyze the problems in the process of implementing “WeChat

plus outpatient medical services" platform.

The present ten problems are analyzed respectively in terms of "five elements affecting the quality" prescribed in total quality management (namely, people, machines, materials, methods and environments).

In this regard, people refers to the hospital's staff; machines are equipments used directly or indirectly by patients in the whole process of outpatient diagnosis such as mobile phones and self-service machines for fee payment; materials represent all kinds of outpatient medical services obtained by patients (for example, medicine, medical examination and guidance of customer service staff); methods indicate the various approaches and means of "WeChat plus outpatient medical services" provided by the hospital, for instance, the current system of the hospital, efficient prescribed procedures, WIFI supply; environments include natural environment, cultural environment, political environment and other environments.

4. The Present Ten Problems

(1). Patients can purchase medical records booklets through WeChat Pay, but still need to queue up together with patients to register and to pay fee. That is to say patients can register through mobile phones without queuing up, but still spend time in on-site queuing up.

(2). Doctors always suspend medical services emergently, while WeChat does not push notifications to patients. Where patients are not informed that doctors have suspended medical services in other ways, the following situations may happen. Firstly, other doctors will diagnose patients but patients are not informed before. Secondly, patients find that their registered doctors have suspended medical services and then give up diagnosis and leave. Thirdly, patients need to register in hospital, but there must still have registration sources.

(3). WeChat official account can only recognize ID card number but other information. When patients create accounts or bind linkmen, they cannot receive verification code of confirmation message. Due to the bound patients cannot receive message of binding, the binding people can always view diagnosis information of the bound patients if they do not unbind, and now one account can bind ten patients.

(4). By the end of January 1, 2018, 33 departments which can be registered in WeChat have no introduction, and only doctors of 15 departments have introductions. (Note: Including the situation that doctors only provide introduction in one department but can be registered in many departments.)

(5). Cannot use fee payment function through health insurance and at the public expenses.

(6). The staff participation in “WeChat plus outpatient medical services” platform is not enough. Some employees answered differently to the question that whether the hospital did correspondent training at early stage, and a few employees could not master their own work of “WeChat plus outpatient medical services” platform construction.

(7). WIFI signal is not stable, network speeds differ in various areas, and network is of different coverage. (Note: weak WIFI signal is the most prominent problem reflected by patients in questionnaire survey.)

(8). Human customer service staff of “WeChat plus outpatient medical services” platform respond slowly; awareness rate among patients and hospital’s staff is quite low.

(9). Doctors cannot get relevant information of patients through “WeChat plus outpatient medical services” platform, which means that power of doctors is limited.

(10). Some test results such as blood test, urinalysis and fecal test may be queried through “WeChat plus outpatient medical services” platform, while results of those tests which need to be delivered to outside hospital or some tests such as electroencephalogram, Ultrasonic B and CT cannot be viewed in WeChat.

5. Cause Analysis

Please analyze the causes of the above mentioned ten problems in the aspects of people, machines, materials, methods and environments, by the use of the method of total quality management theory. (Note: Leave blank if there is no corresponding reason.).

4.2.7.4 Group Discussion

The research group summarized all causes of the above mentioned problems through sorting out the consultation forms collected. After that, it held group meetings to find main causes of each problem, and then found the departments, who are charge of continuous improvement on each problem, clarified their responsibilities, formulated plans of continuous improvement, and finally achieve the goal of the plan.

Tables of group discussion results are shown as Appendix 2, Table 13~Table 22.

4.3 Chapter Summary

Through sketching the procedures including planning, implementation, check and summary, replanning and project improvement of “WeChat plus outpatient medical services” platform, this chapter applied total quality management theory to analyze the causes of problems in “WeChat plus outpatient medical services” platform operation. Also, this chapter, adhering to the idea of continuous improvement, analyzed improvement measures and management approaches to upgrade “WeChat plus outpatient medical services” quality from the aspects of patients and hospital’s management, and optimized patients’ diagnosis procedures

This chapter gives a detailed description about the empirical research process of “WeChat plus Outpatient Medical Services” in T Hospital, including the implementation background and concept of T Hospitals’ “WeChat plus outpatient medical services”, detailed introduction to the construction of “WeChat plus outpatient medical services” in T Hospital. T Hospital has established a special construction group headed by the hospital director and consisting of principals of each department. The overall construction is based on dealing with the problem of long waiting time of patients and consideration has been given to patients’ demands so as to analyze the whole outpatient medical treatment process and formulate detailed plans of medical treatment procedures. The hospital’s original information system is updated based on the above-mentioned construction concept to give convenience to the implementation of “WeChat plus outpatient medical services” platform in the hospital.

In the beginning of T Hospital’s implementation of “WeChat plus outpatient medical services” platform, the project group has conducted training and provided guidance to medical staff and patients in outpatient departments. During the operation, the problems reported by each department have been summarized, mainly including financial problems, restructuring of outpatient registration and restructuring of diagnosis arrangement and calling numbers. Timely and detailed plans have been worked out. The project group conducted a self-designed questionnaire survey among patients to better understand patients’ use feeling and the reliability and validity of the questionnaire have been proven to be sound before the distribution of questionnaire. In the mid-term of the project, the research group conducted interview and group discussion among principals and staff member in the implementation of “WeChat plus outpatient medical services” platform, relevant customer service staff who directly get

in touch with patients, and principals of related supporting functional departments in order to further understand the status quo and deficiencies in the platform. Through interview and field trip survey, the research group summarized the top 10 problems faced by the patients and medical staff in the operation of the platform. In order to figure out the causes for the problems, the research group conducted group discussion and designated specific departments for each problem to formulate continuous improvement plans and realize continuous improvement in a real sense.

Chapter 5: Data Analysis of the Questionnaire Survey

5.1 Descriptive Analysis

5.1.1 Statistical Analysis of Demography

Among the respondents, the proportion of females is higher than that of males, with the ratio of male to female being 1:1.8.

Analyzed from the ages of respondents, those from 18 to 40 years old account for 70.7% which implies that most respondents of the survey are young adults.

Analyzed from education backgrounds of respondents, those with bachelor degree as their highest degree account for 40.5%, the highest proportion of total.

Among the respondents, 39.4% of them are doctors, nurses and managers of T hospital. While among other respondents who are not staff of T hospital, the number of public officers is largest, with the proportion of 19.5%.

Analyzed in the aspect of income, those respondents whose annual income ranging from 60,000 yuan to 100,000 yuan account for 38.6%, the highest proportion of total, and respondents with annual income less than 200,000 yuan account for 93.9%. More details are shown in Appendix 2, Table 23.

5.1.2 Feature Analysis of Respondents Who Do Not Follow T Hospital's WeChat Official Account

This survey collected 800 valid questionnaires, with 116 questionnaires' respondents not following the T hospital's WeChat official account, accounting for 14.5% of the total survey respondents.

Analyzed in different age groups of respondents, the proportion of those older than 60 years old is the highest, accounting for 78.9%; those from 31 years old to 40 years old has the lowest proportion of 8.6%. The fewest elderly people follow the T hospital's

WeChat official account because it is difficult for them to accept WeChat official account and other modern information technology, and they are accustomed to using traditional model for seeking medical advices. On the contrary, the age group from 31 years old to 40 years old, main force in workplace, ties up with work so that they pay more attention to time costs and accept WeChat platform which obviously can save time of registration and fee payment with pleasure.

In respect of education backgrounds, the basic trend is that the lowest education background is, the highest the proportion of not following the WeChat official account shows, for example, those with Junior school or lower than junior school as their education background account for 55.6%, the highest proportion of total. That suggests that education background is positively correlated with the acceptance of "WeChat plus outpatient medical services" platform, while the less doctors follow it probably because the total number of doctors is comparatively few and then the amount of survey sample is relatively few.

In terms of professions, peasants account for the highest proportion of not following the WeChat official account (32.4%) that relates to their educational level. Due to T hospital's staff are more familiar with the "WeChat plus outpatient medical services" platform and feel deeply the convenience of "WeChat plus outpatient medical services", T hospital's doctors, administrative staff and nurses are more receptive to the "WeChat plus outpatient medical services" model and have the lowest proportion of not following the official account, with 3.0%, 4.3% and 5.6% respectively.

Lastly, in the aspect of annual income, those earning more than 500,000 yuan account for the lowest proportion of not following the WeChat official account of 0.0%, while respondents earning 300,000 yuan to 400,000 yuan have the highest proportion of 40.0%. Please see Appendix 2, Table 24 for more details.

5.1.3 Descriptive Analysis of Relevant Problems

5.1.3.1 Cause Analysis of not following T Hospital's WeChat Official Account

Among 800 survey respondents, 684 respondents have followed T hospital's official account, accounting for 85.5% of total, and 116 respondents do not follow it, with the proportion of 14.5%. Based on survey data, not familiar with WeChat official account, unable to use it, and bothered to follow it (namely, unnecessary to follow it for short diagnosis time) are the main causes of not following T hospital's WeChat official account. See details in Appendix 2, Table 25.

5.1.3.2 Usage Analysis of T Hospital's Official Account Services

Among 800 survey respondents, 684 respondents have used T hospital's official account, accounting for 85.5% of total, and 116 respondents do not use it, with the proportion of 14.5%. Through investigating the participators who have used T hospital's official account, appointment registration, information query (including hospital's profile, departments' introduction and doctors' introduction), as well as diagnosis and fee payment are the three WeChat official account functions used most by respondents. See details in Appendix2, Table 26.

5.1.3.3 User Experience Analysis of WeChat Official Account

In respect of the survey that whether respondents can use T hospital's WeChat official account adroitly, 596 respondents chose "Yes", accounting for 74.55%, while 88 respondents (11% of total) and 116 respondents (14.5% of total) chose "No" and did not choose respectively.

From the survey in terms of "Three-Long" dilemma of diagnosis, 607 respondents (75.9% of total) thought waiting time for diagnosis was shortened after using WeChat official account, and 522 of them (65.3% of total) said the waiting time was reduced at least 30 minutes. Besides, 629 respondents (78,6% of total) stated registered time was also shortened after using WeChat official account, 530 respondents (66.3% of total) agreed that time for payment was reduced, and 476 respondents (59.5% of total) thought getting medicine used less time after applying WeChat official account. See details in

Appendix 2, Table 27.

According to the survey of “One-Short” dilemma, 356 respondents (accounting for 44.5% of total) said treatment time remained unchanged after using WeChat official account, 310 respondents (38.7% of total) thought treatment time was shortened, and only 18 respondents (just 2.3%) stated treatment time was extended. See details in Appendix 2, Table 28.

5.1.4 Comparison between Patients’ Expectations and Actual Services

From Appendix 2, Table 29, the average expected value of patients ranges from 4.06 to 4.13, while the average actual service value of the hospital ranges from 3.79 to 3.94.

The actual services provided by the hospital are lower than patients’ expectations in terms of five dimensions of service quality, which indicates hospital’s “WeChat plus outpatient medical services” quality fails to live up to patients’ expectations.

The maximum difference appears in the dimension of empathy that illustrates there is a comparatively large different between hospital’s “WeChat plus outpatient medical services” quality and patients’ expectations in empathy. Oppositely, the minimum difference is in the dimension of reliability which shows “WeChat plus outpatient medical services” quality is similar with patients’ expectations in reliability. **5.1.5 The Effect of Dimensions of Service Quality on Patients’ Perception of Service Quality Improvement**

Through Analyzing the 684 users of “WeChat plus outpatient medical services” platform, explore the effect of various options on five dimensions of service quality.

5.1.5.1 Tangibles

As shown in Appendix3, Figure 26, most patients choose the option of “satisfied” except the question A3 in the aspect of tangibles. The proportion of choosing “very unsatisfied” in question A3 is much higher than other questions of this dimension. See details in Appendix 3, Figure 26.

5.1.5.2 Reliability

As shown in Appendix 3, Figure 27, most patients choose the option of "satisfied" in the questions of reliability. The proportion of choosing "very unsatisfied" in questions B10 and B12 is much higher than other questions of this dimension.

5.1.5.3 Responsiveness

In the dimension of responsiveness, the proportion of choosing the option of "satisfied" in all questions (D16 - D19) is the highest, and then the option of "generally satisfied". Furthermore, the proportion of choosing "very unsatisfied" in all questions of this dimension is the lowest. See details in Appendix 3, Figure 28.

5.1.5.4 Assurance

In the dimension of assurance, the proportion of choosing the option of "satisfied" in all questions is the highest, and then the option of "generally satisfied". Furthermore, the proportion of choosing "very unsatisfied" in question D19 is higher than other questions of this dimension. See details in Appendix 3, Figure 29.

5.1.5.5 Empathy

In the dimension of empathy, the proportion of choosing the option of "satisfied" in all questions is the highest, while that proportion in question E23 is much lower than other questions. Furthermore, the proportion of choosing "unsatisfied" and "very unsatisfied" in question E23 is much higher than other questions of this dimension. See details in Appendix 3, Figure 30.

5.2 One-way Analysis of Variance

5.2.1 Gender

As demonstrated in Appendix 2, Table 30, both of the P values of five dimensions of service quality and patients' perception of service quality improvement are larger than 0.05, with no significant difference among patients of different genders in five dimensions of service quality and perception of service quality improvement.

5.2.2 Age

As demonstrated in Appendix 2, Table 31, P value equals 0.949, which does not show significant difference in patients’ perception of service quality improvement, but P value of tangibles is 0.023 less than 0.05, which shows the significant difference.

Compare every two age groups in dimension of tangibles by the use of Turkey method. When compare the fifth group with the second group and the third group respectively, P values are 0.03 and 0.47 respectively that implying significant difference. Moreover, the average of the fifth group (aging from 51 to 60 years old) is less than the second group and the third group (aging from 18 to 40 years old), which shows respondents aging from 51 to 60 years old pay more attention to the tangibles of medical service quality.

5.2.3 Educational Background

In the aspect of patients’ perception of service quality improvement, P value is larger than 0.05, which does not show significant difference, but P values of five dimensions of service quality is less than 0.05, which shows the significant difference. Going further, compare every two groups through Turkey method.

In tangibles, values of the second group, the third group and the fourth group are less than that of the sixth group, which means the former three groups pay more attention to the tangibles of medical service quality.

In reliability, value of the second group is less than that of the fourth group, the fifth group and sixth group, which illustrates patients with junior high school degree as the educational degree attach more importance to the reliability of medical service quality.

In responsiveness, values of the second group and the third group are less than that of the sixth group, which states the patients with junior and senior high school degree as the educational degree pay more attention to the responsiveness of medical service quality.

In assurance, values of the second group and the third group are less than that of the

sixth group, which demonstrates the patients with junior and senior high school degree as the educational degree attach more importance to the assurance of medical service quality.

In empathy, values of the second group and the third group are less than that of the sixth group, which implies the patients with junior and senior high school degree as the educational degree pay more attention to the empathy of medical service quality. See details in Appendix 2, Table 32.

5.2.4 Profession

In the aspect of reliability, P value is 0.069, larger than 0.05, which does not show significant difference among various professions, but there are significant difference among various professions in total satisfactory degree, tangibles, responsiveness, assurance and empathy.

Continue to compare every two groups through Turkey method, and people can find values of the seventh group, the eighth group and the ninth group are less than that of the second group in total satisfactory degree, which illustrates the former three groups pay more attention to the total satisfactory degree of medical service quality. Along the same line, value of the eighth group is less than that of the first group.

In responsiveness, values of the first group and the fourth group are less than that of the seventh group, which states the patients of the former two groups attach more importance to the responsiveness of medical service quality.

In assurance, value of the first group is less than that of the seventh group, which shows the patients of the first groups pay more attention to the assurance of medical service quality.

In empathy, value of the first group is less than that of the ninth group, which demonstrates the patients of the first groups attach more importance to the empathy of medical service quality.

There is no significant difference among every two groups in tangibles, so it will not be listed. See details in Appendix 2, Table 33.

5.2.5 Income

Except that the P value in tangibles is less than 0.05, different incomes are significantly different in this dimension rather than other dimensions. Continue to compare every two groups through Turkey method.

In tangibles, value of the third group is less than that of the first group with the P value less than 0.05, which means the patients of the third groups (with annual income of 110,000 yuan to 200, 000 yuan) pay more attention to the tangibles of medical service quality than the patients of the third groups (with annual income less than 50, 000 yuan).See details in Appendix 2, Table 34.

5.3 Logistic Regression Analysis of Influence Factors of Patients' Perception of Service Quality Improvement

Set patients' perception of service quality improvement as dependent variable, and gender (dummy variable), age (dummy variable), educational level (dummy variable), profession (dummy variable), education background (dummy variable), annual income (dummy variable), whether following T hospital's WeChat official account, tangibles, reliability, responsiveness, assurance and empathy as independent variables. Apply orderly Logistic regression analysis which conforms to proportional odds assumption to explore the influence factors of patients' perception of service quality improvement. X^2=49.926, P=1, the result of parallel testing, shows there is proportional odds assumption so as to conduct a orderly multi-class Logistic regression analysis. Profession categories, tangibles, reliability and empathy have statistical significance in difference of patients' perception of service quality improvement ($P<0.05$). In the aspect of professions, doctors, nurses and administrative managers of T hospital obviously experienced the improvement of hospital's service quality for they use T hospital's WeChat platform better than respondents in other professions, as well as could clearly feel the difference between the situations before and after the implementation of the platform.

The tangibles are negatively correlated with patients’ perception of service quality improvement; the reliability and empathy are positively correlated with patients’ perception of service quality improvement. Probably due to the“WeChat plus outpatient medical services” platform is at the early stage where the implementation of plenty of work is insufficient and patients need more time to adapt the platform, it exerts a negative impact on the patients’ perception of service quality improvement. While through staff training, reliability and empathy could be embodied in medical service quality provided by the hospital, and hospital’s staff attach great importance to supply of “Internet Plus” medical services quality; therefore, there is a positive correlation between the reliability and empathy of service quality in regression equation and patients’ perception of service quality improvement. See details in Appendix 2, Table 35.

