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INSTITUTO UNIVERSITÁRIO DE LISBOA

Emergency Response Model of Stroke in Regional Medical Alliances-A Case Study of the Western Baiyun District Stroke Alliance in Guangzhou

YU Na

Doctor of Management

Supervisor: PhD Renato Pereira, Assistant Professor, ISCTE University Institute of Lisbon

June, 2022

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BUSINESS SCHOOL

Marketing, Operations and General Management Department

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YU Na



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## Abstract

**Background:** A hospital alliance has been established in the western part of Guangzhou, with the initial goal of optimizing the procedures of stroke care in the region and improving the efficiency of treatment services. Comparison of data reveals that the alliance proves to be effective, but there is still a gap between its performance and the objective.

**Methodology:** Stakeholders in the stroke alliance are identified and classified through a comprehensive review of the stakeholder theory and the synergy theory. Structural equation modeling is used to quantify the synergy of healthcare alliances. A synergistic capacity model is developed to analyze the path relationships between the variables.

**Results:** Several rounds of questionnaire survey reveal that there are 22 stakeholders in the Western Baiyun District Stroke Alliance, including six core stakeholders, eight latent stakeholders, and eight marginal stakeholders, and "hospitals at all levels" are the central members of the core stakeholders of the Western Baiyun District Stroke Alliance. Structural equation modeling has verified that the synergy of the Western Baiyun District Stroke Alliance is an organically integrated system comprised of three levels, namely, macro level synergy, meso level synergy, and micro level synergy, with a significant positive correlation between them. The macro level synergy includes cultural synergy and strategic synergy; the meso level synergy includes business synergy and process synergy. The score of synergy of the Alliance is 3.9646, still in a medium level.

**Conclusion:** A regional stroke alliance is an organically integrated system of macro, meso and micro level synergy, with good macro synergistic capacity and average meso and micro synergistic capacity. Synergistic factors at all levels need to be taken into consideration so as to improve the overall synergy.

**Key words**: Stakeholder Theory; Synergy Theory; Regional Stroke Alliance; Structural Equation Model **JEL**: 110; 118

## Resumo

Antecedentes: Estabelecimento de uma aliança dos hospitais ocidentais em Guangzhou, na China. A intenção da aliança é otimizar o processo de tratamento do AVC. De acordo com os dados existentes, embora a aliança tenha alcançado alguns resultados, ainda não conseguiu atingir todos os objetivos.

**Metodologia:** Teoria dos stakeholders e teoria da sinergia, identificação e classificação dos stakeholders da aliança médica. Quantificação da sinergia na aliança médica através de um modelo de equações estruturais, estabelecimento do modelo de sinergia e análise das relações de dependência entre as variáveis.

**Resultados:** Administração de questionários aos 22 stakeholders da aliança, incluindo os 6 stakeholders principais, 8 stakeholders potenciais e 8 stakeholders marginais. Usando o método de análise de centralidade, provou-se que o hospital é o elemento central dos stakeholders principais. Através da utilização de modelos de equações estruturais verificou-se que a capacidade colaborativa da aliança é um sistema de competências composto pelos níveis macro, meso e micro. O nível macro inclui as sinergias cultural e estratégica; O nível meso inclui a sinergia institucional, a sinergia de inovação e a sinergia de informação; O nível micro inclui a sinergia de negócios e a sinergia de processos. O resultado da capacidade colaborativa da aliança é um nível médio de sinergia.

**Conclusões:** A aliança é um sistema de capacitação composto por três níveis: nível macro, nível meso e nível micro. A capacidade de macro sinergia é muito boa, enquanto as capacidades de meso e de micro sinergia são medianas. É preciso levar em conta os fatores de sinergia em todos os níveis para melhorar de forma abrangente a capacidade geral de sinergia.

Palavras-chave: Teoria dos stakeholders; Teoria da sinergia; Aliança regional de AVC; modelo de equações estruturaisJEL: 110; 118

## 摘要

**背景:**中国广州市区西部医院联盟己初步建立,组建的初衷是优化区域卒中救治的 流程,提高诊疗服务效率。通过数据比较,联盟运作虽有一定成效,但仍与目标存在差 距。

方法:本文通过全面梳理利益相关者理论、协同理论等相关理论,对卒中联盟中利 益相关者进行识别及分类。利用结构方程模型对医疗联盟的协同理论的进行研究量化。 建立协同能力模型,分析各变量之间的路径关系。

**结果:** 经过多轮问卷调查,联盟共有 22 个利益相关者,包括: 核心利益相关者 6 个、潜在利益相关者 8 个,边缘利益相关者 8 个,"各级医院"是白云区西部卒中联盟 核心利益相关者的中心成员。通过建立结构方程模型,验证了区域卒中联盟的协同能力 是由宏观层、中观层、微观层三个层面有机整合而组成的能力系统,三者之间具有显著 的正相关性。宏观层包括理念协同、战略协同;中观层包括体系协同、革新协同、资讯 协同;微观层包括事务协同、程序协同。本文区域卒中联盟协同能力分值为 3.9646,仍 处于中等协同。

**结论**: 区域卒中联盟是由宏观层、中观层、微观层三个层面有机整合而组成的能力 系统,宏观协同能力良好,中观和微观协同能力一般,需兼顾各个层面的协同因素,才 能全面提升整体的协同能力。

关键词:利益相关者理论;协同理论;区域卒中联盟;结构方程模型 JEL: 110; 118

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## **Chapter 1: Introduction**

### 1.1 Research background

#### 1.1.1 Particularity of stroke treatment

Stroke, also known as cerebral stroke, apoplexy and cerebrovascular accident (CVA), is a common and frequent disease of the central nervous system, and it is divided into two categories of ischemic stroke (80-90%) and hemorrhagic stroke (10-20%). As the most common chronic non-communicable disease with high disability and mortality rates, stroke shows an obvious trend towards occurrence in the young people. As the second leading cause of death worldwide, it has been a major public health problem that seriously endangers the life and health of middleaged and elderly patients (Campbell & Khatri, 2020; Donkor, 2018). According to the global burden of diseases in 2019 (GBD 2019 Stroke Collaborators, 2021), with the aging of population, stroke has become the leading cause of death and adult disability in China as well as the leading cause of Years of Life Lost (YLL) in China. The stroke mortality in China accounts for about one third of the global stroke mortality. The average age of stroke patients in China is 66.4 years old, almost ten years younger than the white population in Europe (Z. Li et al., 2019). About 15% of the stroke patients are under the age of 50, resulting in a significant loss of life in the working population (GBD 2019 Stroke Collaborators, 2021). The relatively high incidence of stroke will pose a significant financial burden on the patients. The American Heart Association (AHA) predicts that medical expenses of stroke care will rise from \$66.3 billion in 2015 to \$143 billion by 2035 (Nelson et al., 2016). In China, the lifetime prevalence of stroke for people over 25 years old is 39.3%, which is the highest in the world (GBD 2016 Lifetime Risk of Stroke Collaborators, 2018). The most common stroke subtype in China is ischemic stroke, accounting for 69.6% of all strokes (W. Z. Wang et al., 2017). However, the rate of hemorrhagic stroke is higher in Chinese than that in whites, accounting for 23.8% (Tsai et al., 2013; W. Z. Wang et al., 2017). For patients with ischemic stroke, the incidence of intracranial atherosclerotic (46%) greatly exceeds that of extracranial carotid stenosis (14%). Since patients with intracranial stenosis present more severe strokes on admission and have longer hospital stays than those who have not experienced intracranial stenosis (Y. Wang et al., 2014), stroke prevention strategies in China may differ from those in other countries in terms

of components and priorities.

Accounting for more than 60% of strokes, acute ischemic stroke is a common type of stroke with high morbidity and disability rates. The success rate of treatment is closely related to the onset time and the start time of treatment. The principles of early detection, early diagnosis and early treatment should be followed. The most effective treatment recommended by clinical guidelines is intravenous thrombolysis with recombinant tissue plasminogen activator (RT PA) as soon as possible within the thrombolytic time window. According to the Guidelines for the Early Management of Patients with Acute Ischemic Stroke published by the American Heart Association and the American Stroke Association (AHA/ASA) and the 2014 Guidelines for the Diagnosis and Treatment of Acute Ischemic Stroke in China, due to the narrow time window for AIS treatment (only 4.5 hours), hospitals should establish a green channel for stroke diagnosis and treatment and prioritize the treatment and admission of stroke patients by keeping the door to needle time (DNT) within 60 minutes.

The 2014 Guidelines for the Diagnosis and Treatment of Acute Ischemic Stroke in China recommends that intravenous thrombolysis is the preferred method for revascularization (level I recommendation, level A evidence). Both intravenous thrombolysis and intravascular therapy should be performed with minimal time delay (level I recommendation, level B evidence). (2) Patients with severe stroke caused by middle cerebral artery occlusion within 6 hours of onset are not suitable for intravenous thrombolysis and can be treated with arterial thrombolysis at a carefully selected qualified hospital (level I recommendation, level B evidence). (3) Patients with severe stroke due to posterior circulation artery occlusion who are not suitable for intravenous thrombolysis may undergo arterial thrombolysis in a qualified institution after rigorous selection. Although they have experience with its use within 24 hours of onset, it should be performed as soon as possible to avoid time delay (level III recommendation, level C evidence). (4) Mechanical thrombectomy alone or combined with pharmacological thrombolysis may be effective for revascularization in the context of rigorous patient selection (level II recommendation, level B evidence), but the clinical effectiveness needs to be validated by additional randomized controlled trials. It may be reasonable to use mechanical thrombectomy for some patients who are contraindicated by intravenous thrombolysis (level II recommendation, level C evidence). (5) Remedial arterial thrombolysis or mechanical thrombectomy (within eight hours of onset) may be reasonable for patients with large artery occlusions whose intravenous thrombolysis is ineffective (level II recommendation, level B evidence). (6) The benefits of emergency arterial stenting and angioplasty have not been confirmed, and should only be used in clinical trials (level III recommendation, level C evidence).

Due to the narrow time window for acute ischemic stroke treatment, it is significant to assess the condition in time and make a rapid diagnosis. For every 30-minute delay in reperfusion time, the probability of a favorable prognosis within 90 days will be reduced by 12%. Current guidelines in many countries advocate that thrombolysis should be completed within 60 minutes from the time of emergency treatment to the start of thrombolysis. If possible, the DNT should be as short as possible. The DNT in most Chinese hospitals is more than one hour, which seriously affects the outcome of intravenous thrombolysis channels should be further improved. The central hospital should guide the thrombolysis process to shorten the treatment time of patients and improve the clinical efficacy and thrombolysis rate.

In China, the rate of intravenous thrombolysis within three hours of stroke onset was only about 16% in 2012, and the rate of revascularization in acute ischemic stroke with large vessel occlusion (AIS-LVO) was also low. Clinical trial reports released in 2015 confirmed the superiority of intravascular therapy, especially for AIS-LVO patients. Endovascular therapy proves to be more effective than drug therapy alone. Due to the time-critical nature of stroke treatment and the high requirements of AIS-LVO patients, AIS-LVO patients should be transferred to the nearest advanced stroke center in the shortest possible time and should not simply follow the principle of proximity. Patients transferred directly to an advanced stroke center have a lower mortality rate than patients transferred to an advanced stroke center via a primary stroke center, and the longer the transfer distance, the higher the mortality rate. However, in the real world, most AIS-LVO patients cannot seek treatment directly at an advanced stroke center and must be referred through a primary stroke center. Studies have shown that the model of intravenous thrombolysis followed by referral to an advanced stroke center for endovascular treatment can benefit AIS-LVO patients, as their revascularization rates are similar to those who go directly to the advanced stroke center. Therefore, clear referral criteria and a smooth referral process between advanced stroke centers and primary stroke centers should be established.

The Expert Consensus on Emergency Care for Acute Ischemic Stroke in China (2018) points out that factors such as emergency personnel training, stroke centers and stroke networks, green channels, emergency procedures before admission, and rational transportation should be improved to enhance stroke treatment efficiency and improve patient prognosis. Patients admitted in the super early time window have a longer DNT than those admitted in the near three hours. The relationship between shorter onset-to-door (ODT) time and longer DNT in the

early time window has been described as the "three-hour effect", which may be related to the urgency of the patient's condition as perceived by emergency department students. In this research, the existence of the "three-hour effect" may affect the length of time from admission to specialist arrival. Earlier admission means that patients have more time to receive intravenous thrombolytic therapy. Inpatient care, connection of diagnostic and treatment units, and inpatient transport for such patients tend to be delayed. However, the effectiveness of intravenous thrombolysis decreases significantly with the increase of the onset time. The earlier the thrombolysis is performed, the better the prognosis will be. Therefore, patients within the time window should also be treated with thrombolysis as soon as possible. In order to eliminate the "three-hour effect", we should establish strict stroke diagnosis and treatment procedures and always pay attention to the DNT of stroke patients. Clinicians should strictly follow the diagnosis and treatment process to reduce hospital delays. Decision time for patients and their families is a risk factor for hospital delays. Prior to intravenous thrombolysis, major hospitals in China need to communicate with patients or their families to explain the risks and sign an informed consent form. After the patients or family members fully understand the condition, they will be concerned about their exposure to treatment risks, the high cost of RT-PA thrombolytic therapy, and the absence of immediate family members, which will lead to hesitation in decision making. The international standard delay in hospitalization is less than 60 minutes, while the average DNT for Chinese AIS patients is 116 minutes. In the United States, the United Kingdom, and some European countries, intravenous thrombolysis in AIS patients is mostly a routine treatment and does not require signed informed consent with family members. The difference in DNT is mainly due to the relatively long decision-making time for patients. This requires specialists to clearly explain treatment measures and risks, answer patients' questions, and minimize decision-making hesitations in a short time. Therefore, it is necessary to train specialists and improve their conversational skills to shorten the DNT.

There are different quality control standards among the hospitals in a medical alliance. The standards of physical examination, medication specifications and treatment specifications for the same disease are different. The medical quality evaluation standards are not uniform and examination analysis is not standardized. As a result, the medical quality varies from hospital to hospital, making it difficult to ensure that patients enjoy the same quality of care. In addition, community healthcare alliances lack uniform and operable criteria for upward and downward referrals. Many of the referral systems and norms currently in use are often superficial and formalistic, with no clear referral and reception process or correspondingly sound supervision and management mechanisms. Therefore, unfamiliarity of doctors with the referral process, no

consistent standards, and unreasonable phenomena in two-way referrals not only bring inconvenience to patients and their families, but also increase the financial burden of the patients, which tends to bring about medical disputes.

### 1.1.2 Treatment mode of stroke patients

#### 1.1.2.1 Foreign treatment mode

In Europe, the United States and other western developed countries, there has been a comprehensive Emergency Medical Service (EMS) system that can evaluate and treat stroke patients before they are admitted to the hospital and provide rapid thrombolysis and postrehabilitation care for stroke patients transferred to medical centers based on the assessment of their condition, which can significantly increase the success rate of resuscitation and improve post-treatment rehabilitation. In 1966, the American Academy of Sciences published the Accidental Death and Disability: A Disease Ignored by Modern Society, which first proposed the establishment of a modern emergency medical service system. In 1973, the Emergency Medical Service System Act, EMSS ACT, Public Law 93-154 enacted by the U.S. government put forward the principled provisions of fifteen directions including the scope, content, organizational structure, management system, and access of technical personnel of emergency medicine business in the United States. After decades of development, a relatively complete network of pre-hospital cardiovascular emergency services has been formed in the United States and other developed countries, so that cardiovascular patients can receive efficient and reasonable medical treatment from the spot of disease onset, during transport and even after admission. Since 2008, the U.S. government has reduced the risk of stroke from the third leading cause of death to the fourth by improving the emergency response processes at the onset of acute stroke, thus fulfilling the promise made by the American Stroke Association (ASA) a decade ago.

In the management process of acute stroke treatment, a good prehospital emergency management process can speed up the response time, rationalize the treatment and transport, and shorten the early reperfusion time, which can effectively improve the stroke treatment rate. The prehospital emergency management process includes intensive emergency training, stroke recognition tools, prehospital treatment, and information communication. In the EMS process, it is recommended that the patients and the discovers call 911 first. The 911 transporters should give the highest priority to the stroke patients and endeavor to minimize the transport time. After admission, the EMS dispatcher should use standardized stroke assessment tools such as

the Medical Priority Dispatch System (MPDS) and Cincinnati Prehospital Stroke Scale (CPSS) recommended by ASA and European Stroke Organization (ESO) to determine the extent of stroke and thrombotic occlusion. They will determine whether thrombolysis or interventional procedures will be performed after transportation to the hospital based on the treatment time window. In addition, they will inform in advance the receiving physician of the impending arrival of a suspected stroke patient, so that appropriate hospital resources can be mobilized and prehospital treatment can be provided in a timely manner, thus shortening the prehospital treatment procedures and time.

Hospital treatment includes close collaboration between multi-disciplinary teams, including inpatient neurology, interventional, and surgical departments, in addition to emergency department and radiology department. The nationwide "Follow the Guidelines" initiative shortens the DNT through multiple links, including activating the stroke team in prehospital EMS, moving the initial consultation area to the CT room, and relocating the intravenous thrombolysis site to the CT room and the emergency department. Helsinki University Central Hospital (Meretoja et al., 2012) was able to significantly reduce the DNT to 20 minutes after setting the CT room as the area for first consultation and first dose of intravenous thrombolysis. The Berlin Stroke Research Center (Weber et al., 2013) is equipped with an in-hospital stroke mobile unit where suspected patients of stroke can immediately enter the mobile unit and receive a CT examination after admission. The results are read and diagnosed jointly by radiologists and neurologists, and if the patient has reached the indication for thrombolysis, thrombolysis will be carried out immediately in the mobile unit. After stabilization of condition, the patient will undergo continuous and systematic rehabilitation with the help of a family doctor or the hospital's stroke unit.