5.4 Overall Evaluation of Patients’ Perception of Service Quality

According to overall evaluation of patients’ perception of service quality, 684 patients of the total 800 valid questionnaires have followed and used T hospital’s “WeChat plus outpatient medical services” platform. What is more, in the answers to the third part of questionnaire - “ do you think the hospital’s service quality have obtained improvement after using the WeChat platform?”, 460 respondents, accounting for 67.25% of the 684 respondents who have followed and used T hospital’s “WeChat plus outpatient medical services” platform, chose the option of “according with expectations”; 38 respondents (accounting for 5.56%) chose the option of “beyond expectations”; 13 respondents chose the option of “ far beyond expectations”, accounting for 1.90%. More details see Table 5-14. The number of the respondents of the above mentioned three groups is 511, account for 74.71% of the respondents who have followed and used T hospital’s “WeChat plus outpatient medical services” platform, namely, most patients thought service quality accords with or exceeds their expectations when using T hospital’s “WeChat plus outpatient medical services” platform. See details in Appendix 2, Table 36.

5.5 Chapter Summary

On the basis of SPSS 19.0 software, this chapter adopted descriptive analysis, on-way analysis of variance and statistical approach of orderly multi-class logistic regression analysis to conduct data analysis of information found in survey. On the grounds of the processing results of the above data, patients thought agreed that “WeChat plus outpatient medical services” platform contributed to improvement of “Three-Long” dilemma (namely, long registered time and payment time, long time for getting medicine and long waiting time for diagnosis), instead of “One-Short” problem (namely, short treatment time); on the other hand, in “WeChat plus outpatient medical services” quality, the actual hospital’s service quality gained development, while differed from patients’ expectations to different extent because patients with various professions have diverse perception of service quality improvement.

Chapter 6: Research Discussion and Summary

The course of this more than three-year research went through proposal, demonstration and project approval in September 2014, project bidding, commencement of research and development in June 2015, trial operation and continuous improvement in January 2016, official operation in March 2016, evaluation by questionnaire survey since May 2016, conduct of interviews in October 2016, project expert consultation, brief summary and evaluation in February 2017, and finally, summary of research results during April to May 2017.

6.1 Whether the “Three-Long & One-Short” Dilemma Can Be Solved by the Use of “WeChat plus Outpatient Medical Services” Platform

Over-crowdedness and the “Three-Long & One-Short” dilemma (namely, long registered time and payment time, long waiting time, long time for getting medicine and short treatment time) in outpatient departments in China’s large-sized public hospitals are very common and general. As previously mentioned, “WeChat plus outpatient medical services” platform is obviously able to alleviate the “Three-Long” dilemma according to data results and data analysis of this research, as shown in Table 5-5. Besides, from the results of questions 11 to 15 in the part of “basic information” of the questionnaire, 684 respondents have followed and used T hospital’s WeChat official account among the 800 valid questionnaires. Among the 684 respondents:

629 respondents thought thfiat registered time was shortened, in which, 383 respondents chose the option of “15 minutes shorter”, accounting for 47.9% of the total 800 respondents; 173 respondents chose the option of “30 minutes shorter”, accounting for 21.6% of the total; 17 respondents chose the option of “45 minutes shorter”, accounting for 2.1% of the total; 11 respondents chose the option of “60 minutes

shorter", accounting for 1.4% of the total; 45 respondents chose the option of "more than 1 hour shorter", accounting for 5.6% of the total. Therefore, most patients felt that registered time was shortened to different degrees after using the "WeChat plus outpatient medical services" platform.

530 respondents thought that payment time was shortened, in which, 279 respondents chose the option of "15 minutes shorter", accounting for 34.9% of the total 800 respondents; 193 respondents chose the option of "30 minutes shorter", accounting for 24.1% of the total; 19 respondents chose the option of "45 minutes shorter", accounting for 2.4% of the total; 9 respondents chose the option of "60 minutes shorter", accounting for 1.1% of the total; 30 respondents chose the option of "more than 1 hour shorter", accounting for 3.8% of the total. Hence, most patients felt that payment time was shortened to different degrees after using the "WeChat plus outpatient medical services" platform.

476 respondents thought that time for getting medicine was shortened, in which, 266 respondents chose the option of "15 minutes shorter", accounting for 33.3% of the total 800 respondents; 174 respondents chose the option of "30 minutes shorter", accounting for 21.8% of the total; 12 respondents chose the option of "45 minutes shorter", accounting for 1.5% of the total; 7 respondents chose the option of "60 minutes shorter", accounting for 0.9% of the total; 17 respondents chose the option of "more than 1 hour shorter", accounting for 2.1% of the total. Therefore, most patients felt that time for getting medicine was shortened to different degrees after using the "WeChat plus outpatient medical services" platform.

607 respondents thought that waiting time for diagnosis was shortened, in which, 310 respondents chose the option of "15 minutes shorter", accounting for 38.8% of the total 800 respondents; 212 respondents chose the option of "30 minutes shorter", accounting for 26.5% of the total; 33 respondents chose the option of "45 minutes shorter", accounting for 4.1% of the total; 18 respondents chose the option of "60 minutes shorter", accounting for 2.3% of the total; 34 respondents chose the option of "more than 1 hour shorter", accounting for 4.3% of the total. Therefore, most patients felt that waiting time for diagnosis was shortened to different degrees after using the

“WeChat plus outpatient medical services” platform that improved the work efficiency of the hospital and reduced patients’ wasted time for seeking medical advices .

As shown in Table 5-6, in terms of patients’ perception of changes of treatment time,

310 respondents chose the option of “reduced”, accounting for 38.70% of the total 800 respondents;

356 respondents chose the option of “no change”, accounting for 44.50% of the total 800 respondents;

18 respondents chose the option of “extended”, accounting for 2.30% of the total 800 respondents.

Thus, from patients’ perspective, doctors’ treatment time was not extended clearly after using the “WeChat plus outpatient medical services” platform, which implies that the “One-Short” dilemma (namely, short treatment time) fails to be improved and still exists.

As information technology improves and develops, the application of T hospital’s “WeChat plus outpatient medical services” platform promoted the conduct of this research based on total quality management theory, “Juran Trilogy” thinking method and model of “European Quality Award”, with total staff involvement. Reinvented on the basis of T hospital’s outpatient diagnosis and treatment procedures, “WeChat plus outpatient medical services” platform effectively simplified and combined procedures so as to alleviate the “Three-Long” dilemma (namely, long registered time and payment time, long waiting time for diagnosis, long time for getting medicine), which was proved in both theoretical design and practical application. Thus, the expected goals and effect are basically achieved.

Actually, T hospital is not a large-sized public hospital equipped with over 1000 sickbeds, and the visits to outpatient departments of T hospital is much less than that of top 100 hospitals in China; hence, “WeChat plus outpatient medical services” platform may have a more pronounced effect in those large-sized public hospitals from logistic inference. Nevertheless, due to insufficient data and samples of T hospital, it is hard to reflect the high representativeness in objective respects.

However, the "One-Short" dilemma (namely, short treatment time) fails to be improved evidently by the use of the "WeChat plus outpatient medical services" platform, and even some patients think that time is shortened. In this regard, the amount of patients waiting for diagnosis is comparatively fixed because of the time-phased waiting for diagnosis in T hospital's procedural design, where doctors have to diagnose a certain amount of patients within 1 hour, a deficiency of procedural design. Secondly, doctors get used to make a diagnosis and treatment at a relatively fast speed, so in the aspect of personal service factor, they lack of the awareness to enhance service quality actively. By inference, the present "One-Short" dilemma also cannot gain obvious improvement in the top 100 hospitals in China, since the visits to outpatient departments are really excessive in China. Only the hierarchical medical system indeed come true that "minor illness cured in the community; serious illness cured at the hospital" and reasonable distribution of outpatients are realized, can appropriately alleviate the "short treatment time" dilemma in outpatient departments of large-sized public hospitals.

6.2 The Effect of "WeChat plus Outpatient Medical Services" Platform on the Hospital's Service Quality

6.2.1 The Impact of Dimensions of Service Quality on Patients' Perception of Service Quality

Although T hospital's "WeChat plus outpatient medical services" platform effectively ameliorates or partly solves the "Three-Long" dilemma, as well as raises experience of seeking medical advices, the effect of patients' perception of service quality require a further analysis.

Measurement of service quality is closely related to dimensions of service quality. In the implementation process of the "WeChat plus outpatient medical services" platform, five dimensions of service quality (namely, tangibles, reliability, responsiveness, assurance and empathy) received comparatively high evaluation by patients according to results of questionnaires. Some unsatisfactory aspects are

demonstrated as follows.

In the aspect of tangibles, a few patients (more than 50) chose the option of "very unsatisfied" in the question "The hospital provides a sound WIFI environment".

In the aspect of reliability, a very few patients (approximate 25) chose the option of "very unsatisfied" in the questions "The information in the message of fee payment sent by the hospital is accurate and patients are able to pay the fee after using WeChat to seek medical advices" and "The hospital uploads outpatient examination reports on WeChat official account timely for patients' query".

In the aspect of responsiveness, patients felt fairly satisfied except the question of "The hospital actively responds when patients consult or complain".

In the aspect of assurance, a very few patients (approximate 25) chose the option of "very unsatisfied" in the question "The hospital's WeChat official account has privacy protection setting".

In the aspect of empathy, patients felt fairly satisfied. A very few patients (approximate 25) chose the option of "very unsatisfied" in the question "The hospital takes special demands of patients in consideration and offers relevant services in WeChat official account and procedures of seeking medical advices, for instance, fee reduction and remission through health insurance, at the public expenses, of veterans, the aged, the disabled and others".

Apparently, the unsatisfied aspects of patients focus on hospital's "facilities" and "soft power". Dimensions of tangibles, reliability, assurance and empathy reflect the deficiency of hospital's "facilities" so that design on WeChat platform and facilities need to be developed. While dimension of responsiveness shows weakness in hospital's "soft power" that employees' awareness of serving actively requires to be strengthened and enhanced.

6.2.2 The Analysis on Service Quality Gap among Dimensions of Service Quality

Service quality gap refers to the gap of measuring service expectations and perception of service quality. According to this research, T hospital's services are below

the patients’ expectations in five dimensions of service quality as shown in Table 5-7, which further manifests the service quality gap in various dimensions existed between the usage of T hospital’s “WeChat plus outpatient medical services” platform and patients’ perception of service quality. The largest gap is in the dimension of empathy, while the smallest gap is in the dimension of reliability. For different patients, comparative analysis on their perception of service quality in five dimensions is displayed as follows:

Gender: There is no significant difference in five dimensions and perception of service quality among patients with different genders.

Age: Patients aged 51 to 60 pay more attention to the tangibles of medical services.

Education background: There is significant difference in perception of five dimensions of service quality among patients with different education backgrounds. Basically, all patients focus on the tangibles of service quality, while those with lower education backgrounds pay more attention to perception of reliability, responsiveness, assurance and empathy.

Profession: There is difference in perception of total satisfactory degree, tangibles, responsiveness, assurance and empathy of services among patients with different professions.

Income: Patients who earn 100,000 to 200,000 yuan annually pay more attention to the tangibles.

Thus, according to this research, patients’ age, education background, profession, and income have a great impact on their perception of service quality.

Hence, service quality gap can not only be regarded as the basis of continuous improvement, but also enhance staff’s service initiative, especially promote the extension of treatment time, which is the effective measure to let patients feel doctors’ carefulness and truly cure patients, and is the best diagnosis and treatment experience of patients.

6.2.3 The Overall Embodiment of Service Quality

As Table 5-14 implied, 684 patients, among the 800 valid questionnaires, have followed and used T hospital's "WeChat plus outpatient medical services" platform. In the answers of the third part of the questionnaire "Do you think that the service quality in our hospital is improved after using the WeChat official account".

According with expectations: 460 patients, accounting for 67.25% of the 684 respondents.

Beyond expectations: 38 patients, accounting for 5.56% of the 684 respondents;

Far beyond expectations: 13 patients, accounting for 1.90% of the 684 respondents;

Thus, the amount of the above mentioned patients are 511, accounting for 74.71% of the 684 respondents, which suggests that most patients think the service quality accords with or exceeds their expectations when using "WeChat plus outpatient medical services" platform.

6.3 The Analysis on Correlative Factors Influencing Patients' Perception of Service Quality Improvement

As Table 5-13 showed, with application of Logistic regression analysis, set patients' perception of service quality improvement as the dependent variable, and gender (dummy variable), age (dummy variable), educational level (dummy variable), profession (dummy variable), education background (dummy variable), annual income (dummy variable), whether following T hospital's WeChat official account, tangibles, reliability, responsiveness, assurance and empathy as the independent variables.

In terms of regression analysis, profession categories, tangibles, reliability and empathy have statistical significance in difference of patients' perception of service quality improvement ($P < 0.05$).

In the aspect of professions, doctors, nurses and administrative managers of T hospital obviously experienced the improvement of hospital's service quality for they

use T hospital’s WeChat platform better than respondents in other professions, as well as could clearly feel the difference between the situations before and after the implementation of the platform.

The tangibles are negatively correlated with patients’ perception of service quality improvement; the reliability and empathy are positively correlated with patients’ perception of service quality improvement. Probably due to the “WeChat plus outpatient medical services” platform is at the early stage where the implementation of plenty of work is insufficient and patients need more time to adapt the platform, it exerts a negative impact on the patients’ perception of service quality improvement. While through staff training, reliability and empathy could be embodied in medical service quality provided by the hospital in a short time, and hospital’s staff attach great importance to service quality of “WeChat plus outpatient medical services” platform; therefore, there is a positive correlation between the reliability and empathy of service quality in regression equation and patients’ perception of service quality improvement.

6.4 Deficiencies

For evaluation of this research, except through questionnaire survey, this research group conducted expert consultation and group discussion for ten problems summarized from interview, collected the existing problems of this project research and solutions, as well as found responsible departments so as to facilitate the follow-up research and continuous improvement.

In general, there are some problems including inadequate “facilities” in the hospital, imperfect “soft power”, policy barrier, and issues among stakeholders.

Insufficient objective conditions of the hospital: incomplete coverage of WIFI signals, and PACS system failure to exchange data completely with WeChat platform.

Inadequate service initiative of the hospital: some employees pay little attention to and are unfamiliar with hospital’s WeChat platform, with negative service awareness; the hospital is lack of outpatient customer service staff and needs to provide services timely; the hospital fails to perfect relevant systems and to manage responsible

departments well.

In the aspect of stakeholders: the Health Insurance Office has not completely opened the medical services at the public expenses and through health insurance in WeChat platform, and there are government barrier and policy barrier; after service delivery prescribed in the contract by Internet companies which are responsible for information development, banks and other service suppliers, the hospital is lack of subsequent maintenance and support that results in the backwardness of continuous improvement.

6.5 Chapter Summary

Based on analysis of the research results, this chapter made sure that this research could solve or alleviate “Three-Long” dilemma in the hospital’s outpatient departments instead of “One-Short” problem and made an analysis for this through discussing whether “WeChat plus outpatient medical services” platform could solve the “Three-Long& One-Short” dilemma. On the grounds of analysis of five dimensions of service quality and service quality gap, “WeChat plus outpatient medical services” platform’s influence on improvement of patients’ outpatient diagnosis experience and satisfactory degree of patients and medical staff was explored.

On the grounds of the processing results of the above data, patients thought agreed that “WeChat plus outpatient medical services” platform contributed to improvement of “Three-Long” dilemma (namely, long registered time and payment time, long time for getting medicine and long waiting time for diagnosis), instead of “One-Short” problem (namely, short treatment time); on the other hand, in “WeChat plus outpatient medical services” quality, the actual hospital’s service quality gained development, while differed from patients’ expectations to different extent because patients with various professions have diverse perception of service quality improvement.

[This page is deliberately left blank.]

Chapter 7: Conclusions, Suggestions and Limitations

On the basis of total quality management theory, this research was conducted abiding by “Juran Trilogy” (namely, quality planning - quality control - quality improvement) and the logical model of “European Quality Award”. For the issue of the “Three-Long & One-Short” Dilemma generally appeared in outpatient departments of China’s large-sized public hospitals, this research systematically elaborated historical reasons of the “Three-Long & One-Short” Dilemma and the practical significance of solving this dilemma through literature review, and further put forward that reinvention of outpatient diagnosis and treatment procedures by developing the“WeChat plus outpatient medical services” platform, so as to improve outpatients’ diagnosis and treatment experience. What is more, on the grounds of the empirical research in T hospital, all employees worked together to enhance the outpatient service quality, and finally to increase the satisfactory degree of patients and medical staff.

7.1 Research conclusions

Through the empirical research in T hospital, this research group researched the following conclusion and reflection:

1. The construction of “WeChat plus outpatient medical services” platform is effectively able to alleviate the “Three-Long” dilemma of “Three-Long & One-Short” (namely, long registered time and payment time, long waiting time for diagnosis, long time for getting medicine and short treatment time), but fails to solve the “One-Short” dilemma.

2. At the same time of building the “WeChat plus outpatient medical services” platform based on total quality management theory, the hospital is supposed to mobilize the employees' enthusiasm with all staff involvement. Besides, taking the opportunity of improvement of service procedures, the hospital could strengthen employees’

awareness to serve actively, keep improving outpatient service quality, and further increase the satisfactory degree of patients and medical staff.

3. In the process of the empirical research in T hospital, the research group was deeply aware that TMQ could help the construction of hospital’s quality culture. Owing to the prominent individuation of medical staff’s operations that differs from corporate line production, TQM has its own particularity when it is implemented in the hospital.

4. The establishment and implementation of the “WeChat plus outpatient medical services” platform is subject to all “stakeholders”, government barrier, cooperation and support of partners and staff, as well as feedback and assistance of customers.

5. Under the realistic condition of a large population base, in order to thoroughly or truly solve the problem of over-crowdedness in outpatient departments of China’s large-sized public hospitals, it is necessary to base on hierarchical and appointment diagnosis and treatment, stress the information-based means, enhance health education, raise public awareness of diseases, promote the health of the people so as to reduce aimless medical treatment and build a reasonable order for seeking treatment. Indeed, that is a long-term task.

7.2 Research contributions

This research, as a research on “Internet Plus” medical services based on total quality management theory, explored the methods of solving the problem of over-crowdedness and the “Three-Long & One-Short” dilemma in outpatient departments of China’s large-sized public hospitals through an empirical research of T hospital’s “WeChat plus outpatient medical services”. Additionally, this research also proved that “Internet Plus” medical services models like “WeChat plus outpatient medical services” are conducive to alleviate or solve the “Three-Long” dilemma in outpatient departments, which provided a reference solution for resolving the difficulty of seeking medical treatment among the Chinese public.