The circulation of patient medical information is important in the stroke care management process. Foreign countries with advanced healthcare service have established national or regional medical information sharing systems. Before the arrival of the ambulance, the receiving hospital is notified of the patient's illness and medical information ID through the information sharing system. The hospital is reminded to start the stroke planning process in advance and prepare for reception and treatment of the patient based on his current and past medical history. Studies have shown that advance notification can significantly reduce multiple stroke treatment time points, including physician arrival time for evaluation, CT examination time, CT interpretation time, and DNT, thus effectively increasing thrombolysis utilization.

The Guidelines also recommend that a regional stroke emergency system should be developed, with a comprehensive assessment and rating of stroke hospitals, so as to form the hospital stroke teams. Hospitals throughout the regional stroke emergency system should establish, use and follow protocols or guidelines developed by national and international committees of experts as well as national and local legislatures. The continuity and safety of services for patients transferred between multiple specialties within a hospital or between hospitals must be ensured, so manuals must be in place to ensure safe and efficient intra-hospital or inter-hospital medical service. Standards for inter-hospital transfers should also be established and approved to ensure that all acute ischemic stroke patients can be transferred safely and efficiently at any time.

#### 1.1.2.2 Chinese treatment mode

Stroke prevention and treatment in China started relatively late, and it was not until the 1990s that various types of emergency networks were gradually established. Regional stroke prevention and control network is a system developed in China in recent years, and it is the mainstream mode of stroke prevention and control in China at present. The competent health authorities at provincial and municipal levels organize the stroke prevention and treatment work of public hospitals, primary health care administrative authorities, local disease control centers, and national emergency response organizations in the region (L. D. Wang et al., 2019). By defining the functional positioning, responsibilities and comprehensive evaluation system of the participating institutions, the four-in-one health management model of stroke detection and prevention, emergency rescue, standardized care and health follow-up for key populations is discussed in depth to strengthen the overall control of the disease and enhance the early detection and early diagnosis capability of stroke. The stroke surveillance center and the stroke prevention and control base hospital will play a leading role in establishing the regional stroke prevention and control network by collaborating with secondary public hospitals, community and rural primary care institutions in their respective districts and counties to perform stroke prevention and control. In recent years, China has made certain progress in early stroke prevention and treatment. On the one hand, stroke mortality has been reduced through the establishment of multi-level stroke medical centers. On the other hand, substantial scientific research has been conducted in terms of stroke epidemiology, pathogenesis, diagnosis, care and rehabilitation, and a number of good clinical trial results have been achieved. However, the number of stroke patients in China has still been on the rise, and the management of chronic diseases in the community is facing many problems, with an urgent need to introduce new management models. Stroke prevention and treatment still has a long way to go.

The ability to treat acute ischemic stroke is a litmus test for the efficiency of stroke care.

Stroke treatment can be divided into three processes: "onset" to "emergency call", "emergency call" to "arrival at hospital", and "arrival at hospital" to "in-hospital treatment". The prehospital emergency mainly includes the first two processes. In the prehospital emergency process, rapid identification of stroke is the primary step to start the stroke emergency life chain, which is directly related to the efficiency and quality of emergency treatment. An important factor in prehospital delay is the inability of the patient and his family or caregivers to make effective judgments about stroke, and the failure to call EMS in a timely manner. Their first thought is sometimes even to contact other family members and friends for help or guidance. After the emergency call is connected, the dispatcher becomes the primary role of pre-hospital emergency care for stroke. If there is a suspected stroke patient, the highest priority should be given to dispatch vehicles. Before the ambulance arrives at the scene, the dispatcher can instruct the patient, family members, friends, passersby, or staff at the facility by telephone to carry out the initial and easily administered rescue measures. Upon arrival, the first aid personnel assess the patient's surrounding environment, vital signs, stroke, past medical history, and complete the necessary emergency measures (including maintenance of an open airway, blood glucose status monitoring, electrocardiogram checks, cardiac monitoring, blood pressure checks, and intracranial pressure checks) before transferring the patient to the hospital. It is recommended that suspected stroke patients shall be transferred to the nearest stroke treatment center as soon as possible. If the patient is suspected to have AIS-LVO, he/she can be transferred to an advanced stroke center/national (advanced) stroke treatment center without delaying the use of pharmacological intravenous thrombolysis, especially for patients with thrombolysis taboos within 24 hours of onset. To provide timely warning to the destination medical institution, a close communication channel should be formed between the emergency management agency and the stroke centers at all levels. Pre-hospital information about the suspected ischemic stroke patient should be sent immediately to the current medical institution to which the patient is to be sent using in-vehicle information systems, SMS, instant messaging software and telephone contacts. The stroke team of the destination medical institution should immediately get prepared for the handover and open the green channel in advance. Medical institutions with the capacity and conditions should communicate with the prehospital emergency staff in a timely manner in terms of the current situation, personnel arrangement, process, and other information.

In recent years, the clinical treatment of AIS has progressed rapidly, and its treatment focuses on rapid blood flow reconstruction to the ischemic organs to avoid other complications, which is of great value to improve the quality of life and prolong the life of patients. The commonly used treatment methods include recombinant tissue plasminogen activator (rt-PA),

urokinase intravenous thrombolysis, and mechanical thrombectomy (MT). There is a large amount of evidence-based medical evidence and consensus in the industry that intravenous thrombosis after the onset of AIS is time-sensitive, and the earlier the thrombolysis, the better the efficacy; for patients with ischemic stroke within 4.5 hours of onset, screening should be performed strictly according to stroke indications and contraindications, and intravenous thrombolysis with rt-PA should be performed as early as possible. In areas where rt-PA is not available, intravenous urokinase thrombolysis can be considered by strictly screening patients within six hours of the onset. In the real world, the treatment efficiency of AIS patients in China is not ideal and the situation is unsatisfactory. At present, the stroke center systems across China are in the stage of gradual improvement. However, due to the scattered distribution of stroke centers, uneven medical quality, lack of relevant workflow among major medical institutions, lack of close collaboration mechanism, and lack of incentive mechanism and quality control system, there still exist the following problems. 1. The EMS staff are not familiar with the specific situation of each stroke center and tend to rely on personal experience to make the best choice for transfer of patients. 2. The major time of inter-hospital transfers are consumed in the door-in-door-out (DIDO) process, with data showing that over 40% of patients spend more than two hours in this respect. 3. There are in-hospital delays for a variety of reasons, such as delay in the process from patient arrival to CT completion, delay in the process from CT completion to informed thrombolysis, delay in the process from informed thrombolysis to signing of informed consent form, delay in the process from signing of informed consent form to start of thrombolysis, and medical visits during non-normal working hours.

International and domestic practice shows that early intervention and treatment of TIA patients can effectively reduce the risk of recurrent stroke and it is also the best approach to alleviate the burden of disease in stroke patients. Stroke units should be set up in health care institutions where stroke patients are admitted, and a "stroke emergency green channel" should be established, so that suspected stroke patients can be diagnosed quickly according to the consultation procedure. CT examination and basic assessment shall be finished within one hour, followed by intravenous thrombolysis and/or vascular interventional therapy. Stroke unit is an organized model of care for the management of hospitalized stroke patients. Featuring uniqueness and independence, stroke unit is centered on patients and adopt unitized management and individualized treatment, with the ultimate goal of improving the success rate of treatment and quality of life of patients. With qualified stroke specialists, nurses and rehabilitation physicians (technicians) as the core, multidisciplinary collaboration is carried out to provide systematic

and comprehensive standardized treatment for acute ischemic stroke patients, including pharmacotherapy, physical and psychological functional rehabilitation and health education, which accelerates the rehabilitation of stroke patients, enables them to adapt to normal social life and promotes their overall physical and psychological recovery. The establishment of a sound three-level stroke rehabilitation service system requires the cooperation of medical institutions and health administration departments at all levels. Stroke patients in the acute phase should first be treated in a stroke unit or, if not available, the neurology department of a comprehensive medical institution for multidisciplinary treatment, including acute phase internal and surgical treatment, early rehabilitation interventions, and joint treatment by multiple disciplines. Two-way referral is also a key feature of the regional stroke management model, which generally refers to the referral of a patient to a higher level of care when the initial diagnosis of the disease at the primary care level exceeds the capacity of the institution to treat and manage the patient. For higher-level comprehensive medical institutions, patients suffering from common, multiple and chronic diseases or in rehabilitation needs to be referred by lower-level or primary medical institutions.

There are usually two types of two-way referrals, vertical referral and horizontal referral. Vertical referral refers to the collaborative treatment of patients between different levels of medical institutions, while horizontal referral refers to the collaborative treatment of patients between general and specialized hospitals at the same level. Two-way referral for regional stroke management is a vertical referral (X. Y. Liu & Deng, 2016). Currently, there are two major models of stroke prevention and treatment in China, namely "community initial diagnosis" and "two-way referral", both of which have been widely applied internationally. There are two main types of research on referral mechanism: one is on the factors influencing referral rate, and the other is on referral behaviors and patterns (Kier et al., 2013; Regan, 2017).

Research on two-way referral methods in China occurs mainly after the rise of medical alliances, and the research is mainly focused on the direction of referral mechanisms, referral patterns, and referral methods. The main research approach is to select a large number of patients as the main respondents and distribute designed questionnaires to them, and use statistical methods to explore factors affecting referral method based on the research data in the China Statistical Yearbook (K. Gao & Gan, 2015). It is pointed out that the key to the success of the referral model lies in the establishment of a general practitioner team, a sound medical system of primary medical institutions, and a standardization mechanism (Guan & Shi, 2009).



Figure 1.1 Triage process of stroke patients Source: General Office of the National Health Commission (2021)

There are still many deficiencies in the development of stroke centers in China: (1) Lack of pre-hospital warning. Pre-hospital warning can significantly shorten the time from stroke onset to clinical evaluation, imaging examination and intravenous thrombolysis (Belvis et al., 2005; Lin et al., 2012; Powers et al., 2018). In 2020, the DIRECT-MT study analyzed the diagnosis and treatment data of 41 advanced stroke centers in China. The median DNT and median DPT of intravenous thrombolysis bridging artery thrombectomy group was 59 minutes and 85 minutes respectively, and the median DPT of direct arterial thrombectomy group was 84 minutes (P. Yang et al., 2020). (2) Imperfect development of stroke system. As for the treatment of stroke, especially acute ischemic stroke, significant factors determining the treatment efficiency of stroke include sending patients to the nearest hospital, reducing pre-hospital delay and shortening onset-to-treatment time (OTT). The low medical literacy of Chinese residents, the complex medical environment, the unreasonable distribution of stroke centers, and the differences in hardware and software between hospitals lead to differences in treatment effectiveness. In particular, there lacks a city or regional stroke alliance system to ensure the emergency care of stroke patients and the collaboration between primary and advanced stroke centers (Lou et al., 2015). (3) Insufficient popularization of stroke education. The Chinese people lack general knowledge about stroke, especially first aid of stroke. People tend to not seek medical attention in time after the onset of stroke, which delays the golden time for

treatment. Improving public awareness and ability to recognize stroke can help shorten OTT (European Stroke Organization Executive & Committee, 2008).

Therefore, establishment of an efficient regional stroke alliance has become an urgent need for stroke prevention and treatment, which can help meet the special time requirement for stroke emergency so that stroke patients can be sent to stroke centers that are equipped to provide stroke treatment for intravenous thrombolysis or endovascular treatment as early as possible. In addition, training on clinical protocols, green channel procedures and hierarchical diagnosis and treatment should be carried out in stroke centers in the region to improve the overall level of diagnosis and treatment of the regional stroke center.

#### 1.1.3 Application of hospital alliance

The hospital alliance for stroke emergency management is a consortium formed by the members of the alliance through multidisciplinary cooperation. Hospital alliances are divided the ones with and without asset relationships. It is an association of entities formed by two or more medical institutions that share the same target customers and resources in a certain field for certain development goals, often in the form of mutual mergers or contractual alliances and joint management.

Multilevel hospital systems have become the mainstream organizational structure in the hospital industry (Yonek et al., 2010). In countries and regions where healthcare alliances are well-developed, there are small healthcare alliances in the form of technical support, hospital trusts, and hospital funding and hospital management, and large healthcare alliances such as contractual consortia, group consortia, and combined and merged medical groups (Dai et al., 2012). Take the United States as an example, the development of its hospital alliances has gone through the integration of business operations and services, mergers and acquisitions of healthcare institutions, and the integration of physical and virtual assets (W. H. Yang et al., 2009). The current allocation of medical resources in China is that most of the advantageous medical resources are gathered in national or regional medical centers of first-tier cities, secondtier provincial capitals or economically developed cities. By contrast, medical resources in regional and community medical institutions targeting the general public are relatively insufficient, which also leads to a large number of patients swarming into large hospitals. As a result, the problem of difficult and expensive access to medical treatment in China cannot be solved. Moreover, due to the particularity of the medical system, there is a lack of linkage between various places and medical institutions, resulting in segmentation and isolation from each other.

China has established several medical consortia between hospitals of different levels or types to achieve optimal integration of large, medium and small medical institutions with primary care institutions, maximize hospital benefits, broaden the development room of hospitals, and realize the downward shift of medical service priority. It helps integrate medical services such as diagnosis and treatment and health insurance, promotes the vertical flow of medical resources, improves the accessibility and service efficiency of high-quality medical resources, and facilitates the sharing of patient information and patient referral between different medical institutions, thus improving the effectiveness of diagnosis and treatment and the efficiency of medical resource utilization. Medical alliance is a major trend in the current development of the healthcare industry, and therefore, countries across the world have formulated corresponding policies to encourage the development of medical consortium. The extensive establishment of medical alliances across the country is a way to pool high-quality medical resources in the region, achieve mutual complementarity of resources, promote the flow of medical and health resources, promote the sharing of high-quality medical resources among medical institutions, improve the efficiency of medical resources utilization, and maximize resource allocation, so that primary-level hospitals can also have good medical resources. Enhancement of the work capacity of primary hospitals is the basis for improvement of their service capacity. It is an important measure to improve the national medical and health service system, and a necessary component to promote the establishment of an effective and normative model of hierarchical diagnosis and treatment model. At the National Health Conference, President Xi Jinping proposed five basic medical system reforms, the first of which is to promote the implementation of hierarchical diagnosis and treatment. The establishment of a "three-tier" medical insurance mechanism is the key and difficult task of medical reform in the 13<sup>th</sup> Five-Year Plan, and it is a basic strategy to optimize the national health service system and improve the efficiency of medical services. The establishment of a medical alliance system that is different from the previous inefficient, closed and outdated hospital system is an important means to promote the medical system reform and facilitate the establishment and improvement of the hierarchical diagnosis and treatment system. The 2017 Government Work Report proposes to vigorously promote the development of new-type medical alliance, in which public hospitals of all types at all levels should actively participate. The government should actively guide and promote the establishment of a sound and efficient medical service mechanism. Evaluation and incentive measures for sharing quality resources among different medical institutions should be formulated, and the expertise and service capacity of grassroots

hospitals, community medical service centers, and health clinics should be strengthened to solve people's difficult access to medical treatment.

At present, medical authorities of local governments and medical institutions in China are actively cooperating to develop the medical alliance model, and the dominant form is medical alliance with administrative areas as the main body. However, there lack medical alliances established for certain major and high incidence chronic diseases. Major diseases generally refer to diseases that exert a huge impact on the long-term work and life of patients and their families, such as cardiovascular and cerebrovascular diseases, long-term coma, paralysis, brain injury, Parkinson's disease, mental illness, and organ transplantation, and these diseases usually have expensive treatment and rehabilitation expenses. According to relevant data, chronic diseases of respiratory system, central nervous system, and circulatory system and malignant tumors have the highest mortality rate in China, which seriously affects the life expectancy of the Chinese. The treatment model targeting major chronic diseases should be patient-centered. The families together with the community provide primary prevention for the normal population, the community screens high-risk groups for major chronic diseases through improved physical examinations and health management, the emergency centers provide prehospital first aid for patients, the higher-level hospitals provide inpatient treatment for patients, and then specialized rehabilitation medical institutions are responsible for rehabilitation. Based on multiple steps of screening, prevention, treatment, and rehabilitation, a healthcare loop model has been established with patients as the center. In this model, community-based primary health institutions are responsible for initial prevention and emergency treatment, secondary and tertiary hospitals receive patients referred from lower hospitals, and then patients are transferred to community health service centers or specialized rehabilitation institutions during the rehabilitation period.