7.2.1 The Suggestions for Changing the Problem of Over-crowdedness in China's Public Hospitals

Firstly, the empirical research of T hospital proved that, the construction of "WeChat plus outpatient medical services" platform was capable to alleviate or solve the "Three-Long" dilemma in outpatient departments. The visits to the outpatient departments in T hospital are not enormous, but the platform also has a significant effect, which can be publicized vigorously especially in the top 100 large-sized public hospitals in China.

Secondly, only breaking the policy barrier and opening the interface between the medical insurance settlement or medical settlement at public expenses and the platform or other "WeChat plus medical services" platforms, can "WeChat plus outpatient medical services" platform truly play an important role and provide "one stop" services such as achieving payment in WeChat or by Internet financial systems. This is a problem that has troubled hospital's managers for many years. In the early stage of the research in 2014, hospital's managers called to open the government barrier; however, the interface between the fee payment by health insurance and Internet payment has not been actually opened at the summary stage of this research, for instance, it is only permitted in Guangzhou Women and Children's Medical Center as a pilot in Guangzhou.

Premier Li Keqiang of China's State Council chaired a State Council executive meeting on April 12, 2018, which decided to carry out measures of Internet Plus healthcare that can significantly alleviate the problem of inaccessible and expensive public health services for the general public while improving people's health. He pointed out that accelerating the development of Internet Plus healthcare can ensure more efficient medical services and bring convenience to patients. More importantly, it will make quality medical resources more accessible to the public. According to a decision at the meeting, firstly, the top two levels of hospitals within the country's three-tier hospital system will be encouraged to provide online services, including consultation, reservation and test result inquiry. Medical institutions will be allowed to

provide online diagnostic services for some common and chronic diseases in patients' follow-up visits to their doctors. Secondly, the government will see to it that long-distance healthcare services cover all healthcare consortiums and county-level hospitals, and that quality medical resources in the country's eastern areas be made available to the central and western regions. More efforts will be made to ensure that high-speed broadband networks will be extended to cover medical institutions at all levels in urban and rural areas. Dedicated internet access services will be set up to meet the need for long-distance healthcare services. Thirdly, the real-time sharing of prescription and drug retail sales within medical institutions will be explored. The review for health insurance will be vigorously applied, and the one-stop settlement will be brought forward. The system of Internet Plus healthcare standards will be further refined. The inter-connectivity and sharing of medical information will be accelerated, and the quality supervision of medical services and information security will be strengthened (General Office of the State Council of the People's Republic of China, 2018).

Undoubtedly, the announcement of the news greatly inspired hospitals' managers around the whole country. It is believed that "WeChat plus outpatient medical services" platform and other Internet Plus healthcare constructions will be in full swing, which also could promote and accelerate the resolution of the problem of inaccessible and expensive public health services for the general public.

Thirdly, when striving to develop Internet Plus healthcare, it should be realized that Internet Plus healthcare is only a kind of measure to alleviate the treatment dilemma at present public hospitals. In the long term, it is essential to implement and develop hierarchical medical system, as well as encourage doctors' multi-sited license to break the medical pattern that public hospitals always play a dominant role. In this regard, medical staff, as the subject to provide medical services, will come out from public hospitals, and flow freely between public hospitals and private hospitals or clinics so as to remedy the reality that the ratio between Chinese present medical staff and Chinese population is extremely imbalanced. Besides, only accelerate accessibility of public

health services, can the problem of inaccessible and expensive public health services for the general public be alleviated.

7.2.2 The Theories and Social Contributions

For the problem of inaccessible and expensive public health services for the general public, this research offered instances and reference to China’s government, which made social contributions to the Chinese government’s resolution of dilemma for seeking medical services for the general public. Although this research is only the tip of the iceberg, in respect of Chinese model of Internet Plus healthcare, it has conducted pilot exploration and case analysis together with hospitals’ managers. This research has stimulated and undertaken social responsibility to promote development of Chinese Internet Plus healthcare and resolution of policy barrier. For many years, the researches of hospitals’ management team strived to, based on their researches and specific practices, find and solve problems. Therefore, a State Council executive meeting was held on April 12, 2018, which decided to carry out measures of Internet Plus healthcare that can significantly alleviate the problem of inaccessible and expensive public health services for the general public while improving people’s health. The meeting pointed out that accelerating the development of Internet Plus healthcare can ensure more efficient medical services and bring convenience to patients. More importantly, it will make quality medical resources more accessible to the public, as well as the one-stop settlement including medical insurance settlement and Internet Financial payment will be brought forward.

T hospital’s research process and experience of “Internet Plus” Medical Services are able to improve the development of national Internet Plus healthcare. Specifically, it can provide experience in case study for the public hospital, and share cases with national theory construction of solving the problem of inaccessible and expensive public health services for the general public, which possesses practical significance.

Besides, the research of the “WeChat plus outpatient medical services” platform was carried out based on total quality management theory, “Juran Trilogy” of quality management and model of “European Quality Award”, with total staff involvement and

continuous improvement. Furthermore, the research provided experience for the refinement of the system of Internet Plus healthcare standards, accelerate inter-connectivity and sharing of medical information, as well as strengthen the quality supervision of medical services and information security.

Hence, the research made social and theoretical contributions to national construction of the system of Internet Plus healthcare, creatively carried out the research of the “Internet Plus” medical services based on total quality management theory, shared cases, as well as offered practical experience in management to perfect the system of Internet Plus healthcare.

7.3 Research limitations

Although the final research conclusions have been made, with certain theoretical and social contributions, there are still some limitations, which are shown as follows:

1. This research has only been conducted in one hospital, featuring incomprehensive research basis and the possibility of overgeneralization. This research has provided some practical experience, which, however, can only be used as references.

2. The Grade III Level A hospitals in China boast enormous outpatient visits, which lead to even severe “Three Longs and One Short” dilemma. But T Hospital has only 500 sickbeds, and compared with other large-sized public hospitals, the number of its outpatient visits is much smaller. The “Three Longs and One Short” dilemma in T Hospital is less severe than that in large-sized public hospitals. As a result, the conclusions are not universal and this research has certain limitations.

7.4 Future Research Directions

This research has an obviously practical significance. Under the guidance of the State Council policy of developing Internet Plus healthcare, hospitals are expected to further improve the facilities and soft power of hospitals’ “WeChat plus outpatient

medical services”, perfect their coverage of WIFI, enhance the interconnection of “Pacs” and other systems, and prepare to perfect the infrastructure for medical insurance settlement docking, in order to finally bring forward the one-stop services. Moreover, intelligent pharmacy can be established according to the actual situation, which can accomplish the full-automatic dispensing system for better solving the dilemma of long time for getting medicine.

Meanwhile, conducting comparative studies on samples of several hospitals, and learning from other's strong points to offset their own weakness will deepen and develop the research of Internet Plus” Medical Services.

In addition, as the in-depth research continues, it is indispensable to enhance staff’s recognition and understanding of the “total quality management theory”. With information construction as the means, update hospitals’ service concepts and develop the quality culture, to eventually establish the hospitals’ culture of “innovating service mode with patients as the center, and improving service level with quality as the criterion”, which is the development direction and ultimate goal of this research.

[This page is deliberately left blank.]

Bibliography

Ar, De. (2012). A road of quality in Japan. *Quality Exploration,* 9 (z1)*, 43.* In Chinese.

Anonymity. (1979). Vice Minister Qian Zhongxin's speech to reporters: modern construction becomes the focus of medical healthcare. *People's Daily*, P4. In Chinese.

Cai, W. H. (1997). *A Practical Book of Reform of China's Medical Security System*. Beijing: China Human Resources Press. In Chinese.

Cao, W. W. (2017). Family doctor sign system in Great Britain and its enlightenment. *Medicine & Jurisprudence*, 9 (1), 19-25. In Chinese.

Chen, L. F., Lin, J., & Zhang, L. (2012).The inspiration of Singapore health system to China. *Medicine and Society*, 25 (1), 71-73. In Chinese.

Chen, Y. T. (2014). *Quality Management.* Beijing: Beijing Jiaotong University Press, Tsinghua University Press. In Chinese.

Chiarini, A. & Baccarani, C. (2016).TQM and lean strategy deployment in Italian hospitals: benefits related to patient satisfaction and encountered pitfalls. *Leadership in Health Services*, 29 (4), 377.

Cong, X., Yang, D. R., Meng, Y. H., & Gu, Z. H. (2014).Human resource sharing between small- and medium-sized public hospitals and large-sized ones. *Soft Science of Health*, 28 (9), 570-573. In Chinese.

Deming, W. E. (1986). *Out of Crisis.* Cambridge: Cambridge University Press.

Editorial Committee of Guangdong Health and Family Planning Yearbook.(2017). *Guangdong Health and Family Planning Yearbook-2016*. Guangzhou: Guangdong People's Publishing Housing. In Chinese.

Eklof, J. A. & Westlund, A. (1998). Customer satisfaction index and its role in quality management. *Total Quality Management*, 9 (4-5), 80-85.

Engel, J. F. (1995). *Consumer Behavior*. New York: Dryden Press.

Oxford. (1978). *The Oxford English Dictionary*. Oxford County: The Clarendon Press.

Falkenreck, C. & Wagner, R. (2011). The impact of perceived innovativeness on maintaining a buyer-seller relationship in health care markets: a cross-cultural study. *The TQM Journal,* 27 (3): 225-242.

Fierman, J. & Carvell, T. (1995). Americans can't get no satisfaction. *Fortune*, 132 (12), 186-189.

Fitzsimmons. J. A.,& Fitzsimmons. M. J. (2003). *Service Management: Operations,*

Strategy and Information Technology. (Zhang, J. C. & Fan, X. C., Trans). Beijing: China Machine Press. In Chinese.

Fornell, C. (1996). A national customer satisfaction barometer: the Swedish experience. *Journal of Marketing*, 56 (1), 6-21.

Fornell, C. & Johnson, M. D. (1993). Differentiation as a basis for explaining customer satisfaction across industries. *Journal of Economic Psychology*, 14 (4), 681-696.

Han, B. (2009). The trilogy of Juran's quality management. *Enterprise Reform and Management*, (9), 65-66. In Chinese.

Han, J. P., Li, P., Gao, K. Y., & Ma, X. C. (2006). Constructing a hospital total quality management system that is suitable for China. *Hospital Management Forum*, 23 (10), 12-14. In Chinese.

Henkin, L. (1974). Privacy and autonomy. *Columbia Law Review*, 74 (8), 1410-1433.

Hurchill, S. J. (2009). *Marketing Research*. New York: Dryden Press

Iveta, P., Dumitru, R. C., Chronaki, C. E., Bujnowska-Fedak, M. M., Andreassen, H. K., & Silvina, S., et al. (2007). European citizens' use of e-health services: a study of seven countries. *Bmc Public Health*, 7 (1), 53.

Jeonghoon, L. & Hansuk, L. (2013). Dose satisfaction affect brand loylty? *Academy of Marketing Studies Journal*, 17 (2), 133-147.

Jiao, L. (2017).Study of influencing factors of sustained use behavior of network medical reservation platform users. *Medicine and Society*, 30 (10), 81-83. In Chinese.

Juran, J. M. (2013). *Juran's Quality Handbook: The Complete Guide to Performance Excellence*. Beijing: China Renmin University Press. In Chinese.

Keiningham, T., Gupta, S., Aksoy, L., & Buoye, A. (2014).The high price of customer satisfaction. *Mit Sloan Management Review*, 55 (3), 37-46.

Krüger, V. (1999).Towards a European definition of tqm – a historical review.*TQM Magazine,* 11 (4), 257-263.

Krüger, V. (2001). Main schools of tqm: "the big five". *TQM Magazin*e, 13 (3), 146-155.

Kulkarni, R. & Malouin, R. A. (2016).State of telehealth. *N Engl J Med*, 375 (14), 1399-1400.

Lai, Y. C. & Chen, J. X. (2017).Thoughts on Internet medicine. *Chinese Medical Equipment Journal*, 38 (3), 120-122. In Chinese.

Li, C. M. & Wang, B. (2001).Historical significance of China's rural doctors and limitation on development. *Chinese Community Doctors*, (1), 3-4. In Chinese.

Li, J. D. (1998). The application of theory of total quality management to library work. *Research on Library & Information Work of Shanghai Colleges & Universities*, (2), 14-

16. In Chinese.

Li, J., Fu, L. H., Mao, Y. Q., Wang, X. Y., & Yao, Y. B. (2015). The situation of China's family doctor system and some advice on its improvement. *Drug Evaluation*, 12 (22), 14-17. In Chinese.

Li, L., Jiang, Y., & Chen, Q. L. (2008). A review of China's health care reform after the reform and open policy in 1978.*Chinese Health Economics*, 27 (2), 5-9. In Chinese.

Li, N. & Chen, M. (2016). China's Internet medical service models and its current situation of application. *Chinese Journal of Health Informatics and Management,* (5), 455-460. In Chinese.

Li, S. F. & Yang, D. R. (2016). O2O medical pattern based on "Internet +". *Soft Science of Health,* 30 (5), 258-260. In Chinese.

Li, W. P. (1991). Development and reform direction of public health services and labor-protection medical care. *Chinese Health Economics*, (8). In Chinese.

Li, X. G. (2010). A review of customer satisfaction theory and its development trend. *Economic perspectives*, 1 (4), 87-90. In Chinese.

Li, Y. N., Lei, H., & Wu, H. B. (2017).Foreign hierarchical medical treatment and its reference for China. *Foreign Medicine (Health Economics)*, 34(2), 49-53. In Chinese.

Li, Y. & Sun, C. X. (2016). Innovation and development of "Internet plus medical care". *Macroeconomic Management*, (3), 33-35. In Chinese.

Li, Z. Q. & Lin, F. (2006).The introduction of the first-treatment system at community abroad. *Chinese Health Economics*, 25 (2), 76-77. In Chinese.

Liang, H. X. (2010). An overview of the activity development of Japanese and International QC groups. *China Quality*, (1), 62-63. In Chinese.

Liang, Y. & Zhang, N. (2015). Thoughts and reference of foreign healthcare system in completing hierarchical hospital visit system. *Chinese Hospitals*, (8), 50-52. In Chinese.

Ling, S. (2015). The role of China's family doctor system in improving the hierarchical medical treatment system. *Journal of Inner Mongolia Agricultural University (Social Science Edition)*, 17 (4), 34-38. In Chinese.

Liu, H. Q. (2009). Public health services and labor-protection medical care: fading memory. *China Social Security*, (10), 42-45. In Chinese.

Liu, L. Q. (2018). Promoting the contracting services for home doctors and strengthening the construction of hierarchical medical treatment system. *Chinese General Practice*, (1). In Chinese.

Liu, Y. Z. (1990). China's total quality control (TQC): characteristics, achievements and expectation. *Management Review*, (4), 3-9. In Chinese.

Luor, T., Lu. H. P., Chien, K. M., & Wu, T. C. (2015). Contribution to quality research:

a literature review of Kano's model from 1998 to 2012. *Total Quality Management & Business Excellence*, 26 (3), 234-247.

Ma, X. K. (2013). Development history and application status of network medical treatment. *China Medical Equipment*, (8), 70-72. In Chinese.

Magdalena, B. F. M. (2015). Trends in the use of the internet for health purposes in Poland. *BMC Public Health*, 15 (1), 1-17.

Makanyeza, C., Macheyo, R., & Toit, F. D. (2016). Perceived product necessity, perceived value, customer satisfaction and attitude: an integrative model. *Journal of African Business*, 17 (1), 69-86.

Man, L. (2006). Hot topic on medical insurance. *Chronic Pathematology Journal*, (3), 18-23. In Chinese.

Meng, Q., Yin, X., & Liang, C. (2017). The current situation and development of China Internet plus healthcare. *Chinese Journal of Health Informatics and Management*, 14 (2), 110-118. In Chinese.

Mosadeghrad, A. M. (2016). Why tqm does not work in Iranian healthcare organizations. *International Journal of Health Care Quality Assurance*, 27 (4), 320-335.

National Bureau of Statistics of People's Republic of China. (2011). *China Statistical Yearbook-2011.* Beijing: China Statistics Press. In Chinese.

National Health and Family Planning Commission of People's Republic of China. (2015). *China Health and Family Planning Statistical Yearbook (2014)*. Beijing: Peking Union Medical College Press. In Chinese.

National Health and Family Planning Commission of People's Republic of China.(2015). Action plan for further improving medical services. *Chinese Practical Journal of Rural Doctor*, (13), 16-18. In Chinese.

Nwabueze, U. (2014). The rise and decline of tqm in the nhs. *TQM Journal*, 26 (5).

Oliver, R. L. (1994). Conceptual issues in the structural analysis of consumption emotion, satisfaction, and quality. *Advances in Consumer Research*, 21 (1), 16-22.

Ostrom, A. & Lacobucci, D. (1995). Consumer trade-offs and the evaluation of services. *Journal of Marketing*, 59 (1), 40-47.

Parasuraman, A. (1998). Customer service in business-to-business markets: an agenda for research. *Journal of Business & Industrial Marketing*, 13 (4/5), 309-321.

Parasuraman, A., Zeithaml, V. A., & Berry, L. L. (1985). A conceptual model of service quality and its implications for future research. *Journal of Marketing*, 49 (4), 41-50.

Peng, Z. C., Sang, Z. Q., Wang, Y. G., Pan, J., Wang, M. J., & Xiong, J., et al. (2012). Application of bank-hospital connection system in outpatient departments, *China Medical Equipment*, 9 (4), 30-32. In Chinese.

Peppard, J. & Rowland, P. (2003).*The Essence of Business Process Re-Engineering*. Beijing: CITIC Press. In Chinese.

Petersen, P. B. (1999). Total quality management and the deming approach to quality management. *Journal of Management History*, 5 (8), 468-488.

Pinto, M. B. (2015).Social media's contribution to customer satisfaction with services. *Service industries Journal*, 35 (11), 573-590.

Psychol, S. W. C. (2009). Use of the internet for health purposes: trends in Norway 2000–2010. *Scandinavian Journal of Caring Sciences*, 23 (4), 691–696.

Pu, L. Z. & Dai, A. Q. (2017).Experience of Singapore family physician service and its implication for family physician service in China. *Medicine & Philosophy*, 38 (19), 66-68. In Chinese.