European and American health departments have classified the management and planning of stroke emergency centers into medical emergency center management, but for various reasons, the management models vary from country to country, and western countries such as the United States and the United Kingdom are improving their own management system according to their own actual situation. Spector-Bagdady et al. (2019) found that the U.S. federal government has taken several steps to try to intervene in the medical resources of hospitals after an investigation of medical institutions. Healthcare administrations such as the FDA have become involved in the clinical management of hospitals, hoping to address inefficiencies and inequities in medical emergency care in the United States. Physicians will be subject to more government regulation and greater risk in the United States with the
promulgation of the Right to Try Act in 2018. The government should take investigative interventions to promote equity and efficiency in the U.S. healthcare industry. Awan (2016) in Pakistan has demonstrated the great role of government intervention in medical teaching in emergency centers. On the contrary, due to lack of government support, supervision and management, the quality of medical education in private hospitals is very low. The author believes that the government should take due responsibility for medical institutions and use government intervention to solve the current problem of uneven quality of medical services in China. Through the study of the Japanese medical emergency system (Tanigawa & Tanaka, 2006), we learned that Japan has a mature social intervention mechanism and its performance has positive reference value for our social practice, especially the study of the stroke emergency center system. Japan adopts a three-tier medical service system characterized by EMS. The EMS staff consist of three professionally trained EMS personnel, equipped with at least a cardiac defibrillator, ECG monitor, tracheal intubation equipment, respirator, oxygen supply equipment, and resuscitation vehicle, and includes first level EMS personnel, second level ambulance personnel and senior ambulance personnel. With the increasing complexity of emergency care, the Japanese government needs to establish an efficient medical monitoring system. Japanese health organizations should strengthen their support to the emergency medical system and assist the EMS rescue system to perform in a better manner. Emadzadeh et al. (2016) analyzed the practical effect of the implementation of NHS in the UK. With lack of coordination and communication in disease treatment, particularly in stroke, the NHS, as the key national healthcare authority, has an obligation to assist medical institutions in providing effective medical assistance so as to alleviate the suffering of emergency patients of diseases such as stroke. The advantageous resources of different medical institutions are scattered, lacking a platform for medical technology and services to support and collaborate with each other, and the information communication is not smooth. A survey by Wang (2013) showed that the proportions of internet-based information sharing between provincial and municipal hospitals, provincial and county hospitals and municipal and county hospitals are 25%, 42%, and 20% respectively. On the other hand, the enthusiasm and attention of municipal medical institutions in medical collaboration is also much less than that of provincial and county medical institutions. These problems have greatly limited the development of healthcare in China and have imposed a serious burden on the public health service system, which has seriously affected the health status of the general public. It also restricts the improvement of the medical service level, resulting in unsatisfied needs of health maintenance.

Ren (2014) argues that the presence of large-scale medical institutions in a regional medical

alliance has weakened the role of the alliance and given them more administrative functions, so it is important to redefine the collaboration model within the alliance so as to realize hierarchical diagnosis and treatment. Phillips (2014) contends that the key to health care reform lies in integration of the resources of each medical institution, and integration of resources exerts a huge impact on the overall level of medical care in a country. Adjustment and reorganization of the advantageous resources of medical institutions, reduction of operating costs, and continuously improvement of the scientific management of institutions can effectively enhance the collaborative ability of each medical institution, thus improving the efficiency of the use of medical resources. As a result, an operation mechanism featuring linkage between high-level and low-level institutions, advantage complementarity, and resource sharing can be established to improve the country's medical service capacity. Ho and Hamilton (2000) suggest that part of the U.S. health service delivery system is controlled by the government, including the Medicaid and Medicare system for patients with special diseases and the system for veterans, and the other part is covered by privately-run enterprises.

## 1.2 Motivation and problems of stroke treatment process management

## 1.2.1 Theoretical motivation

This research will explore the stroke emergency response model in a regional hospital alliance in Guangzhou, Guangdong Province, China. Hospital alliance refers to a hospital consortium formed by two or more hospitals for a specific strategic goal. A hospital alliance is a form of integration of organizations with commonalities. In the 1950s, European and American countries made a lot of exploration and reform on the division of labor and collaboration mechanism of enterprises. Some enterprises formed new groups and presented scale effect, which rapidly expanded market share, integrated resources, and achieved the goal of cost reduction and profit increment. In the process of business development, stakeholder theory has been gradually developed in order to maximize the overall benefits of the company rather than the interests of one or several parties (S. W. Gao & Li, 2009). Stakeholder theory was first introduced in developed countries in Europe and the United States in the 1990s, and the stakeholder theory and methodology was first introduced to the healthcare field by Blair and Whitehead in the United States (Y. Luo & Jiang, 2011). The hospital alliance is a complex and open system, in which all the members are independent of each other. In the current context of imbalanced allocation of resources and distribution of medical institutions, the application of the synergy theory in healthcare organizations can maximize the role of hospital alliance in resource optimization and integration and achieve the division of labor and cooperation among medical institutions in a specific region.

Hermann Haken proposed synergetics in the 1970s. Synergy refers to combination of two different things in a complex and open system to achieve an effect that is better than the simple addition of the two things. According to the synergy theory, the efficiency of production can be promoted through the division of labor, and synergy can help avoid the increased costs caused by unduly segmented division of labor, thus generating new productivity, namely, collective force.

Therefore, with reference to the connotation of enterprise groups and based on the current situation of municipal hospital alliances, we refer to the stakeholder theory and the synergy theory to carry out research on regional hospital alliances at the municipal level. The interrelationship of each stakeholder is analyzed, and methods such as coordination, communication and benefit transfer are adopted to solve problems in the development of hospital alliances in a positive and efficient way so as to ensure long-term development of the hospital alliances. The advantages of interconnection and mutual assistance within hospital alliances are utilized to enable medical institutions in the region to achieve division and cooperation of labor, which can improve the treatment rate of stroke patientw by forming a sound stroke emergency response system.

### **1.2.2 Practical motivation**

By bringing together tertiary hospitals, secondary hospitals, and primary hospitals, the medical alliance has achieved hierarchical diagnosis and treatment. The gaps in rank and administrative affiliation among hospitals in the alliance are bridged, allowing for a balanced allocation of medical resources while promoting access to quality medical resources for primary health care providers. As a result, patients can get medical service in the principle of proximity.

In this thesis, we analyze the rationality and synergy of the establishment of a regional stroke treatment medical alliance in western Guangzhou, evaluate its performance and effectiveness, and analyze its positive aspects and shortcomings, so as to provide suggestions to improve the treatment process and management model for stroke patients, and create the premise for improvement of physician or patient satisfaction as well as further promotion of the treatment model.

### 1.2.3 Existing problems

The co-construction of hospitals at all levels is one of the key factors in the establishment of a medical alliance, but it also faces challenges in the distribution of benefits. Members of the alliance usually have to act as both resource providers and resource recipients, and have to bear part of the sharing costs when sharing medical resources.

The Western Baiyun District Stroke Alliance has been operating for a certain period of time, and after an in-depth investigation, we have identified the following problems.

(1) The medical technology level varies greatly among different levels of medical institutions in the Stroke Alliance.

The diagnosis and treatment level of each stroke center in the Stroke Alliance is uneven, and the level of standardization and homogenization of stroke treatment is low. The longstanding "inverted triangle" pattern of medical service in China tend to cause difficult and expensive access to medical treatment. The unbalanced allocation of medical resources between tertiary hospitals and primary care institutions over the years has made it difficult to maintain consistency in the emphasis on medical quality and assessment of medical quality goals between the leading hospitals and other member hospitals, and between different levels of member hospitals. In addition, if there is no unified clinical diagnosis standard and treatment specification within a medical alliance, or in other words, if different members have different test and examination standards, drug use guidelines and treatment methods for the same disease, the homogenization process within the medical alliance will be hindered.

(2) It is difficult to coordinate the interests of medical institutions at all levels within the Stroke Alliance.

Currently the two-way referral mechanism has not been comprehensively implemented. It is relatively simple to transfer patients between the Stroke Alliance, but due to the limited number of beds in the higher-level hospitals, some of the critically ill patients at the grassroots level cannot be transferred to the higher-level hospitals in time. In the case of downward transfer, the doctors of the higher-level medical institutions are not very clear about the service level of the lower level hospitals, and there are no clear and detailed criteria for downward transfer, so it is difficult to make perfect decisions. Furthermore, it is also very difficult to transfer patients because each department of the medical institutions has corresponding profiteering goals. Due to the different administrative affiliation and funding sources of member hospitals, their interests can hardly be unified.

(3) There is misunderstanding of patients' treatment needs.

Although the proportion of medical insurance reimbursement for community consultation is high and it is also more convenient, patients prefer to choose large hospitals because they have the best medical staff, better equipment, more experienced doctors, more complete drugs, and low drug delivery cost due to large scale of drug consumption. In contrast, community hospitals are not competitive in terms of doctors' ability, equipment and drugs, and the departments available for consultation are not complete, so patients and their families lack trust in primary healthcare. In addition, patients are also concerned about whether they can use their original drugs when they are transferred to primary healthcare institutions.

(4) The degree of information sharing is low.

The survey shows that the ratios of internet-based information sharing between provincial and municipal, provincial and county, and municipal and county medical institutions are 25%, 42%, and 20% respectively. Informatization is closely related to hospital development strategy. A major problem in the hierarchical diagnosis and treatment is the incompatibility of information systems of each member institution in the medical alliance. The difficulties in sharing patient records, tests and examination data and difficulties in two-way referral lead to poor continuity of medical treatment, inability to fully develop telemedicine, and duplicate tests and prescriptions among member institutions.