Pulles, N. J. (2016). The impact of customer attractiveness and supplier satisfaction on becoming a preferred customer. *Industrial marketing Management*, 54 (4), 129-140.

Qi, C. (2006). China's medical insurance system in the system transition. *Chinese Health Economics*, 25 (1), 44-46. In Chinese.

Qin, L. M. (2015). Application of total quality management in nursing management. *Jilin Medical Journal*, 36 (7), 1461-1462. In Chinese.

Rajic, T. & Dado, J. (2013). Modeling the relationships among retail atmospherics, service quality, satisfaction and customer behavioral intentions in an emerging economy context. *Total Quality Management & Business Excellence*, 24 (9), 1096-1110.

Research Group of Shanghai Academy of Quality Management. (2011). Quality improvement and national prosperity: quality management strategies and enlightenment in Japan, the U.S. and Germany. *Shanghai Quality*, (4), 33-35. In Chinese.

Scherr, A. L. (1992). A new approach to business processes. *Ibm Systems Journal*, 32 (1), 80-98.

Schier, L. (2002). Perspectives on the American quality movement. *Business Process Management Journal*, 6 (1), 21.

Song, J. W. (1989). The implementation of total quality management in the past ten years (abstract).*Quality and Reliability*, (5), 3-6. In Chinese.

Stake, R. E. (1995). *The Art of Case Study Research*. Thousand Oaks, California: Sage Publications.

Sun, G. Q. (2014). *Methodology of Management Research*. Shanghai: Truth & Wisdom Press. In Chinese.

Tang, Y. L. (1991). Status quo of the reform of system of public health services and labor-protection medical care. *Chinese Health Economics*, (11), 44-46. In Chinese.

The Third Research Department of Party History Research Center of the CPC Central Committee. (2008). *China's Reform and Opening-up: 30 Years On*. Shenyang: Liaoning People's Publishing Housing. In Chinese.

Veljković, S. & Marinković, V. (2010). Models for measuring customer satisfaction at the national level. *Economic Themes*, 48 (3), 383-402.

Wang, A. Q. & Zheng, X. Q. (2016). The status quo of Internet medical based on the analysis and investigation on three hospitals. *Chinese Journal of Health Policy*, 9 (1), 69-73. In Chinese.

Wang, A. W. & Shen, J. (2010). A review of Chinese customer satisfaction theory. *Jiangsu Commercial Forum*, 6 (2), 12-13. In Chinese.

Wang, X. D. (2004). Problems resulted from the sharp increase of number of outpatients and emergent patients and countermeasures. *Chinese Journal of Hospital Administration*, 20 (10), 602-602. In Chinese.

Wang, Y. L. (2014). Exploration and thoughts on Internet Medical Care. *China Computer & Communication (Theory Edition)*, (8), 75-76. In Chinese.

Wang, Y. Z. (2001). China's role in rural medical health security. *Strategy and Management*, (3), 15-24. In Chinese.

Weiner, J. P. (2012). Doctor-patient communication in the e-health era. *Israel Journal of Health Policy Research*, 1 (1), 33.

Westbrook, R. (1991). *Customer Subjective*. New York: Wiley Press.

Wingo, W. S. (1985). Index measures quality on nationwide scale. *Design News*, 50 (22), 22-23.

Wu, F. L. (2015). Rural cooperative medical treatment in the perspective of systematic transformation. *Seeking Truth*, 42 (1), 49-57. In Chinese.

Wu, W. J. (2014). The study of construction of the public health system in the early new China--based on the perspective of the waste. *Technoeconomics & Management Research*, (7), 86-90. In Chinese.

Wu. M. L. & Tu, J. T. (2012). *SPSS & the Application and Analysis of Statistics*. Dalian: Dongbei University of Finance & Economics Press. In Chinese.

Xia, G. F. (2004). Total quality management in German hospitals. *Chinese Nursing Research*, 18 (11), 1026. In Chinese.

Xu, H. L. (2004). Close connection of hospitals' total quality management (TQM) with the maximum rights and interests of customers. *Contemporary Medicine*, 10 (1), 14-15. In Chinese.

Yang, C. G. (2009). Avoid patients' unexpected misfortune caused by the "three longs and one short" dilemma in hospitals. *Health for Everyone,* 15, 21. In Chinese.

Yang, G. B. (1997). TQC in German Enterprises. *Cemented Carbide*, (4), 254-256. In Chinese.

Yi, M. (2003). Three major stages in the development of quality management. *Electronics Quality*, (3), 86, 78. In Chinese.

Yin, R. K. (1984). *Case Study Research Methods: Design and Methods*. California: Sage Publications.

Yu, D. P., Zhang, Y. L., & Zhao, Y. T. (2016). Discussion on "Internet+ medical" development trend. *Mobile Communications*, 40 (13), 12-15. In Chinese.

Yu, H. X., Feng, Y. M., Fu, W., Liu, Z. Y., & Yao, L. (2014). International experience on the division and cooperation among medical institutions and its implications for China: an analysis of the U.K., Germany, Singapore and the U.S. *Chinese Journal of Health Policy*, 7 (6), 10-15. In Chinese.

Yu, Y. (2012). Characteristics of quality management approach of Japanese manufacturing. *Value Engineering*, 31 (16), 126. In Chinese.

Yu, Z. & Zhang, L. (2006). Total quality management and its application in hospital administration. *Chinese Journal of Hospital Administration*, 22 (7), 467-470. In Chinese.

Zhang, R. X. & Zhang, W. (2009). The rise and demise of the Chinese barefoot doctors. *Chinese Journal of Medical History*, 39 (6), 327-330. In Chinese.

Zhang, X. & Yang, N. X. (2015). Practice of classified diagnosis and treatment in U.K. and U.S.A. and their implications to China. *Medicine & Philosophy*, 36 (13), 37-41. In Chinese.

Zhang, Y. & Li, Y. H. (2005). Features of and enlightenment from general practitioners abroad. *Chinese Journal of Hospital Administration*, 21 (3), 213-215. In Chinese.

Zhang, Z. K. (1992). A review of the early history of cooperative medical services. *Chinese Health Economics*, (6). In Chinese.

Zhang, Z. K., Zhao, L., & Li, F. (2006). Changes in China's rural cooperative medical services over the past 50 years. *Chinese Health*, 26 (3), 3-5. In Chinese.

Zhao, Y. G. (2011). The "three longs and one short" dilemma in large hospitals. *Yunnan Daily*, pp, 001. In Chinese.

Zhou, S. Q., & Gu, X. Y. (1994). Progress in the research on China's rural health security system. *Chinese Rural Health Service Administration*, (9), 7-12. In Chinese.

Zhou, C. (2010). Singapore healthcare service: experience and enlightenment. *Hospital Directors' Forum- Journal of Capital Medical University (Social Science)*, 7 (6), 86-87. In Chinese.

Webliography

Anonymity.(2017). *British family doctor system VS China's grading diagnosis and treatment system.* Retrieved July 9, 2018, from http://www.medsci.cn/article/show_article.do?id=39699e79867. In Chinese.

China Information World. (2017). *An overview of China's "Internet plus medical care"*. Retrieved July 9, 2018, from http://www.dooland.com/magazine/article_971633.html. In Chinese.

Li, L. X. (2012). *Li Lixin, a member of Chinese People's Political Consultative Conference (CPPCC): cancelling the state-funded public medical treatment for civil servants.* Retrieved April 3, 2018, from http://news.163.com/12/0312/18/7SDR6D5700014JB5.html. In Chinese.

Li,N. (2014). *Guahao.com wins a bill of over USD 100 million: Tencent leads the investment and Qiming follows.* Retrieved July 9, 2018, from http://finance.sina.com.cn/roll/20141014/020420527066.shtml. In Chinese.

National Health and Family Planning Commission of PRC.(2017). *How to advance the contracting service for Chinese family doctors and strengthen the construction of hierarchical medical treatment system.* Retrieved April 3, 2018, from http://baijiahao.baidu.com/s?id=1592742081794169959&wfr=spider&for=pc. In Chinese.

Ouyang, F. (2018). *Latest! China's top 100 hospitals with the most outpatient visits.* Retrieved July, 13, 2018, from https://www.cn-healthcare.com/article/20180403/content501976.html?appfrom=jkj&from=singlemessage. In Chinese.

People.com-Hubei. (2016). *The first medical payment system through face recognition in China is online in Wuhan and patients can seek medical services through face recognition.* Retrieved July 9, 2018, from http://hb.people.com.cn/n2/2016/0328/c194063-28023016.html. In Chinese.

Xi, J. P. (2014). *General Secretary Xi Jinping in field trip in Jiangsu Province: I hope everyone enjoys prosperity.* Retrieved May 3, 2018, from http://news.cntv.cn/2014/12/14/VIDE1418556056402930.shtml. In Chinese.

Xi,J.P. (2016). *Expert interpretation: building the medical consortium is a major measure for promoting hierarchical medical treatment.* Retrieved May 3, 2018, from http://www.nhfpc.gov.cn/zwgk/jdjd/201705/12bebaa7cd5a47389e1569b0121ca2b5.shtml. In Chinese.

Xie,J. (2017). *Family doctor system in U.K. vs hierarchical medical treatment in China.* Retrieved May 3, 2018, from http://www.medsci.cn/article/show_article.do?id=39699e79867. In Chinese.

Medical Community. (2018). *Over 1,400 operations conducted in one day! This hospital breaks a record*. Retrieved July 13, 2018, from https://mp.weixin.qq.com/s/kUnB0AWqOw5Xp7mOEmIM6Q. In Chinese.

Zhu,H.P. (2015). *Internet may help China to exceed its rivals in medical care even in twists and turns.* Retrieved July 9, 2018, from http://www.geekheal.com/hulianwangyiliao-2/?fm=wx. In Chinese.

Zhu,H.P. (2018). *The root cause of China's medical system is found out!* Retrieved July 9, 2018, from http://www.360doc.com/content/18/0207/12/15509478_728339746.shtml. In Chinese.

Other References

Bureau of Finance of Guangzhou Municipality. Notice of Guangzhou Municipal Human Resources and Social Security Bureau on Adjusting Related Treatment Standards of Basic Medical Insurance in Guangzhou and the Payment Scope of Personal Medical Account. 2010. In Chinese.

CPC Central Committee and the State Council. Outline of the Healthy China 2030 Plan. 2016. In Chinese.

General Office of Guangzhou Municipal People’s Government. Notice of General Office of Guangzhou Municipal People’s Government on Issuing Trial Measures of Guangzhou Rural and Urban Residents’ Social Medical Insurance.2014. In Chinese.

General Office of the State Council of the People’s Republic of China. Outline for the Planning of the National Medical and Health Service System (2015-2020). 2015. In Chinese.

General Office of the State Council of the People’s Republic of China. Opinions of the General Office of the State Council on Promoting the Development of “Internet plus Health Care”.2015. In Chinese.

General Office of the State Council of the People’s Republic of China. Opinions of the General Office of the State Council on Promoting the Development of “Internet plus Health Care”.2018. In Chinese.

General Office of the State Council of the People’s Republic of China.Report on the Work of the Government (2015). 2015. In Chinese.

Guangzhou Municipal Human Resources and Social Security Bureau. Notice on the Scope and Standards of Payment of General Outpatient Medical Fees through Consolidated Funds of Employees’ Social Medical Insurance. 2014 In Chinese.

Guangzhou Municipal Human Resources and Social Security Bureau & Bureau of Finance of Guangzhou Municipality. Notice on Adjusting the Relevant Treatment Standards of Guangzhou Basic Medical Insurance and the Payment Range of Personal Medical Accounts.2010. In Chinese

Meeting of the Standing Committee of the State Council. Determine the development of “Internet health care” measures to ease the problem of seeing a doctor and improve the health of the people. 2018. In Chinese.

Ministry of Labor and Social Security of People’s Republic of China and National Bureau of Statistics of People’s Republic of China. Statistical Communique on the Development of Labor and Social Security in 2005. 2006. In Chinese.

National Bureau of Statistics of People’s Republic of China. China Statistical Yearbook (2001).2002. In Chinese.

National Health and Family Planning Commission of People’s Republic of China. Administrative Measures for the Registration of Practicing Medical Doctors. 2017. In Chinese.

Political Bureau of the CPC Central Committee. Report on the Work of the Government at the 17th National Congress of the Communist Party of China. 2007. In Chinese.

Political Bureau of the CPC Central Committee. Report on the Work of the Government at the 18th National Congress of the Communist Party of China. 2012. In Chinese.

World Bank. *China: The health Sector*.1984

[This page is deliberately left blank.]

Appendix 1

Questionnaire of "WeChat plus Outpatient Medical Services"

Dear friend,

In order to learn about your expectations for "WeChat plus outpatient medical services" and evaluation of our hospital's "WeChat plus outpatient medical services", we carry out this research. After that, we will summarize and analyze the research results, which would be regarded as the basis of improvement of our hospital's "WeChat plus outpatient medical services". This questionnaire is completely anonymous, so please answer every question of this questionnaire according to the actual situation. We ensure that all of your personal information will be kept confidential, please feel free to answer.

Thanks for your support and cooperation!

I Basis information

Please tick"√" box of the corresponding option according to your actual situation, and write down actual information in those questions need to be filled out.

1. Gender:

   a. male□ b. female□

2. Age:

   a.＜18□ b. 18-30□ c. 31-40□ d. 41-50□ e.51-60□ f.≥60□

3. Educational level:

   a. junior school or below□ b. junior high school□ c. senior high school or technical secondary school□ d. junior college□ e. undergraduate□ f. postgraduate□ g. PhD□

4. Profession:

   a. public officer (including civil servant, staff of public institutions) □ b. administrative staff of company□ c. technician of company□ d. worker□ e. peasant□ f. the self-employed□ g. doctor of T hospital□ h. nurse of T hospital□

i. administrative manager of T hospital□ j. administrative manager of T hospital□ k. other employee of T hospital□

5. Annual income:

a.＜50,000 yuan□ b. 60,000-100,000 yuan□ c. 110,000-200,000 yuan□ d. 210,000-300,000 yuan□ e.310,000-400,000 yuan□ f. 410,000-500,000 yuan□ g.≥500,000 yuan□

6. Have you followed our hospital's WeChat official account? (If the answer is "yes", please move to the question 8 directly.)

a. yes□ b. no□

7. What are the causes that you do not follow our hospital's WeChat official account? (You may choose more than one option, and this is the end of the Part I if you answer this question.)

a. not familiar with WeChat official account□ b. unable to use WeChat official account□ c. bothered to follow it□ d. concerned about revealing personal information□ e. cannot pay by health insurance or at the public expenses□ f. insufficient WeChat service functions□ g. inconvenient because of bad network□ h. unnecessary to follow it for short diagnosis time□ i. inconvenient registration withdrawal and fee refund□ j. other causes

8. Have you used our hospital's WeChat official account?

a. yes□ b. no□

9. Which services have you used in our hospital's WeChat official account? (You may choose more than one option.)

a. information query (including hospital's profile, departments' introduction and doctors' introduction)□ b. appointment registration□ c. diagnosis and fee payment□ d. reports query□ e. receipts query□ f. consultation□ g. survey of satisfactory degree□

10. Could you use our hospital's WeChat official account adroitly to seek medical advices?

a. yes□ b. no□

11. Do you think the waiting time for diagnosis in our hospital is shortened through using the WeChat official account?

a. 15 minutes shorter□ b. 30 minutes shorter□ c. 45 minutes shorter□ d. 60 minutes shorter□ e. more than 1 hour shorter□ f. no change□ g. extended□

12. Do you think the registered time in our hospital is shortened through using the WeChat official account?

a. 15 minutes shorter□ b. 30 minutes shorter□ c. 45 minutes shorter□ d. 60 minutes shorter□ e. more than 1 hour shorter□ f. no change□ g. extended□

13. Do you think the time for payment in our hospital is shortened through using the WeChat official account?

a. 15 minutes shorter□ b. 30 minutes shorter□ c. 45 minutes shorter□ d. 60 minutes shorter□ e. more than 1 hour shorter□ f. no change□ g. extended□

14. Do you think the time for getting medicine in our hospital is shortened through using the WeChat official account?

a. 15 minutes shorter□ b. 30 minutes shorter□ c. 45 minutes shorter□ d. 60 minutes shorter□ e. more than 1 hour shorter□ f. no change□ g. extended□

15. Do you think the treatment time in our hospital is shortened through using the WeChat official account?

a. reduced□ b. no change□ c. extended□

II Expectations for and Satisfactory Degree Evaluation of "WeChat plus Outpatient Medical Services"

1. The following survey focuses on your expectations for and satisfactory degree evaluation of "WeChat plus outpatient medical services". If your expectation for "WeChat plus outpatient medical services" or satisfactory degree of actual services is comparatively high, please tick a higher score; on the contrary, if you think some contents are not so important in your expectations or you feel unsatisfied with hospital's actual services, please tick a lower score.

2. Please score in terms of your actual feelings. The scores range from 1 to 5 that 1 expresses "very low" and 5 means "very high" in the aspect of the expectation. Besides, in respect of satisfactory degree of hospital's actual services, 1 means "very unsatisfied" and 5 implies "very satisfied".