We believe that one of the reasons for these problems is the lack of stakeholder analysis of all relevant parties in the alliance before its establishment and the lack of evaluation of the rationality of its establishment.

## **1.3 Research significance**

Through exploration of the management mode of Western Baiyun District Stroke Alliance, this research is expected to identify the three-level management process of stroke prevention and treatment, control the variables in the management process, such as increasing thrombolysis guidance from the central hospital to the community hospitals, increasing endovascular treatment, encouraging active two-way referral and increasing technical support for training on ward rounds, explore the impact of improving clinical diagnosis and treatment technology of the community hospitals on the treatment rate of stroke patients, and use information technology to improve the management process of community alliance hospitals so as to improve the diagnosis and treatment technology and standardize the management process of Western Baiyun District Stroke Alliance, reduce the mortality rate of stroke patients, and

provide efficient, hierarchical, continuous and inexpensive medical services to the public.

# **Chapter 2: Background**

## 2.1 Strategic alliance

Strategic alliance is a cooperative organization formed by two or more independent enterprises with common alliance goals and shared risks and profits, and it has three important characteristics. First, member enterprises of the alliance remain independent after the alliance is formed. Second, there is an obvious interdependence among alliance members, which leads to a shared control of the alliance and greatly increases the complexity of alliance management. Third, the relative independence among alliance members leads to inconsistency of their behaviors, which in turn creates uncertainty. Alliances can take forms ranging from weak ties between enterprises (supply chain relationship) to very strong partnerships (joint ventures). Through establishment of an alliance, enterprises can acquire knowledge and capabilities, share the risks and costs of innovation and enhance the operational flexibility.

## 2.1.1 The alliance promotes economic development

In the context of global economic integration, enterprises are facing great opportunities and challenges for their survival. Through strategic alliances, enterprises can share with each other their production experience, sales channels and management experience, which greatly saves costs and avoids waste. It allows the enterprises to detach themselves from their location and scale, which can bring profits to the enterprises as well as expand their scale in an invisible way and improve their profits. The complementary advantages of cooperative enterprises in core competitiveness provide strong support for them to develop new markets. The pursuit of economies of scale and diversification is the inevitable trend of enterprise development. Strategic cooperation between enterprises can effectively resolve and reduce the uncertainties brought about by development in new fields and development of new technologies. In addition, it can also integrate the capital, technology and core competence of enterprises to develop new products and explore new fields in a quick and timely manner.

## 2.1.2 The alliance promotes social development

The knowledge progress promotes social development. According to the National Medium and

Long Term Science and Technology Development Plan Outline (2006-2020) as well as the Implementation Measures on Promoting the Construction and Development of Industrial Technology Innovation Strategic Alliance (Trial), the major task of the industrial technology innovation strategy alliance is to organize enterprises, universities, and research institutes to carry out technological cooperation around the key issues of industrial technology innovation, so as to break through the core technology that restricts industrial development and promote economic and social development.

In strategic alliances, the integration of intellectual resources such as talents, technology and management of the enterprises can enhance their strategic decision-making ability. Nowadays knowledge and information are the key to the core competitiveness of enterprises. If the prospects of the industry, changes in the market and competition in the market are not clear, a large amount of investment will be unable to pay off, thus putting the enterprise in a greater predicament. Establishment of strategic alliances can bring together different resources to avoid irrational decisions and enhance the scientific nature of decision making, thus promoting the decision-making ability of enterprises. Connectivity and complementarity of technology between enterprises can facilitate systematic development, and thus drive or promote technological innovation to realize a cluster effect.

## 2.2 Medical alliance

Since the 1990s, governments across the world have proposed the concept of integrated health services (Enthoven & Tollen, 2005), due to population aging, increasing prevalence of chronic diseases, high level of economic burden of disease treatment, complexity of disease diagnosis, and the increasing health awareness of the population. As for "Health Integration", Goodwin (2016) and Wistow et al. (2015) believe that the integration of health care resources can be manifested in different forms and different perspectives, such as the level of integration (macro, meso and micro) and the intensity of integration (connection-coordination-complete integration). The forms of integration include horizontal integration, vertical integration, human-centered integration, and system-wide integration. The medical alliance proposed in China is also called medical group, medical community, medical consortium, and medical association, which is composed of but not limited to municipal medical group, county medical community, specialty alliance, and telemedicine alliance. The establishment of medical alliance is a crucial step in the implementation of hierarchical diagnosis and treatment, an effective means to realize the hierarchical diagnosis and treatment system, and a key and important

initiative in the current medical reform in China. The goal is to meet the growing medical demands of the general public and achieve effective utilization of medical resources through the division of labor and collaboration among medical institutions at all levels (Schmitt, 2017). A medical alliance is comprised mainly of tertiary hospitals, secondary hospitals, township health centers, and community health service centers (service stations).

## 2.2.1 Macro level

Establishment of medical alliance is a major strategic deployment to further promote and accelerate the implementation of the hierarchical diagnosis and treatment service system. The responsibility of government in funding hospitals should be unswervingly followed. With people's health as the core, it is necessary to maintain and guarantee the public welfare nature of basic medical and health care, optimize the resource structure, guide the high-quality medical resources to be accessible in grassroots level, and promote the organic integration of disease prevention and management. As a result, the medical quality will gradually be homogenized, medical services, public health services and emergency response to public health events will be effectively improved, and the social responsibility of public hospitals will be manifested.

## 2.2.1.1 Public welfare—core value of medical alliance

At the macro level, the core value of the establishment of an medical alliance is public welfare. As stated in the *Decision on Health Reform and Development* issued in 1997, China's medical and healthcare industry is a social public welfare undertaking with welfare policies implemented by the people's government. According to the *Opinions on Deepening the Reform of the Medical and Healthcare System* issued in 2009, the public welfare nature of socialist public healthcare must be adhered to. Subsequently, the *Guiding Opinions on Promoting the Construction and Development of Medical Alliance* issued in 2017 stated that adhering to the main responsibility of the government in funding hospitals and effectively maintaining and guaranteeing the public welfare nature of basic medical and healthcare industry is one of the basic principles for promoting the construction and development of medical alliance.

## 2.2.1.2 Macro institutional development of medical alliance

The concept of hierarchical treatment was first proposed by the State Council in the *Guiding Opinions on the Development of Urban Community Health Services* (No. 10 [2006] of the State Council) (State Council, 2006). Hierarchical healthcare means to establish the systems of graded diagnosis and treatment, two-way referral and initial diagnosis at community level

through multi-level and multi-form association and collaboration between community health care institutions and large and medium-sized hospitals, hoping that community health service institutions can gradually undertake the general outpatient, rehabilitation and nursing care of large and medium-sized hospitals. The Guiding Opinions of the General Office of the State *Council on Promoting the Construction and Development of Medical Alliance* (No. 32 [2007] of the General Office of the State Council) (General Office of the State Council, 2017) clearly requires that by 2017, the organizational structure of medical alliance should be basically built, multiple forms of medical alliance pilots should be carried out, public hospitals at all levels should take the initiative and play a leading role, and municipalities and pilot cities for hierarchical diagnosis and treatment should build at least one medical alliance with exemplary characteristics. Through exploration of vertical cooperation models such as medical alliance, a relatively scientific division of labor, collaboration and smooth referral mechanism has been established within the alliance. It is expected that by 2020, the policy system of medical alliance will be gradually constructed and improved through the reform of medical institutions. All secondary public hospitals and government-run primary health care institutions shall participate in the establishment of medical alliance. It is necessary to build a medical alliance division of labor and collaboration system featuring clear goal, well-defined rights and responsibilities, and fairness and efficiency as well as a guiding mechanism with consistent rights and responsibilities, so that medical alliance can actually become a consortium of medical services, responsibility, benefit and management. In this way, medical resources are effectively shared, and service capacity the grassroots healthcare institutions can be further enhanced, effectively promoting the formation of a hierarchical diagnosis and treatment model integrating community initial diagnosis and two-way referral as well as differentiated treatment for acute and chronic diseases and linkage between high level and primary level institutions. Based on a comprehensive summary of the national medical alliance pilot program, the National Health Commission and the National Administration of Traditional Chinese Medicine formulated the Medical Alliance Management Measures (Trial) (National Health Commission & National Administration of Traditional Chinese Medicine, 2020) to accelerate construction of medical alliances and gradually realize the grid layout management of medical alliances.