Contents	Your Expectations					Hospital's Actual Services				
	Very high	High	Middle	Low	Very low	Very	Satisfied	Generally	Unsatisfie	Very
A1. The WeChat official account's interface is simple and clear.	5	4	3	2	1	5	4	3	2	1
A2. The contents of WeChat official account are set reasonably.	5	4	3	2	1	5	4	3	2	1
A3. The hospital provides a sound WIFI environment.	5	4	3	2	1	5	4	3	2	1
A4. The hospital posts up WeChat official account marks at prominent positions.	5	4	3	2	1	5	4	3	2	1
A5. The hospital provides clear and concise operational guidance of WeChat official account which can be easily obtained by patients.	5	4	3	2	1	5	4	3	2	1
A6. The hospital provides clear and concise procedural guideline of using WeChat official account which can be easily obtained by patients.	5	4	3	2	1	5	4	3	2	1

B7. Information provided by hospital's WeChat official account is accurate and reliable.	5	4	3	2	1	5	4	3	2	1
B8. The procedures of using WeChat official account to seek medical advices are precise and reasonable.	5	4	3	2	1	5	4	3	2	1
B9. The hospital can provide medical services after accomplishing the appointment registration through WeChat.	5	4	3	2	1	5	4	3	2	1
B10. The information in the message of fee payment sent by the hospital is accurate and patients are able to pay the fee after using WeChat to seek medical advices.	5	4	3	2	1	5	4	3	2	1
B11. Patients can get medicine after using WeChat to pay the fee.	5	4	3	2	1	5	4	3	2	1
Contents	Your Expectations					Hospital's Actual Services				
	Very high	High	Middle	Low	Very low	Very	Satisfied	Generally	Unsatisfie	Very
B12. The hospital uploads outpatient examination reports on WeChat official account timely for patients' query.	5	4	3	2	1	5	4	3	2	1
C13. The time for seeking medical advices is shortened after using WeChat official account.	5	4	3	2	1	5	4	3	2	1
C14. The hospital's staff can actively solve problems confronted by patients in the use of WeChat official account and respond quickly.	5	4	3	2	1	5	4	3	2	1
C15. The hospital actively responds when patients consult or complain.	5	4	3	2	1	5	4	3	2	1
D16. The hospital's staff is familiar	5	4	3	2	1	5	4	3	2	1

with procedures of seeking medical advices in WeChat.										
D17. Procedures of seeking medical advices in WeChat are reasonable and can save time.	5	4	3	2	1	5	4	3	2	1
D18. Service information in the hospital's WeChat official account is updated timely.	5	4	3	2	1	5	4	3	2	1
D19. The hospital's WeChat official account has privacy protection setting.	5	4	3	2	1	5	4	3	2	1
E20. The services provided by the hospital's WeChat official account accord with patients' demands.	5	4	3	2	1	5	4	3	2	1
E21. The hospital know patients' demands for WeChat outpatient services.	5	4	3	2	1	5	4	3	2	1
E22. The hospital follows up and revises the problems of WeChat operation and procedures that you reflect.	5	4	3	2	1	5	4	3	2	1
E23. The hospital takes special demands of patients in consideration and offers relevant services in WeChat official account and procedures of seeking medical advices, for instance, fee reduction and remission through health insurance, at the public expenses, of veterans, the aged, the disabled and others.	5	4	3	2	1	5	4	3	2	1

III Do you think that the service quality in our hospital is improved after using the WeChat official account?

a. far below expectations□ b. slightly below expectations□ c. according with expectations□ d. beyond expectations□ e. far beyond expectations□ f. no change□

Appendix 2

Table

Table 1 Conclusion on the Development History of China's Cooperative Medical System

years	Contents
1955	Formal emergence of cooperative medical system of insurance nature in China's rural areas.
1956	*Model Guidelines on Agricultural Production Cooperatives* was passed at the Second Session of the First National People's Congress, giving the responsibility to collectives at the legal level for the first time to get involved in the medical securities of rural residents.
1959	Ministry of Health of the PRC initially used the term "cooperative medical".
1960	The cooperative medical system was promoted throughout China.
1965	China emphasized that efforts should be devoted to the construction of cooperative medical system in rural areas.
1978	The cooperative medical system was incorporated into the Constitution
1979	China defined the rural cooperative medical system as a socialist medical system that was established by people's communes with the help of collective forces on a voluntary and mutual-aid basis, which was the collective welfare undertakings for commune members
1980	The production teams equipped with barefoot doctors accounted for 93.7% of China's total production teams with the number of barefoot doctors reaching 1.46 million.

Source: The Author

Table 2 T Hospital’s requirements of diagnosis and treatment procedures

Links of Procedures	**Requirements**
Binding Patient ID Card	1. Use ID card number to bind only, including children. 2. Verify telephone number when bind with patient ID card.
Unifying Appointment Source Pool	1. Unify administration of appointment and registration source pools, and share the source pools at all platforms. 2. Six appointment sources are available each hour (the hospital can maintain it by itself). 3. The appointment cycle of appointment sources is one week. 4. Experts are appointed as doctors; others are appointed as departments.
Identity Authentication	1. Patients who are in the first diagnosis should authenticate identities and health insurance. 2. Those who are not in the first diagnosis but the first appointment registration in WeChat also need an authentication. 3. Users can choose pay in health insurance card or at their expenses.
Appointment Registration	1. Patients who have appointed registration could seek medical services directly with no need to register; the ordinary numbers are delivered to doctors automatically by the system, but the triage nurses could manually adjust. 2. if the appointment number is invalid because the patient comes late, the triage nurses could manually adjust. For example, if the patient misses his or her appointment time period from 8 am to 9 am, the nurses would manually adjust the queue. 3. Pay the fee when appoint. 4. Corresponding discounts of appointment fee would be given in terms of users’ identity (for instance, old certificate and disabled certificate). The patients should pay the full fee before identity authentication, and the discount would be given after that. 5. The registered time and the window time at that day are the same and can be set, such as 7:45-11:45 and 1:45-16:45.
Appointment Restrictions	The patients who have appointed but refunded fee without seeking medical services will be recorded a break of the appointment. If a patient who has broke the appointment for 5 times, he or she will be blacklisted and then has no right to appoint registration.
Lifting Restrictions	One record of breaking appointments will be cancelled every month after entering the blacklist.
Fee Refund for Registrations	1. If the users who have appointed need to withdraw the registration, fee of the WeChat appointment will be refunded at 24:00 in the day before the treatment day at the latest. 2. If withdraw the registration in the treatment day, the fee collectors can decide to refund fee in the same manner it is received or refund in cash according to the original appointment registration way.

Suspending Medical Services	1. Provide function of suspending medical services, consisting of two stages --- "apply" and "affirm". 2. Apply for suspending medical services at least one day in advance. 3. If the application for suspending medical services is approved, the appointed registration should be canceled and refund fee; meanwhile, the notification of suspending and fee refund would be pushed.
Seeking Medical Services	1. The patients who come late should be arranged manually, and they are not in the queue waiting for being called. On the contrary, their names are displayed in the screen of waiting area, and will be added into the queue waiting for called after being arranged manually. 2. Push notification of consulting rooms and clinic desk numbers at the day before the treatment day and at the treatment day. 3. Seek medical services after showing the WeChat electronic registration list. 4. Save the health care diagnosis in the additional fields of diagnostic lists. When doctors diagnose, they must choose a health care diagnosis after diagnosing in original way. 5. Push relevant notification when doctor print prescriptions. 6. The doctor stations are supposed to have referral function: the initial doctors could refer the patient, and after the referral, triage nurses of referral departments would adjust the queue. Notably, the patients' numbers need to embody the referral procedure, for example, "referral 01".
Fee Payment	1. Only can pay the fee of treatment at the day. 2. At present, health insurance can only deduct part of expenses, and the other part which should be paid by patients' themselves cannot be paid by health insurance cards. 3. Push notification of fee payment. 4. Add QR code in the prescriptions so that the patients could pay by scanning i
Getting Medicine, Treatment, Examination, Test	1. LIS and PACS interface do not adopt written application forms, and the HIS system provides inquiry function as well. 2. Pharmacy: if pay by WeChat, the label must contain the sign of mobile medical payment. 3. The report time within one month could be inquired.
Invoice Printing	1. Print based on needs, add invoice printing interface, and the HIS system is bound to record the time of receiving invoices. 2. Invoices could be printed by fee collectors, and also in the special window.
Fee Refund	Maintain the present procedures of fee refund: doctors initiate a fee refund, relevant departments affirm (off-line procedures), fee-collection counter refunds, and the fee collectors decide to refund fee in the same manner it is received or refund in cash, either full refund or half refund.

Source: The Author

Table 3 T Hospital's system functions of "WeChat plus medical services" platform

Categories	Column Names	Function Introduction
Information Inquiry	Information about the Hospital	Hospital's integrated information block shows the profile of the hospital (namely, the scale, history, key departments and so on), hospital navigation, qualification and certification, and other information.
	Information about Departments	Elaborate the profiles, characteristics and experts of all departments.
	Information about Doctors	Consist of positional titles, working departments and doctors' major areas.
Outpatient Services	Appointment Registration	Patients can make time-phased appointment registration for many days remotely and pay the registration fee.
	On-site Registration	Patients can make registration of the day before arriving at the hospital and pay the registration fee.
	Get Registration Numbers	Patients can cancel registration or make registration of the day by using mobile phones, and then seek medical advices in terms of electronic receipts.
	Get Reports	Patients can inquire reports of tests and examination, and will be sent examination results automatically.
	Queue Waiting for Diagnosis	The hospital's situation of the queue waiting for diagnosis and remote alerts will be passed to patients in this mobile terminal.
In-patient Services	Payment at Patient's Own Expenses	If patients pay online through mobile phone terminals, they can check detailed fee lists before payment; if patients make real-time settlement through health insurance, they only need to pay the part of fee at their own expenses.
	Payment by Health Insurance	
	Hospitalization Deposit	Patients can check and recharge deposits; moreover, deposits will also be reminded to recharge.
	List of Hospitalization Expenses	Patients can check daily lists of hospitalization expenses and total expenses, and will be sent daily lists.
Customer Scarification Survey	Customer Satisfaction Survey	After diagnosis and treatment, questionnaire should be sent to patients in WeChat timely. All-round and multi-dimensional survey is encouraged so as to strengthen hospital's outpatient management.
Account Management	Receipt Inquiry	Patients can inquire registration form, bill of payment, list of getting medicine, reports and other receipts.
	Management of Patient ID Card	Patients can build a new patient ID card, bind cards, add other cards, and cancel existed cards.

Source: The Author

Table 4 T Hospital's feedback of the trial operation of WeChat service system and situation related with finance

	No.	Feedback of Financial Department	Answers of Information Department
Problems of Financial Statement and Reconciliation	1	Summarized data of WeChat fee collection are not consistent with data in detailed list.	Inquire detailed list of daily mobile payment through the function of mobile reconciliation.
	2	In the reconciliation with banks, HIS system can only inquire the information of WeChat registration but not the reconciliation data transmitted from Caifutong company and China Merchants Bank. As a result, data checking among three parties cannot be realized and fund checking also is seriously affected.	At present, HIS system can reconcile accounts with Caifutong automatically through the function of financial management - mobile reconciliation; meanwhile, data from China Merchants Bank are not available to Beikang.
	3	At present, registered fee of WeChat appointment registration is counted in the day of actual payment, but not the day patients seek medical advices, which is not consistent with principle of accounting treatment.	Function of Fee collection in advance is being realized right now.
Problems Confronted by Fee Collectors	1	Since WeChat registration is opened, paper prescriptions has never shown the bar code so that fee collectors have to type patient ID card number with 18 numbers, which has caused an serious impact on fee collectors' work efficiency and accuracy.	Update the typeface of outpatient computers.
	2	After registered in WeChat, the interface of registration receipts print merges with the interface of "invoice reprint" in the original HIS, which leads to confusion of fee collectors.	The function is being optimized that name of operators, groups, description of having accepted diagnosis or not, operation time and number of prescriptions are added in the interface of "registration invoice reprint", and 00:00:00 is being canceled from the registration time.
	3	The interface of "registration invoice print" can only show the diagnosis date but not the actual time of (appointment) registration, so that fee collectors cannot affirm clear source information with patients.	
	4	The time period of seeking medical services is not clear in the interface of "registration invoice print".	Having registered in WeChat or not and having printed registration invoice or not can be judged through operators. If the operator is Beikang Mobile, invoice of this registration record has not been printed.
	5	In the interface of "registration invoice print", where the patients have registered for the same doctors twice, they need to cancel one of them. However, due to lack of corresponding reminders (for example, have made prescriptions or not) in the system, fee collectors are unable to decide to cancel which one.	The interface of cancelling registration has added information about situation of diagnosis and treatment so as to facilitate fee collectors to make judgment.
	6	HIS can only print the latest and future registration invoices but not the previous invoices.	The function of inquiring previous registration invoices has been added.
	7	In the Tianhe District General hospital's daily statement of registers, where the fee collectors refund registered fee in WeChat Pay, the amount in words actually received that is written in the statement is not consistent with the amount that fee collectors should hand in.	It is a procedural issue that WeChat Pay is used to record the amount refunded in the same manner it is received. Due to refund in cash, so -2 should be deducted in the amount in words actually received.

	8	When deal with WeChat payment records with invoices having been printed, there are two records --- one positive and one negative in the daily payment statement of fee collectors. Among these two records, the record of invoice print is marked as “reprint” in the daily payment statement that the expression is inaccurate, and it is hoped to change it into “WeChat Print”.	Optimize the problem and revise the description.
	9	In the Tianhe District General hospital’s daily statement of outpatient fee collectors, “registration in cash” in the heading should be changed into “among them: registration in cash”; Two yuan refund of WeChat registered fee should not be expressed in column of “WeChat Registration” but in columns of “Cash” and “Registration in Cash”.	It is a procedural issue that two yuan refund of WeChat registered fee should be expressed in columns of “Cash” and “Registration in Cash”.
Problems Doctors Met in HIS System	1	In terms of reflection of doctors, if temporal medical advices are prescribed by a doctor who is not in today’s work schedule, the patients cannot register this doctor in WeChat or at fee collector window. For instance, when doctors of gastro-endoscope room prescribe for patients after examination, the patients may not be able to register the doctors.	As stipulated previously, the doctors who are arranged in the work schedule can diagnose. If doctors have contacted patients in advance and prescribe for them, they can register the doctors who are in today’s work schedule for patients, and then they can prescribe through typing the Patient ID card number or searching the patient list of this department.
	2	According to reflection of doctors, electronic examination reports in HIS system (for example, Ultrasonic B examination report) are not printed completely, which requires information department to reset print format.	Original format of Ultrasonic B examination report is A4, and papers should be changed when printing. Now, the function is optimized and HIS system makes some adjustment so that examination, test and treatment application forms are in A5 format uniformly.
Other Problems	1	According to reflection of fee collectors, outpatient doctors who are arranged in schedule are often different from the actual doctors who diagnosed for patients, which results in second registration of patients.	It is the management problem of doctor arrangement that arrangers have not arranged in terms of actual situation.
	2	According to reflection of employees who have experienced the WeChat registration, patients can only go through one route --- “choose date >choose department 1(for example, Internal Medicine Department) >choose department 2 (for example, Outpatient Internal Medicine Department) >choose a doctor (for example, Dr. Yang Zhaoping)”, which is quite mechanized. It is suggested that WeChat registration could add other registration routes, such as registration through searching name of doctors or disease categories, so as to meet patients’ different demands of diagnosis.	Optimize demands in the second phase construction of WeChat official account.
	3	Patients who register for seeking medical advices in WeChat still do not need to do verification in customer service center, which may lead to privacy disclosure of patients. Moreover, in “Binding Patients”, a function of “Management of Patients”, the authorization problem of bound patients is unsettled yet.	After binding in WeChat, patients who wants to enjoy registration discounts must verify in customer service center, otherwise they have to pay at their own expenses. The authorization of bound patients can be accomplished through verifying mobile phones; however, the hospital has not opened short message function yet, this requirement cannot be achieved.

Source: The Author

Table 5 Financial problems required to be revised in T Hospital

Functions	**Description of Problems**
Daily Statement of Registers	I. Format Modification 1. The font of the first column should not be in bold. 2. Add sequence number in cash payment amount, Beikang WeChat Pay and comments. 3. Add date of the statements. II. Lack of money and bills of diagnosis and treatment in registration cancellation and registration withdrawal.
Daily Statement of Fee Collectors	The number of bills of diagnosis and treatment at public expenses is wrong.
Outpatient Registration – Registration Cancel	1. Add description of having accepted diagnosis or not in the interface of withdrawal of registration so that operators can make judgment.
Outpatient Registration – Reprint	1. Add date query in registration receipts reprint, and previous receipts can be queried (only previous receipts through mobile payment can be queried). 2. Add name of operators, groups, description of having accepted diagnosis or not, operation time and number of prescriptions in the interface of "registration invoice reprint", and cancel 00:00:00 from the registration time. Having registered in WeChat or not and having printed registration invoice or not can be judged through operators. If the operator is Beikang Mobile, invoice of this registration record has not been printed. 3. The function of reprint can only reprint patients' own receipts and mobile payment receipts.
Financial Management – Statistical Query >Comprehensive Query of Registration	1. Statistical Query >Comprehensive Query of Registration does not query in terms of the start time and end time actually input, and add 1 in the end time.
Financial Management – Mobile Reconciliation – Beikang Financial Reconciliation	1. The button of downloading should be put in front of the query button, while the query button is supposed to be turned into query of reconciliation. 2. Add a line of total amount in tabs for summary and details so as to aggregate the records queried. 3. Add a function of excel exporting. 4. Tabs for summary and details had better be queried synchronously, but now, after the tab for summary has been queried, the tab for details will be queried again if operators click the button.

Summary Sheet of Settlement	1. Add "Appointment Registration Write-off" Statistical businesses: affirm earning of appointment registration Statistical data: second-degree subjects which are treatment fee collected in advance – outpatient registration fee + treatment fee collected in advance – the total amount of the debtor of outpatient diagnosis and examination fee 2. Add statistical categories in WeChat Registration Registration in the day of diagnosis Registration withdrawal in the day of diagnosis through WeChat Appointment registration, appointment registration withdrawal
Summary Sheet of Earning	Add description of "appointment registration" Statistical businesses: appointment registration, appointment registration withdrawal Statistical businesses: second-degree subjects which are treatment fee collected in advance – outpatient registration fee + treatment fee collected in advance – the total amount of the creditor of outpatient diagnosis and examination fee
Summary Sheet of Settlement	Summary Sheet of Settlement is divided into two pages when printing
Transformation of Two Accounting Methods	The new financial statement is used since April 1st, and the fee collected in advance is counted since April 1st as well. Where the appointment registration was made before April 1st, while the diagnosis was done after April 1st, it is impossible to affirm appointment earning in the day seeking medical advices. Where the appointment registration was made before April 1st, while the diagnosis was done after April 1st, it is unnecessary to write down the fee collected in advance in appointment withdrawal. Details of fee collected in advance, daily statement of Beikang mobile registration, and summary sheet of registration do not summarize the orders before April 1st, and affirm earning and withdraw registration of that fee collected in advance after April 1st.
Information of Fee Payment	In WeChat official account, if many persons are bound and the patient is not in default, operators cannot find payment records after clicking the information of fee payment. At this moment, operators have to reselect a patient.
Notification Pushed for Information of Fee Payment	In the notification pushed for information of fee payment, please add that "payment at patients' own expenses only. If there is a need to charge to an account such as paying by health insurance and at public expenses, please move to fee-collection counter."