## 2.2.1.3 Preliminary results of macro level development of medical alliance

Since the implementation of the new medical reform in 2009, the medical and healthcare industry in China has achieved favorable results. According to the Statistical Bulletin of China's Healthcare Development in 2020 (National Health Commission, 2020), the total health

expenditure in 2020 was expected to reach 7.23064 trillion yuan. To be specific, the amount of government health expenditure was 2.19983 trillion yuan, accounting for 30.4%, the amount of social health expenditure was 3.02528 trillion yuan, accounting for 41.8%, and the amount of personal health expenditure was 2.00553 trillion yuan, accounting for 27.7%. The total per capita health expenditure was 5146.4 yuan, and the percentage of total health expenditure to GDP was 7.12%. In 2020, 3.32 billion visits (42.9%) were made to hospitals and 4.12 billion visits (53.2%) were made to primary healthcare institutions. Compared with 2019, the percentage of hospital visits decreased (44.0% in 2019) and the percentage of primary healthcare institution yields (52.0% in 2019) (National Health Commission, 2019).

#### 2.2.2 Meso level

Following the principle of "planning and development, industry supervision, integration of prevention and treatment, zoning and service packaging", health administrative departments at all levels shall strengthen the integration of Chinese and Western medicine and develop scientific plans to construct municipal and county-level medical alliance. Hospitals representing medical strength in the region shall play an exemplary role in municipal and county-level medical institutions. Municipal and county-level health administration departments should make plans of establishment of medical alliances. According to the geo-jurisdictional relationship, the configuration of medical and health resources, population distribution and the needs of the masses for medical care, healthcare resources shall be divided into a number of segmented units. The medical resources are concentrated in a grid to form a medical alliance with tertiary public hospitals and medical institutions as the leading service providers, and primary medical institutions and public health institutions as the subordinate service providers.

Health administrative departments at all levels, according to cross-regional disease and technical needs of patients, should make targeted overall planning and guidance for the construction of each specialty alliance. Construction of specialty alliance should give priority to major diseases and key disciplines such as tumors and cerebrovascular diseases, which are harmful to people's health and are in great demand.

#### 2.2.2.1 Exploration of medical alliance models

China's medical alliance is exploring models including urban medical group, county medical community, specialty alliance and telemedicine collaboration networks.

In the urban area, the mainly adopted model is medical group. In cities with administrative districts, public hospitals or well-operated hospitals are supposed to cooperate with community

health institutions, nursing homes and professional rehabilitation institutions to form a management model of resource sharing and division of labor. In public medical institutions, collaboration should be carried out in terms of talent sharing, technical support, mutual recognition of examinations, prescription process, and service connection. For example, the Yanhu District Medical Group of Yuncheng and Luohu District Medical Group of Shenzhen make a comprehensive inventory of the officially budgeted posts, employees and assets for the township-level health centers, public community health service centers or district hospitals, and community rehabilitation centers and hand them over to the medical group. Then according to the actual needs, the medical group establishes corresponding new departments, such as medical testing, radiology, and sterilization. As a result, the unified management of people, property and materials is realized, and a system featuring well-defined rights and responsibilities, and mutual coordination and mutual restraint is established.

In the counties, the mainly adopted model is medical community. In the county medical community model, county hospitals play the leading role, while township health centers are the hub and village clinics are the foundation, aiming to achieve a balanced development between urban and rural healthcare. It is necessary to give full play to the division of labor and cooperation among medical institutions at the county, township and village levels to build a three-tier medical service system. Take the medical community in Tianchang as an example, the city hospital transferred 2,668 people to county-level hospitals in 2015, and the county-level hospitals then took the initiative to transfer patients downwards to the town health centers, and there were 1,140 upward transfers from the lower level medical institutions.

For cross-regional situations such as between different cities and regions, the mainly adopted model is specialty alliance. Based on the advantageous specialty resources of medical institutions in each region and the specialized expertise of multiple hospitals, these hospitals make full use of the national medical centers, national clinical research centers and the synergistic network to form regional specialty alliances integrating multiple disciplines. The special alliance enables the hospitals to draw on each other's advantages, enhance strengths and overcome weaknesses, and improve the level of treatment of major diseases through collaboration.

In remote and impoverished areas, the focus is on the development of telemedicine collaboration network. A telemedicine collaboration network for grassroots, remote and backward areas should be established to promote the vertical circulation of medical resources through telemedicine, distance learning and distance training. Telemedicine collaboration network can improve access to medical resources and enhance the overall effectiveness of

medical services.

### 2.2.2.2 Classification of medical alliance

Vertically speaking, medical alliance can be divided into three types: close-knit, loose and semiclose-knit, and the division is based on the relationship between rights, responsibilities and interests and the degree of integration between them.

In Luohu District of Shenzhen, a close-knit corporate sole medical group, the Luohu Hospital Group, was established in August 2015. At the Briefing on Deepening Medical System Reform 2019 held by the State Council Information Office, Wang Hesheng, deputy director of the National Health Commission, said, "We should draw on the experience of places such as Shenzhen Luohu to promote the medical alliances to be close-knit". In terms of medical expenses, the Luohu Hospital Group implements a health effect-oriented medical insurance payment method to achieve transformation from "disease protection" to "health protection". The medical insurance fund implements the principle of "total budget management, balance retention and reasonable overspending sharing", forcing hospitals to focus more on preventive healthcare and improve their level of connotation construction.

#### 2.2.2.3 Implementation of medical alliance in Guangdong Province

In terms of traditional Chinese medicine, according to the *Guangdong-Hong Kong-Macao Greater Bay Area Traditional Chinese Medicine Highland Construction Program (2020-2025)* (National Administration of Traditional Chinese Medicine, 2020), with the establishment of the first Chinese medicine hospital in Hong Kong as an opportunity, it is required to set up Chinese medicine medical alliances and Chinese medicine hospital groups in the Guangdong-Hong Kong-Macao Greater Bay Area. Medical institutions in Hong Kong and Macao are encouraged to participate in the alliance in the form of joint ventures and cooperation. With major diseases and Chinese medicine advantageous specialties as the feature, the alliance can enhance its international medical service capacity. It insists on specialized medical resource supply, and provides universal and whole-lifecycle Chinese medicine medical services for the general public in the Chinese mainland, Hong Kong and Macao.

There are 23,000 TCM medical institutions in Guangdong Province at present and 192 TCM hospitals, including 36 Grade A tertiary hospitals, 72 Grade A secondary hospitals, and 1,715 TCM treatment sections (TCM clinics) in primary medical institutions, covering the eastern, western and northern parts of Guangdong. Based on the cooperation among Guangdong, Hong Kong and Macao, Guangdong will actively promote the convergence of rules, systems

and factors of the three places, and actively promote the establishment of TCM medical alliance in the Guangdong-Hong Kong-Macao Greater Bay Area (Xinhua News Agency, 2021).

### 2.2.3 Micro level

According to the organizational structure of disease-related medical institutions in the literature, we divide the medical alliance into four modules: administrative management, business management, stakeholder management, and information sharing platform management. Through administrative means, daily regulations and management systems and implementation deadlines for medical institutions are identified to optimize management procedures and enhance management effectiveness. Business management refers to management of the main business of hospitals so as to realize the basic functions of medical institutions, including patient treatment and smooth referrals between medical institutions at different levels. Stakeholders include the government, patients and medical staff at all levels of medical institutions. Through the information sharing platform, patient data can be stored, transmitted, analyzed and predicted to provide technical support and back-end support for clinical diagnosis, treatment, rehabilitation and health tracking.

### (1) Administrative management

Basically, all the management matters in hospitals, except for medical care, belong to administrative management, and the level of administrative management is directly related to the overall level of a hospital. Chapter 3 of this thesis mainly analyzes the main influencing factors of medical alliance and points out that the key factor affecting the patient cognition is hospital management. Therefore, it is of great significance to establish a reasonable health care management system so as to improve the quality of medical services.

As an intricate system composed of several medical institutions, the management of a medical alliance is extremely complicated, so management personnel with certain professional quality should be hired and corresponding incentive measures should be formulated to promote its efficiency. The organizational constitution of the medical alliance should be formulated to clarify the responsibilities, rights and obligations of the main body and member institutions of the alliance. The highest authorities should be set up at each level of the alliance for the management personnel of the alliance should be the president and vice president of the superior hospital within the alliance, and they are responsible for the daily operation and management of the alliance. In addition, an internal affairs department is set up within the alliance as a

functional organ, responsible for coordinating and supervising the administrative decisions of the medical alliance.

(2) Business management

The medical alliance for major diseases established in this thesis consists of five functions: primary prevention, emergency management, in-hospital management, rehabilitation management, and secondary prevention. Primary prevention is carried out in community healthcare institutions. In case of emergency, patients will be transferred to emergency departments of secondary and tertiary hospitals by emergency centers within the medical alliance. After admission, patients receive treatment, surgery, examination, and medication. After receiving inpatient treatment, patients will receive rehabilitation guidance and follow-up observation in rehabilitation centers. After rehabilitation, patients in the rehabilitation centers will receive secondary prevention under the guidance of their families and the community health institutions.