Source: The Author

Table 6 Fee collection at different ranks of registration in outpatient departments of T Hospital

Ranks of Registration	Contract Units	Registered Fee	Consultation Fee
General Outpatient Services	Pay at Patient's Own Expenses	1	3
Outpatient Services of Vice Archiater	Pay at Patient's Own Expenses	1	6
Outpatient Services of Archiater	Pay at Patient's Own Expenses	1	8
General Outpatient Services for the Aged,	Pay at Patient's Own Expenses	0	3
Outpatient Services of Vice Archiater for the Aged	Pay at Patient's Own Expenses	0	6
Outpatient Services of Archiater for the Aged	Pay at Patient's Own Expenses	0	8
General Outpatient Services for T Hospital's Staff	Pay at Patient's Own Expenses	1	0
Outpatient Services of Vice Archiater for T Hospital's Staff	Pay at Patient's Own Expenses	1	0
Outpatient Services of Archiater for T Hospital's Staff	Pay at Patient's Own Expenses	1	0

Source: The Author

Table 7 T Hospital's ranks of registration and objects enjoying discounts

Ranks of Registration	General Outpatient Service
	Outpatient Services of Vice Archiater
	Outpatient Services of Archiater
	Outpatient Services in the Emergency Department
	Specialist Outpatient Services
	Well-known Experts
	Experts for VIPs
	Outpatient Services on a Volunteer Basis

Source: The Author

Table 8 T Hospital' registration offer object

Objects Enjoying Discounts	Ordinary People T Hospital's Staff	Free Consultation Fee
	The Aged	Reduce two yuan from Consultation Fee
	The Disabled	Free of Charge
	Veterans	Free of Charge
	The Aged Older Than 60	Free Registered Fee
	Patients Older Than 60 at Public Expenses	Free Registered Fee, Charge 2 yuan to an Account, Reduce 2 yuan from Consultation Fee
	Patients Younger Than 60 at Public Expenses	Charge 2 yuan to an Account
	Free of Charge at Public Expenses	Free Registered Fee, Charge 3 yuan to an Account, Reduce 3 yuan from Consultation Fee
	The Disabled and Veterans at Public Expenses	Free of Charge

Source: The Author

Table 9 Registration fee and consultation fee corresponding to different registration levels and preferential objects of T hospital

Ranks of Registration	Objects Enjoying Discounts	Registered Fee	Consultation Fee
General Outpatient Services	Patients at Their Own Expenses	1	3
Outpatient Services of Vice Archiater	Patients at Their Own Expenses	1	6
Outpatient Services of Archiater	Patients at Their Own Expenses	1	8
General Outpatient Services	The Aged	0	3
Outpatient Services of Vice Archiater	The Aged	0	6
Outpatient Services of Archiater	The Aged	0	8
General Outpatient Services	T Hospital's Staff	1	0
Outpatient Services of Vice Archiater	T Hospital's Staff	1	0
Outpatient Services of Archiater	T Hospital's Staff	1	0

Source: The Author

Table 10 T Hospital's rules of diagnosis arrangement

Categories	Rules
Departments	1. When arranging diagnosis according to departments, ordinary patients are distributed to doctors automatically when doctors choose the next patient. 2. First visits to stomatology department are arranged in terms of departments. 3. If patients demand to select doctors, it can be arranged manually by nurses. After that, only designated doctors can call up the patients.
Doctors	1. Registration for experts is arranged according to doctors, and second visits to stomatology department also are arranged in terms of doctors. 2. Doctor station only can find patients arranged in terms of doctors instead of those arranged in accordance with departments. Thus, to select the latter would input card number and query.

Source: The Author

Table 11 Percentage (%) of T Hospital's Outpatient Registration in WeChat in 2016-2018

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
2016	3.2	6.6	6.4	10.6	12.9	12.8	12.8	13.1	13.7	15.8	16.7	17.2
2017	18.9	20.3	21.4	23.8	24.9	25.1	26.3	25.3	25.9	27.9	28.1	28.6
2018	32.2	29.2	31.4	34.8	33.9							

Source: The Author

Table 12 The present Top Ten problems in the early operation of "WeChat plus outpatient

medical services" platform in T Hospital

No.	Problems	Details
1	Queue up for purchasing medical records booklets	Patients can purchase medical records booklets through WeChat Pay, but still need to queue up together with patients to register and to pay fee. That is to say patients can register through mobile phones without queuing up, but still spend time in on-site queuing up.
2	Suspend medical services emergently	Doctors always suspend medical services emergently, while WeChat does not push notifications to patients. Where patients are not informed that doctors have suspended medical services in other ways, the following situations may happen. Firstly, other doctors will diagnose patients but patients are not informed before. Secondly, patients find that their registered doctors have suspended medical services and then give up diagnosis and leave. Thirdly, patients need to register in hospital, but there must still have registration sources.
3	Lack of recognition and safety check function in WeChat official account	WeChat official account can only recognize ID card number but other information. When patients create accounts or bind linkmen, they cannot receive verification code of confirmation message. Due to the bound patients cannot receive message of binding, the binding people can always view diagnosis information of the bound patients if they do not unbind, and now one account can bind ten patients.
4	Lack of introduction of departments and doctors	By the end of January 1, 2018, 33 departments which can be registered in WeChat have no introduction, and only doctors of 15 departments have introductions. (Note: Including the situation that doctors only provide introduction in one department but can be registered in many departments.)
5	Cannot pay through health insurance and at the public expenses	Cannot use fee payment function through health insurance and at the public expenses.
6	Insufficient staff participation	The staff participation in "WeChat plus outpatient medical services" platform is not enough. Some employees answered differently to the question that whether the hospital did correspondent training at early stage, and a few employees could not master their own work of "WeChat plus outpatient medical services" platform construction.
7	Weak WIFI signal	WIFI signal is not stable, network speeds differ in various areas, and network is of different coverage. (Note: weak WIFI signal is the most prominent problem reflected by patients in questionnaire survey.)
8	Inefficient implementation of human customer service	Human customer service staff of "WeChat plus outpatient medical services" platform respond slowly; awareness rate among patients and hospital's staff is quite low.
9	Lack of supplier (doctor) design, namely limited power of doctors	Doctors cannot get relevant information of patients through "WeChat plus outpatient medical services" platform, which means power of doctors, is limited.
10	Little effect on pushing notifications of examination and test results	Some test results such as blood test, urinalysis and fecal test may be queried through "WeChat plus outpatient medical services" platform, while results of those tests which need to be delivered to outside hospital or some tests such as electroencephalogram, Ultrasonic B and CT cannot be viewed in WeChat.

Source: The Author

Table 13 Results of cause analysis of failure to purchase medical records booklets on “WeChat plus outpatient medical services” platform in T Hospital

The problem having been solved before discussion:

Problem	Analytical Aspects	Causes
Queue up for purchasing medical records booklets	People	
	Machines	
	Materials	
	Methods	
	Environments	

Source: The Author

Table 14 Results of cause analysis of suspending medical services emergently on “WeChat plus outpatient medical services” platform in T Hospital

Responsible departments: Medical Department and Outpatient Department

Problem	Analytical Aspects	Causes
Suspend medical services emergently	People	Doctors are lack of discipline consciousness especially organizational discipline, and take no count of outpatient sources.
	Machines	
	Materials	
	Methods	1. Do not establish relevant management rules of suspending medical services such as declaration, approval, supervision and specific punishment. 2. Exclude suspending medical services from attendance check, rewards and punishment system of doctors and departments.
	Environments	

Source: The Author

Table 15 Results of cause analysis of lack of recognition and safety check function in WeChat official account on “WeChat plus outpatient medical services” platform in T Hospital

Responsible department: Information Department

Problems	Analytical Aspects	Causes
Lack of recognition and safety check function in WeChat official account	People	
	Machines	Lack of short message platform.
	Materials	
	Methods	
	Environments	

Source: The Author

Table 16 Results of cause analysis of lack of introduction of departments and doctors on “WeChat plus outpatient medical services” platform in Hospital

Responsible departments: Medical Department and Publicity Office

Problems	Analytical Aspects	Causes
Lack of introduction of departments and doctors	People	
	Machines	
	Materials	
	Methods	The hospital does not make functional division in specific natures for the work (namely, not decide which departments charge of this work).
	Environments	

Source: The Author

Table 17 Results of cause analysis of failure to pay through health insurance and at the public expenses on "WeChat plus outpatient medical services" platform in T Hospital

Responsible department: Health Insurance Office

Problems	Analytical Aspects	Causes
Cannot pay through health insurance and at the public expenses	People	
	Machines	
	Materials	
	Methods	
	Environments	The interface of fee payment has not been opened by Health Insurance Office.

Source: The Author

Table 18 Results of cause analysis of insufficient staff participation on "WeChat plus outpatient medical services" platform in T Hospital

Responsible department: Personnel Department

Problems	Analytical Aspects	Causes
Insufficient staff participation	People	Hospital's staff that pays little attention to hospital's development, does not take initiative to learn from other hospitals' excellent management methods and management technology, as well as does not actively participate in information construction. Besides, the staff takes negligent and hands-off attitude.
	Machines	
	Materials	
	Methods	Unreasonable staff training system
	Environments	

Source: The Author

Table 19 Results of cause analysis of weak WIFI signal on "WeChat plus outpatient medical services" platform in T Hospital

Responsible department: Information Department

Problems	Analytical Aspects	Causes
Weak WIFI signal	People	
	Machines	Information department and equipment department need to strengthen WIFI construction especially in the dense areas of patients and staff.
	Materials	
	Methods	
	Environments	

Source: The Author

Table 20 Results of cause analysis of inefficient implementation of human customer service on "WeChat plus outpatient medical services" platform in T Hospital

Responsible departments: Customer Service Department and Publicity Office

Problems	Analytical Aspects	Causes
Inefficient implementation of human customer service	People	1. Staff training is not enough, and staff participation is insufficient. 2. Lack of customer service staff.
	Machines	
	Materials	
	Methods	Lack of specific working requirements and supervision system for WeChat customer service staff.
	Environments	

Source: The Author

Table 21 Results of cause analysis of lack of supplier design on "WeChat plus outpatient medical services" platform in T Hospital

Responsible department: Personnel Department

Problems	Analytical Aspects	Causes
Lack of supplier (doctor) design, namely limited power of doctors	People	Doctors are unfamiliar with the system and functions of it.
	Machines	
	Materials	
	Methods	
	Environments	

Source: The Author

Table 22 Results of cause analysis of little effect on pushing notifications of examination and test results on "WeChat plus outpatient medical services" platform in T Hospital

Responsible department: Information Department

Problems	Analytical Aspects	Causes
Little effect on pushing notifications of examination and test results	People	
	Machines	
	Materials	
	Methods	PACS system failure to exchange data completely with WeChat platform is the fundamental reason of unsafe results query.
	Environments	

Source: The Author

Table 23 Sample characteristics

	Information of Respondents	Number of Samples	Proportions（%）
Gender			
	Male	282	35.20%
	Female	518	64.80%
Age			
	Younger than18 years old	23	2.90%
	18 years old – 30 years old	300	37.50%
	31 years old – 40 years old	266	33.20%
	41 years old – 50 years old	125	15.60%
	51 years old – 60 years old	67	8.40%
	Older than 60 years old	19	2.40%
Education Background			
	Lower than junior school	18	2.20%
	Junior high school	88	11%
	Senior high school or technical secondary school	133	16.60%
	Junior college	164	20.50%
	Bachelor	324	40.50%
	Master	66	8.20%
	Doctor	7	9%
Profession			
	Public officer (civil servant, staff of public institutions)	156	19.50%
	Administrative staff of company	78	9.80%
	Technicians of company	52	6.50%
	worker	82	10.20%
	Peasant	37	4.60%
	The self-employed	80	10%
	Doctor of T hospital	66	8.20%
	Nurse of T hospital	125	15.60%
	Administrative manager of T hospital	46	5.80%
	Other manager of T hospital	78	9.80%
Income			
	Less than 60,000 yuan	262	32.80%
	60,000 yuan – 100,000 yuan	309	38.60%
	100,000 yuan – 200,000 yuan	180	22.50%
	200,000 yuan – 300,000 yuan	34	4.20%
	300,000 yuan – 400,000 yuan	5	0.60%
	400,000 yuan – 500,000 yuan	5	0.60%
	More than 500,000 yuan	5	0.60%

Source: The Author

Table 24 Feature Analysis of Respondents Who Do Not Follow T Hospital's WeChat Official Account

		The number of respondents not following	The total number of survey respondents	Proportions of respondents not following（%）
Age	Younger than18 years old	4	23	17.4
	18 years old – 30 years old	38	300	12.7
	31 years old – 40 years old	23	266	8.6
	41 years old – 50 years old	23	125	18.4
	51 years old – 60 years old	13	67	19.4
	Older than 60 years old	15	19	78.9
Education Background	Junior school or lower than junior school	10	18	55.6
	Junior high school	32	88	36.4
	Senior high school or technical secondary school	27	133	20.3
	Junior college	18	164	11.0
	Bachelor	23	324	7.1
	Master	3	66	4.5
	Doctor	3	7	42.9
Profession	Public officer	15	156	9.6
	Administrative staff of company	12	78	15.4
	Technicians of company	8	52	15.4
	Worker	26	82	31.7
	Peasant	12	37	32.4
	The self-employed	21	80	26.3
	Doctor of T hospital	2	66	3.0
	Nurse of T hospital	7	125	5.6
	Administrative manager of T hospital	2	46	4.3
	Other manager of T hospital	11	78	14.1
Annual income	Less than 60,000 yuan	61	262	23.3
	60,000 yuan – 100,000 yuan	35	309	11.3
	100,000 yuan – 200,000 yuan	14	180	7.8
	200,000 yuan – 300,000 yuan	3	34	8.8
	300,000 yuan – 400,000 yuan	2	5	40.0
	400,000 yuan – 500,000 yuan	1	5	20.0
	More than 500,000 yuan	0	5	0.0

Source: The Author

Table 25 Causes of Not Following T Hospital's WeChat Official Account

Causes	Frequency
Not familiar with WeChat official account	42
Unable to use WeChat official account	30
Bothered to follow it	25
Unnecessary to follow it for short diagnosis time	25
Cannot pay by health insurance or at the public expenses	16
Concerned about revealing personal information	13
Inconvenient because of bad network	11
Other causes	10
Inconvenient registration withdrawal and fee refund	5
Insufficient WeChat service functions	3

Source: The Author

Table 26 Usage Analysis of T Hospital's Official Account Functions

Used official account services	Frequency
Appointment registration	590
Information query (including hospital's profile, departments' introduction and doctors' introduction)	398
Diagnosis and fee payment	247
Reports query	162
Receipts query	79
Survey of satisfactory degree	65
Consultation	63

Source: The Author

Table 27 Patients' Perception of Changes of Time for Seeking Medical Advices

	Whether waiting time for diagnosis is shortened	**Whether registered time is shortened**	**Whether time for payment is shortened**	**Whether time for getting medicine is shortened**
Do not choose	116（14.5%）	116（14.5%）	116（14.5%）	116（14.5%）
15 minutes shorter	310（38.8%）	383（47.9%）	279（34.9%）	266（33.3%）
30 minutes shorter	212（26.5%）	173（21.6%）	193（24.1%）	174（21.8%）
45 minutes shorter	33（4.1%）	17（2.1%）	19（2.4%）	12（1.5%）
60 minutes shorter	18（2.3%）	11（1.4%）	9（1.1%）	7（0.9%）
More than 1 hour shorter	34（4.3%）	45（5.6%）	30（3.8%）	17（2.1%）
No change	75（9.3%）	52（6.5%）	142（17.8%）	196（24.5%）
Extended	2（0.3%）	3（0.4%）	12（1.5%）	12（1.5%）
Total	800（100%）	800（100%）	800（100%）	800（100%）

Source: The Author

Table 28 Patients' Perception of Changes of Treatment Time

Treatment time	**Frequency**	**Proportions**
Do not choose	116	14.50%
Shortened	310	38.70%
No change	356	44.50%
Extended	18	2.30%
Total	800	100%

Source: The Author

Table 29 Comparison between Patients' Expectations and Actual Services

Dimensions of service quality	The average expected value of patients	The average actual service value of the hospital	Difference
Tangibles	4.06	3.79	0.27
Reliability	4.13	3.94	0.19
Assurance	4.12	3.86	0.26
Responsiveness	4.11	3.89	0.22
Empathy	4.1	3.79	0.31

Source: The Author

Table 30 Difference among Patients of Different Genders in Five Dimensions and Perception of Service Quality Improvement

	Total Satisfactory Degree	Tangibles	Reliability	Responsiveness	Assurance	Empathy
F	1.441	0.394	0.001	0.017	0.571	0.003
P	0.23	0.53	0.972	0.895	0.45	0.958

Source: The Author

Table 31 Difference among Patients of Different Ages in Five Dimensions and Perception of Service Quality Improvement

	Total Satisfactory Degree	Tangibles	Reliability	Responsiveness	Assurance	Empathy
F	0.231	2.623	0.794	1.736	1.164	0.636
P	0.949	0.023	0.433	0.142	0.325	0.672

Source: The Author

Table 32 Difference among Patients of Different Education Backgrounds in Five Dimensions and Perception of Service Quality Improvement

	Total Satisfactory Degree	Tangibles	Reliability	Responsiveness	Assurance	Empathy
F	1.593	4.243	2.831	4.083	2.926	4.006
P	0.146	0	0.01	0	0.008	0.001

Source: The Author

Table 33 Difference among Patients of Different Professions in Five Dimensions and Perception of Service Quality Improvement

	Total Satisfactory Degree	Tangibles	Reliability	Responsiveness	Assurance	Empathy
F	3.434	2.388	1.78	3.062	2.311	3.02
P	0	0.012	0.069	0.001	0.015	0.002

Source: The Author

Table 34 Difference among Patients of Different Educational Level in Five Dimensions and Perception of Service Quality Improvement

	Total Satisfactory Degree	Tangibles	Reliability	Responsiveness	Assurance	Empathy
F	0.579	3.523	1.018	1.298	1.213	0.8
P	0.747	0.002	0.412	0.256	0.298	0.57

Source: The Author

Table 35 Logistic Regression Analysis of Influence Factors of Patients' Perception of Service Quality Improvement

Parameters	B	S. E.	Waldχ2	df	P	OR(95%CI)
Doctor of T hospital	0.724	0.3471	4.348	1	0.037	2.062（1.044，4.071）
Nurse of T hospital	0.865	0.2939	8.672	1	0.003	2.376（1.336，4.227）
Administrative manager of T hospital	0.864	0.3735	5.347	1	0.021	2.372（1.141，4.931）
Tangibles	-0.522	0.2591	4.052	1	0.044	0.594（0.357，0.986）
Reliability	0.538	0.25	4.63	1	0.031	1.713（1.049，2.796）
Empathy	1.098	0.2531	18.817	1	＜0.001	2.997（1.825，4.922）

Source: The Author

Table 36 Overall Evaluation of Patients' Perception of Service Quality

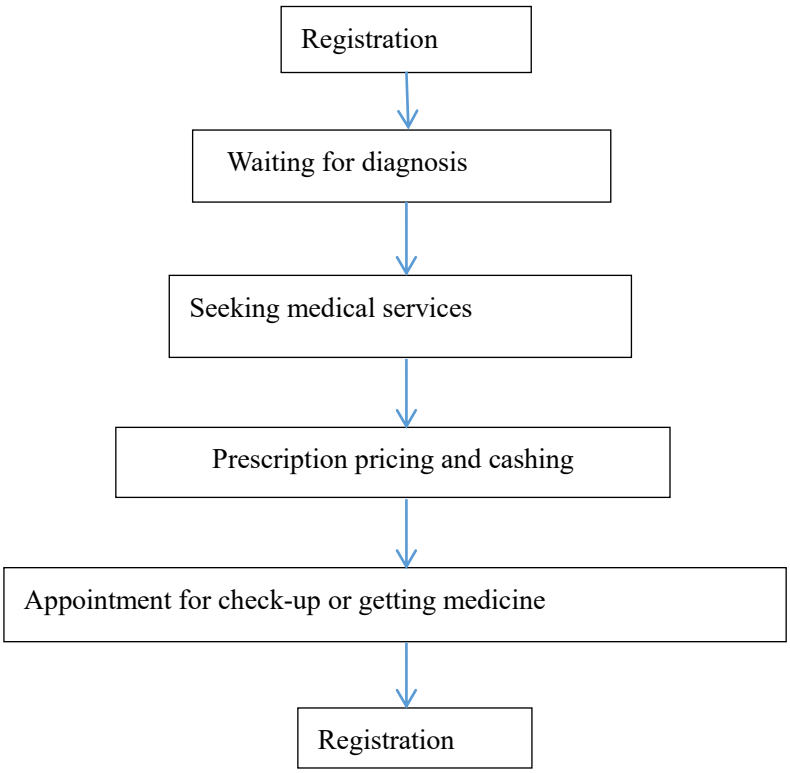
Options	**Frequency**	**Proportions**
Far below expectations（option 1）	23	3.36%
Slightly below expectations（option 2）	150	21.93%
According with expectations（option 3）	460	67.25%
Beyond expectations（option 4）	38	5.56%
Far beyond expectations（option 5）	13	1.90%
Total	684	100%

Source: The Author

Appendix 3

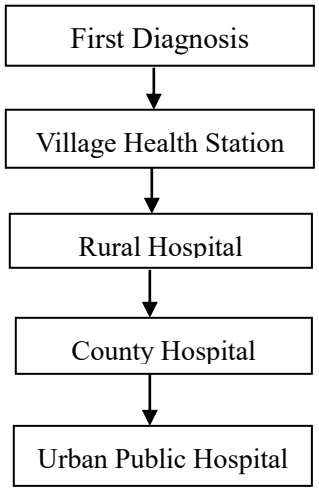
Figure

Figure 1 Conventional diagnosis and treatment procedures in China (6 procedures)



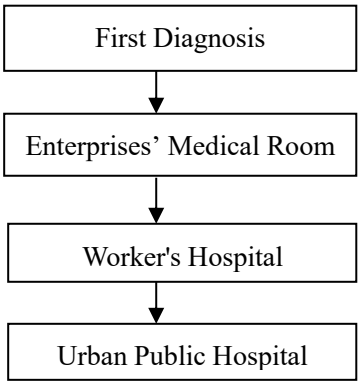
Source: The Author

Figure 2 Diagnosis and treatment procedures under the rural cooperative medical system in the first stage



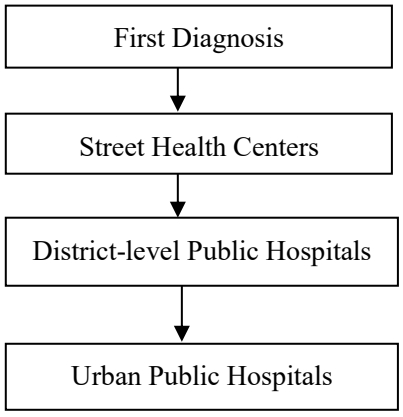
Source: The Author

Figure 3 Diagnosis and treatment procedures under the employees’ labor-protection medical system in the first stage



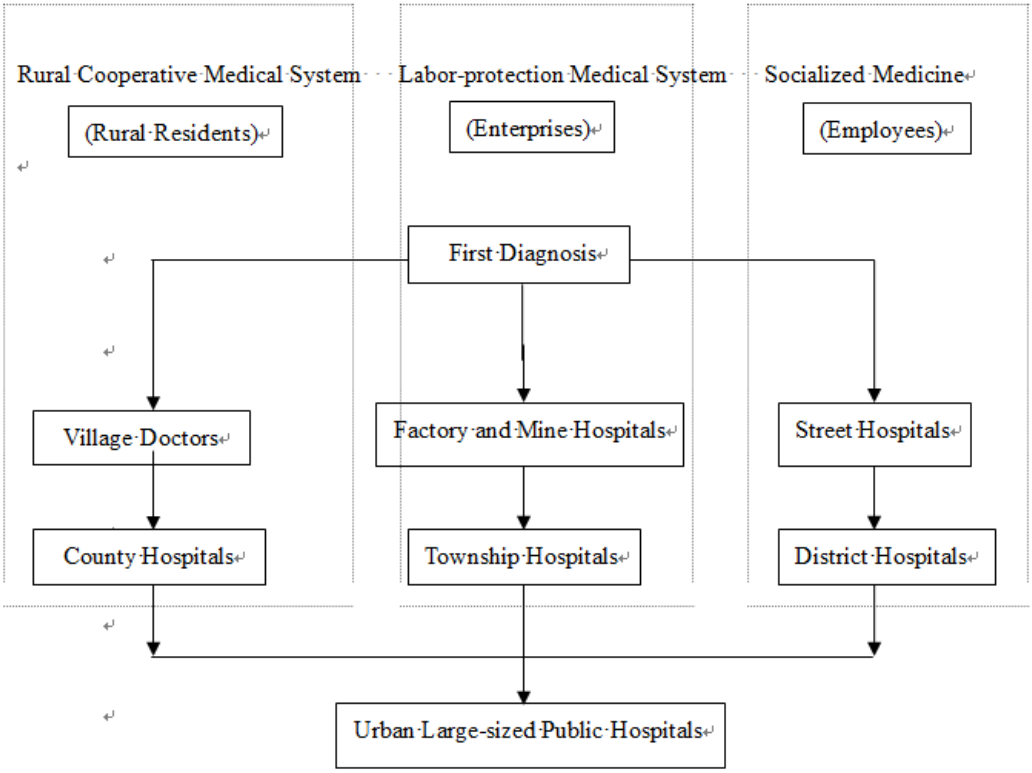
Source: The Author

Figure 4 Diagnosis and treatment procedures under urban publicly-funded medical care in the first stage



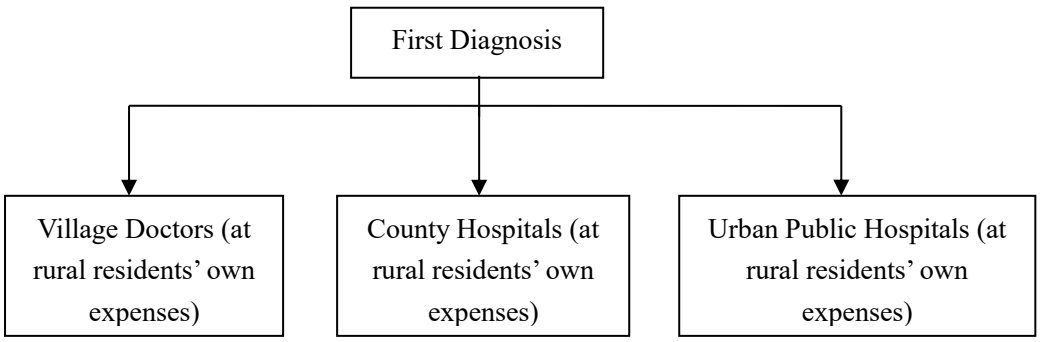
Source: The Author

Figure 5 Chinese Residents' Diagnosis and Treatment Procedures in the First Stage (1949-1979)



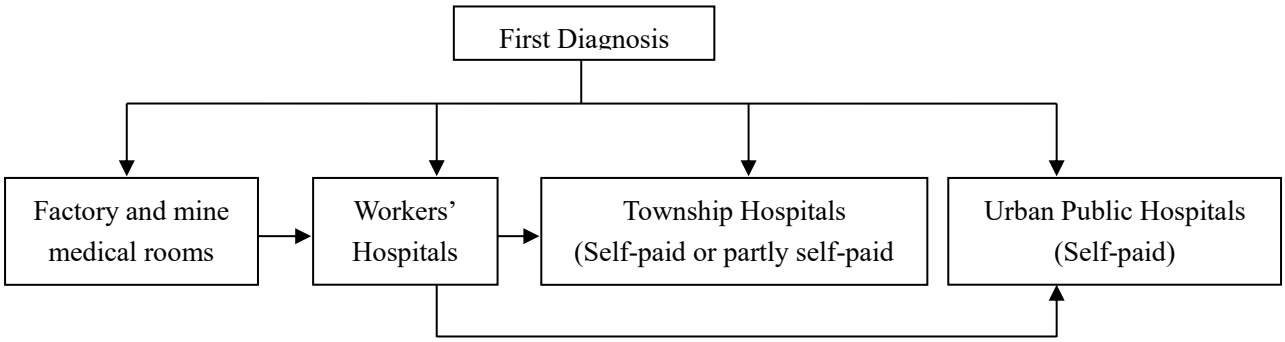
Source: The Author

Figure 6 Doctor-seeking models in China's rural areas from late 1970s to early 1990s



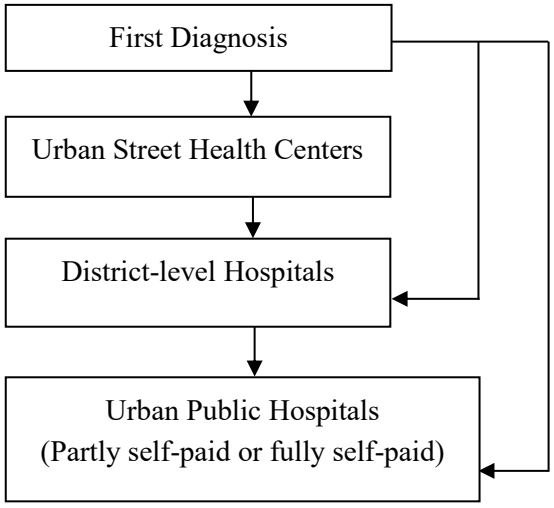
Source: The Author

Figure 7 Diagnosis and treatment procedures under the labor-protection medical system from late 1970s to early 1990s



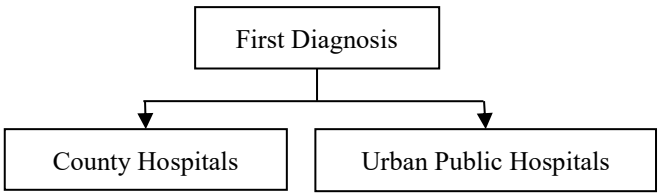
Source: The Author

Figure 8 The doctor-seeking model under the publicly-funded medical care system from late 1970s to early 1990s



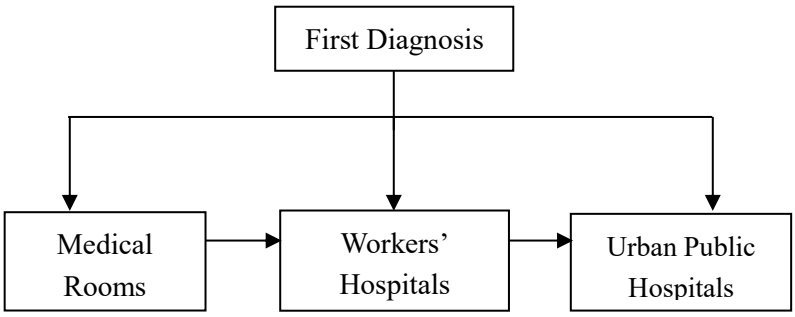
Source: The Author

Figure 9 Doctor-seeking procedures of rural residents from early 1990s to early 2000s



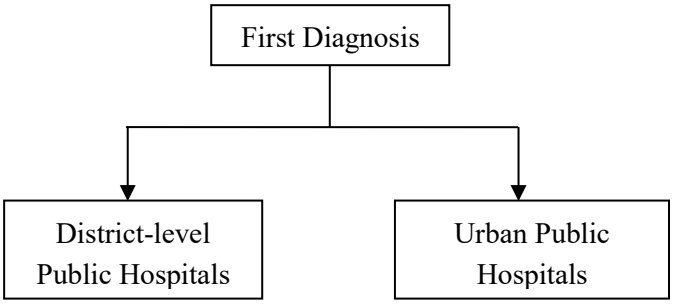
Source: The Author

Figure 10 Doctor-seeking procedures under staff medical insurance system from early 1990s to early 2000s (1)



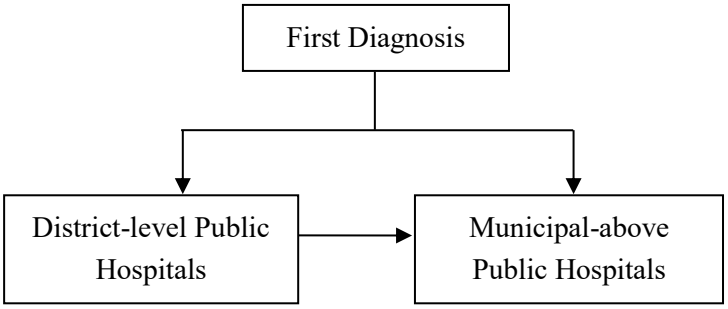
Source: The Author

Figure 11 Doctor-seeking procedures under staff medical insurance system from early 1990s to early 2000s (2)



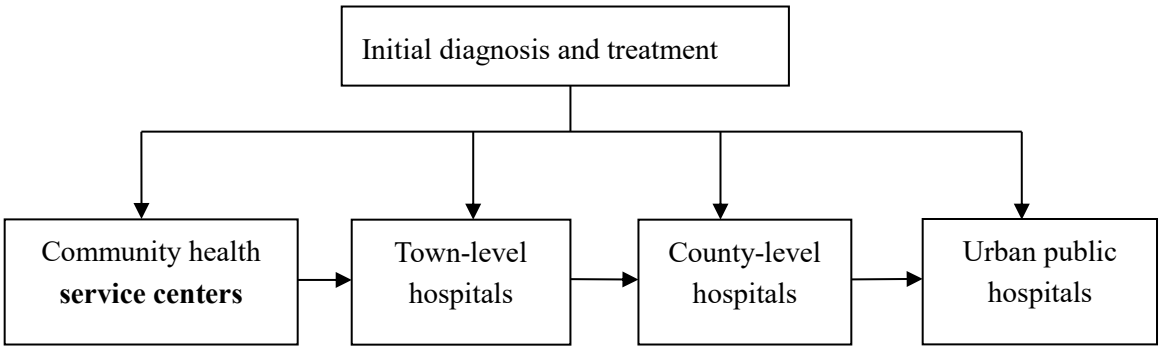
Source: The Author

Figure 12 Doctor-seeking procedures of urban publicly funded medical care from early 1990s to early 2000s



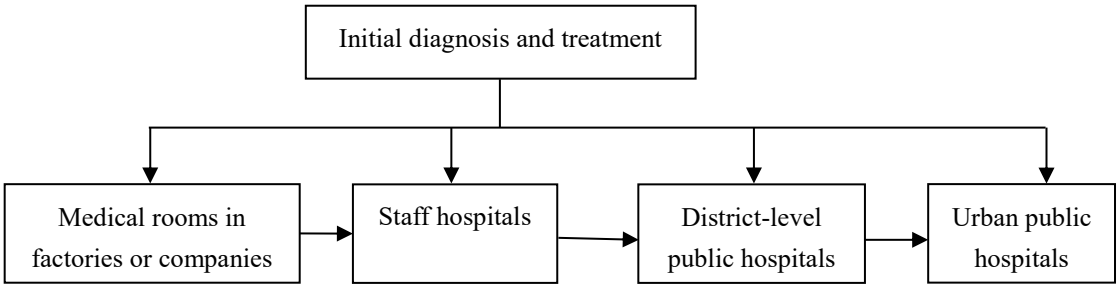
Source: The Author

Figure 13 Flow chart of medical services pattern (NRCMS)



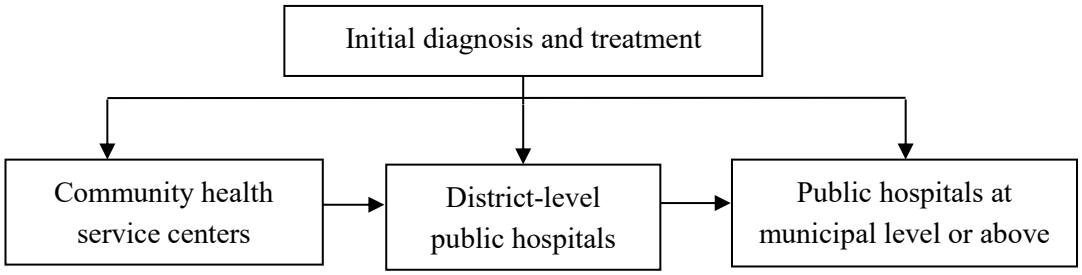
Source: The Author

Figure 14 Flow chart of medical services pattern (Social medical insurance)



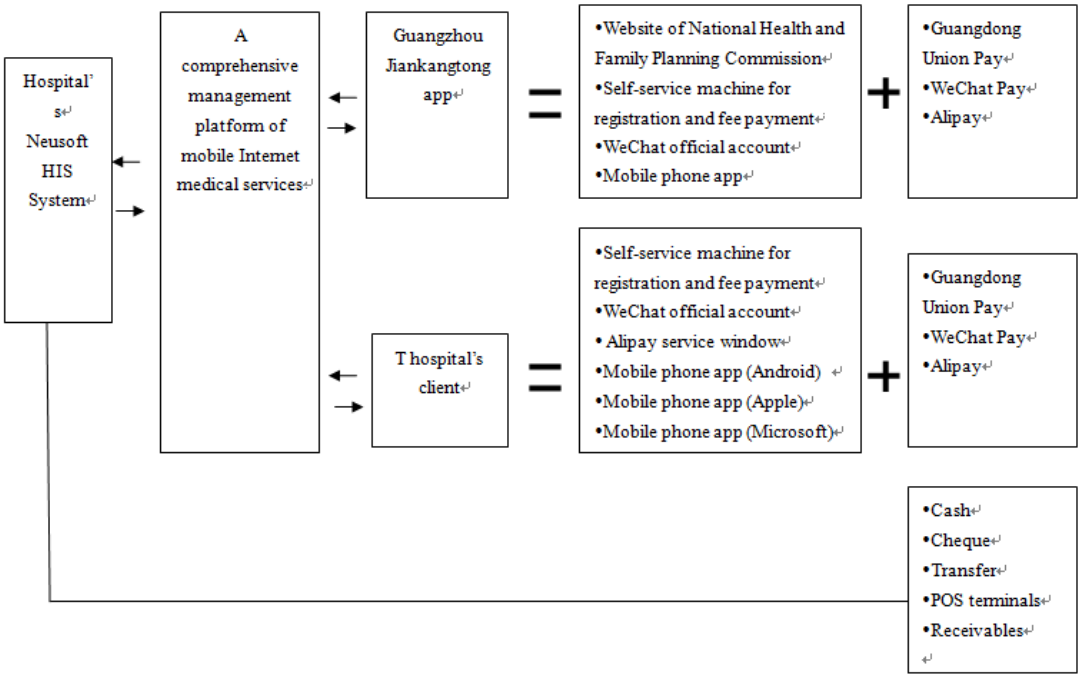
Source: The Author

Figure 15 Flow chart of medical services pattern (Free medical service in urban cities)



Source: The Author

Figure 16 Neusoft HIS System and Mobile Internet Platform

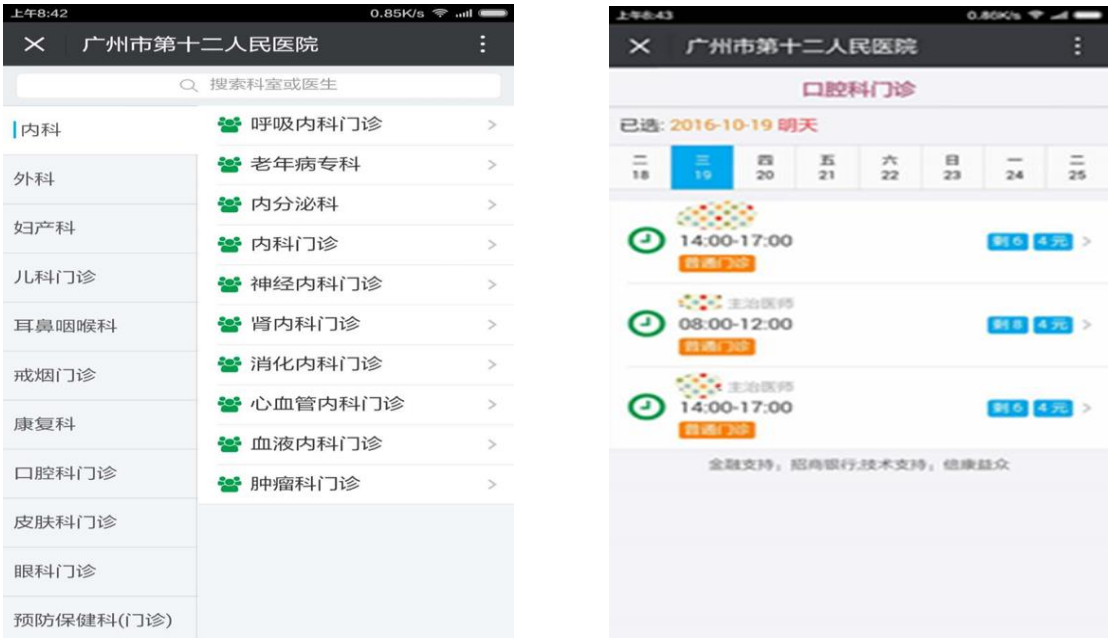


Source: The Author

Figure 17 Card Application for First Visit

Source: The Author

Figure 18 Search Departments or Doctors



Source: The Author

Figure 19 Appointment Registration

Figure 20 Registered Fee Payment

Source: The Author

Figure 21 Registered Successfully

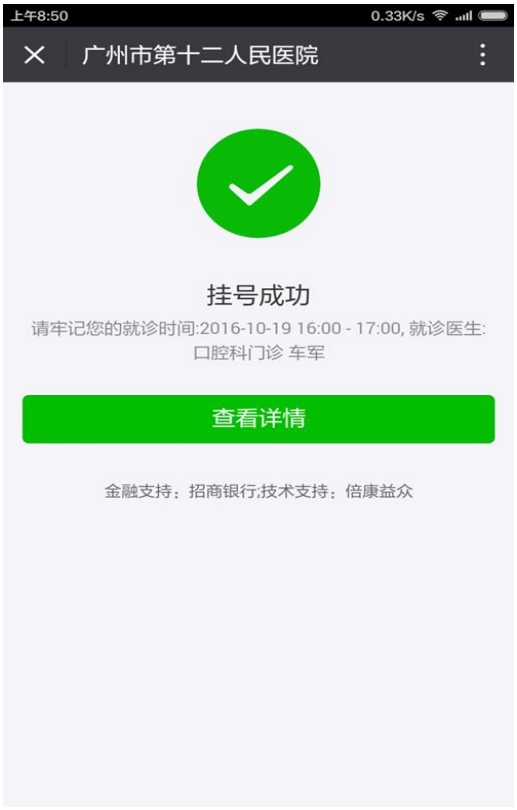


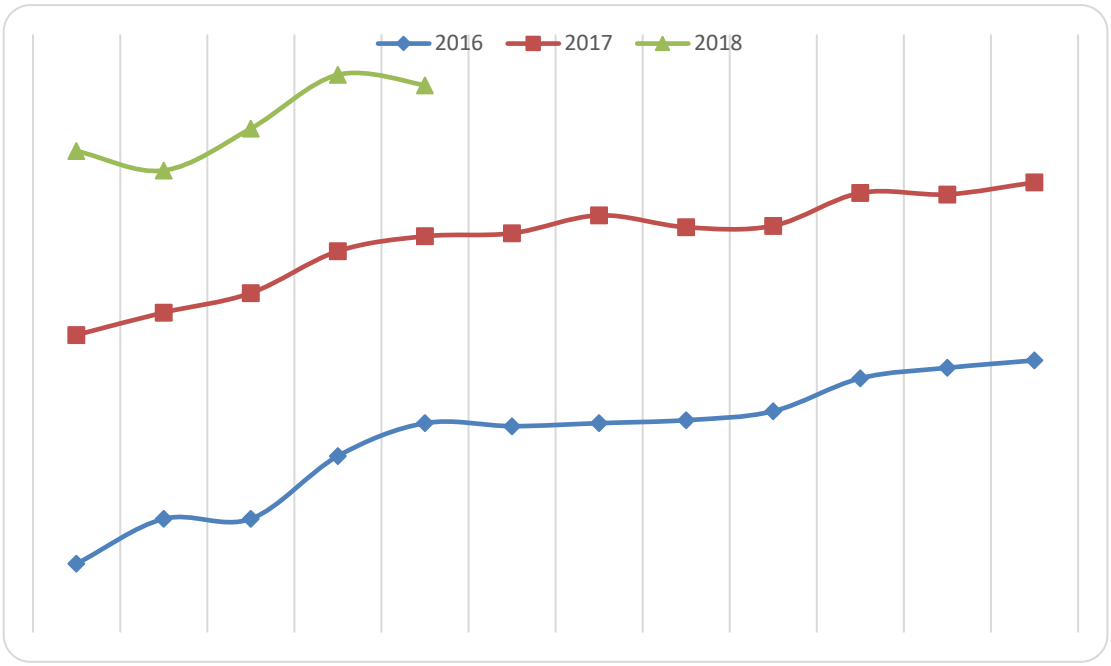
Figure 22 Payment for Tests

Figure23 Results Inquiry for Tests

Figure 24 Payment for Medicine

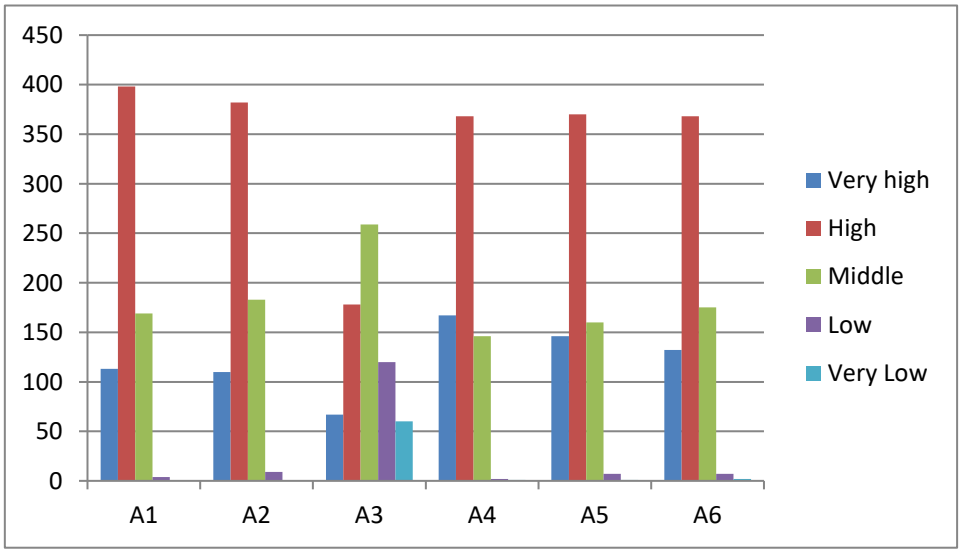
Source: The Author

Figure 25 Percentages of T Hospital's Outpatient Registration in WeChat in 2016-2018



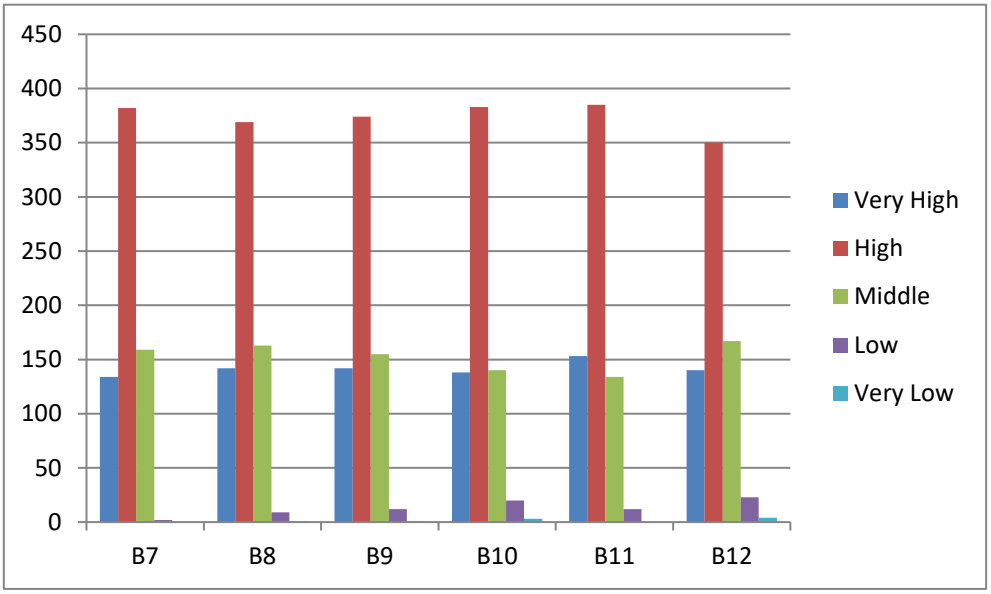
Source: The Author

Figure 26 Analysis of Satisfactory Degree of Respondents in Tangibles



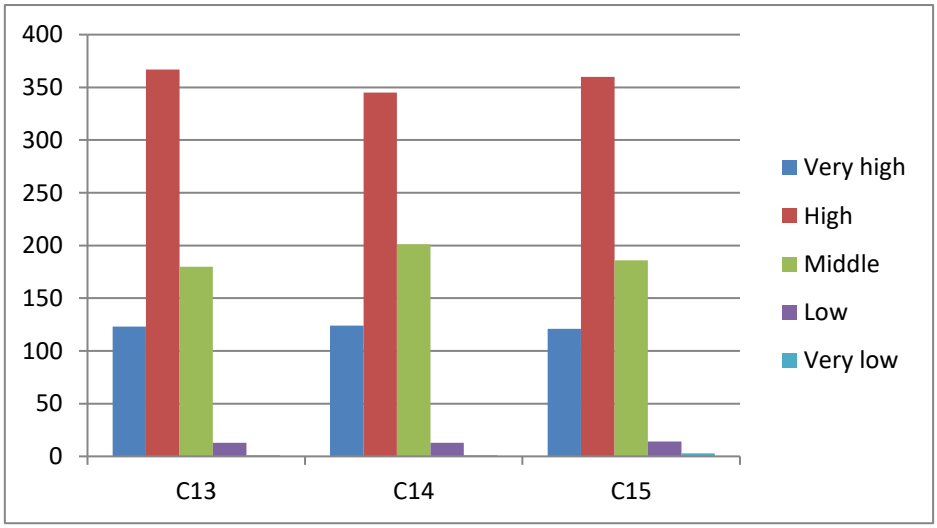
Source: The Author

Figure 27 Analysis of Satisfactory Degree of Respondents in Reliably



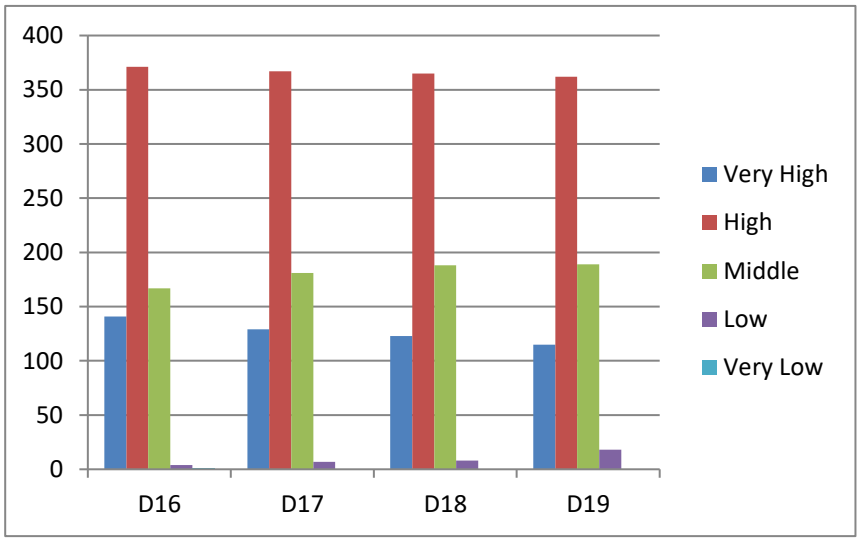
Source: The Author

Figure 28 Analysis of Satisfactory Degree of Respondents in Responsiveness



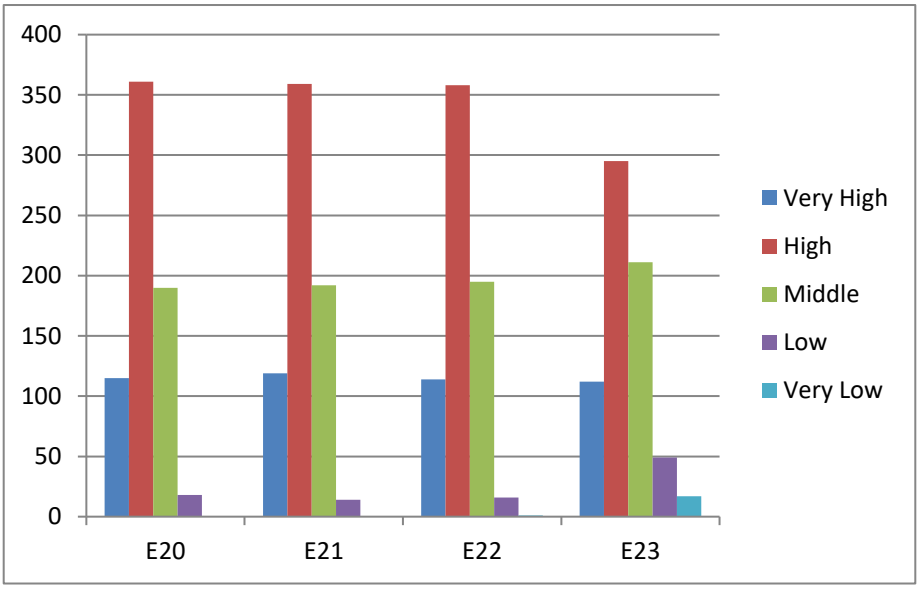
Source: The Author

Figure 29 Analysis of Satisfactory Degree of Respondents in Assurance



Source: The Author

Figure 30 Analysis of Satisfactory Degree of Respondents in Empathy



Source: The Author