The operation efficiency and level of a medical alliance is an important indicator of its operation effectiveness. In the business operation of a medical alliance, there are clear criteria for the effectiveness of each medical staff. They will be evaluated by their average consultation time, patient recovery rate, patient and family feedback, communication with primary hospitals and frequencies of further training. In addition to the direct involvement of medical staff, hospital administrative and management personnel should also be responsible for their own work to continuously improve and enhance hospital operations and management, so as to create a better environment for medical operations.

(3) Stakeholder management

According to stakeholder analysis of the medical alliance, there are five stakeholders involved in the medical alliance: tertiary hospitals, secondary hospitals, primary community medical institutions, the government and patients. A medical alliance is not only cooperation and integration of technology, personnel and resources, but also an interest group driven by various interests. In medical institutions, the distribution of interests among all parties is a necessary condition for the establishment of a medical alliance. In particular, the new round of medical reform stipulates that all medical institutions can use uniform drugs, which can increase the enthusiasm of patients and reduce drug income of the hospitals. The service charges related to diagnosis and treatment are the biggest source of profit. In other words, the more the patients, the more the profits. The downside, however, is that patient referrals in the medical alliance become difficult.

An effective benefit management mechanism should be established within the medical alliance to achieve the unity of interests between doctors and patients, enhance patients' trust in the medical alliance, and balance the needs of all parties, so as to ensure the smooth operation of the medical alliance. In terms of governance of stakeholders, the only way is to fundamentally change the system and reform the operation mechanism, establish a well-designed distribution system within the medical alliance, and give corresponding subsidies according to the needs of the hospital, so that more people can get the best treatment. Only with the balance of these interests, can the medical alliance get better development.

(4) Information sharing platform management

An information sharing platform based on the existing information systems of each member hospital should be established. The operation of a medical alliance often requires a large number of resources, including hardware, software, data, and users. Members of the medical alliance can use a cloud management platform for management and provision of cloud services to patients. On the cloud platform, a comprehensive, multi-layered and integrated cloud resource management system is built through integrated services. To achieve different functions, the platform offers multiple management interfaces for managers and users.

### 2.3 Research problems

Before the establishment of the Western Guangzhou Hospital Alliance, no stakeholder analysis of all relevant members in the alliance has been carried out, and rationality of the establishment of the alliance has not been evaluated.

The original intention to establish the Western Guangzhou Hospital Alliance is to optimize the process of stroke treatment and improve the quality and efficiency of treatment services by organizing various organizations (community hospitals and tertiary hospitals) related to stroke treatment in the western region of Guangzhou. Two periods (six months since the establishment and the recent six months) of objective data about referral and treatment efficiency have been collected retrospectively. The successful referral rate has increased from 73.68% to 96.15%, the rate of door to puncture time (less than 45 minutes) has increased from 21.05% to 48.72%, the rate of door to reperfusion time (less than 30 minutes) has decreased from 18.42% to 32.05%, and the rate of door to reperfusion time (more than 60 minutes) has decreased from 31.58% to 10.26%. The comparison indicates that the Stroke Alliance has made great progress in patient treatment since its establishment, but there are still shortcomings, such as occurrence of

accidents or delays, and there is still a need to improve the rate of door to puncture time and door to reperfusion time. Although the alliance has proved to be effective, it still falls short of the desired goal.

## 2.4 Research questions

(1) Is there a correlation of interests between the members in a stroke alliance? What is the degree of correlation?

(2) If there is correlation of interests between the alliance members, do they have a desirable synergy relationship with each other in the operation?

(3) If the synergy between the alliance members is undesirable, what are the specific influencing factors?

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## **Chapter 3: Literature Review**

## 3.1 Stakeholder theory

The stakeholder theory, a business ethics and organizational management theory with corporate and social values as its core, emerged in the 1960s and has gradually developed with the continuous research of several scholars. The definition made by Professor Freeman in his *Strategic Management: A Stakeholder Approach* is widely recognized, which states that an enterprise should be the stakeholder's enterprise, and all stakeholders, including shareholders, should have ownership of the enterprise because they have invested in the survival and development of the enterprise, shared the business risks of the enterprise, or paid costs for the management of the enterprise. In this section, we will elaborate from the perspectives of theoretical background, theoretical innovation, and definition of stakeholder.

### 3.1.1 Theoretical background

Before the 1960s, it is believed in the United States and the United Kingdom that enterprises naturally belong to their shareholders and a shareholder-oriented management philosophy is advocated. The enterprises insisted that the core of corporate management was to continuously improve the interests of the controlling shareholders and increase the corporate wealth. Therefore, enterprises should serve to maximize the profits of shareholders, which is the shareholder focused theory. In this case, in business activities, enterprises tend to seek profits at the expense of other interests such as the optimal interests for the society. With the economic downturn in the 1960s in the United Kingdom and the United States, and the rapid economic development in Germany and Japan, where the stakeholder theory requiring benefit-sharing with employees is advocated, the "shareholder focused" corporate governance model has been questioned. It is argued that the shareholder focused theory will keep enterprise managers trapped in the quagmire of short-term goals, which will damage the long-term interests of the enterprise and the stakeholders.

According to the stakeholder theory, although enterprises are created by the shareholders, employees and other stakeholders are equally indispensable, and the business activities of enterprises should focus on the interests of stakeholders. The key is that enterprises should balance all stakeholders as a whole rather than focus on increasing assets of the shareholders. Enterprises should focus not only on their financial performance, but also their social benefits. Enterprise managers should understand and respect each individual who is closely linked to the organizational behavior and results, and meet their needs as much as possible. The stakeholder theory developed rapidly in the mid-1980s as a result of the emergence of hostile takeover (also called hostile M&A) in the US and the UK. A hostile takeover occurs when an acquirer takes over a company without the consent of its management; instead, it side-steps the management team to negotiate directly with the company's shareholders. If the acquirer becomes the majority shareholder by buying the stock of the target enterprise at a high price, it will reorganize the management to secure a higher stock price and safeguard the interests of shareholders by downsizing the scale, firing employees, and lowering operating costs. As a result, such a hostile takeover seriously infringes on the interests of other corporate stakeholders, such as the management, employees, suppliers and the community, which well explains the notoriety of hostile takeover.

The traditional core concept of "enterprise ownership belongs to the individuals and institutions that hold the enterprise's shares" that has been practiced by British and American enterprises has been seriously challenged and questioned. At the same time, unlike the prevalence of hostile takeover in the U.K. and U.S., German and Japanese enterprises have achieved impressive results by building long-term partnerships with their boards of directors, financial departments, and employees, bringing stakeholder governance to the forefront of attention. According to the stakeholder theory, all stakeholders are the driving force of enterprise development and the role of capital owners in the enterprise should gradually be diminished. Enterprises should be responsible to both shareholders and all stakeholders to ensure the sustainable development. In corporate management, the enterprises should take into consideration both internal and external stakeholders. Under the influence of this theory, the approach of corporate management in the United States and the United Kingdom has been influenced and changed.

#### 3.1.2 Definition of stakeholders

The concept of stakeholder was first proposed by the Stanford Research Institute in 1963. Ansoff introduced this theory to management and economics in 1965, arguing that "setting an ideal corporate goal requires balance of the claims of various stakeholders in the conflicts of interests, including the management, employees, shareholders, suppliers, and distributors". In

1977, the Wharton School of the University of Pennsylvania offered a course on stakeholder management for the first time, and since then the stakeholder theory has gained widespread attention in the mainstream academic community in Europe and the United States. Although the concept of stakeholder has been explained in many forms over the years, none of them has been generally acknowledged. Among all the definitions, the two given by Freeman and Clarkson respectively are the most representative. Freeman defines a stakeholder as "any group or individual who can affect or is affected by the achievement of the organization's objectives". This definition visually explains the relationship between an enterprise and its stakeholders, and the scope of a stakeholder includes shareholders, creditors, employees, suppliers, and customers, as well as the general public, community, environment, and media. All these stakeholders directly or indirectly affect the business activities of the enterprise. According to Clarkson, "stakeholders are those who invest capital, human capital, financial capital, or other valuable objects in the enterprise, and are therefore exposed to various forms of risk". This definition mainly emphasizes concurrence of benefits and risks, which suggests that the definition of stakeholders tends to be more specific and focused with the deepening of research. Chinese scholar Jia Shenghua define stakeholders as individuals or groups who take certain risks of a specific investment that affects their behavior. This definition highlights both the specific investment and the relationship between stakeholders and the enterprise. In addition, modern industrial civilization has brought about serious environmental pollution, and the continuous deterioration of the natural environment poses a threat to human survival. Therefore, the environment or community should also be included in the stakeholders. The report of China's "Two Sessions" in 2003 first proposed the concept of circular economy, which emphasizes the harmonious development of human and nature. It is believed that the traditional economy has led to the depletion of natural resources and environmental pollution, so the material cycle model of "resources-products-renewable resources" is advocated, the essence of which is to consider the environment as a stakeholder of the enterprise. The participation of different stakeholders in the corporate decision-making is both an ethical requirement and a strategic resource, and these stakeholders will all help improve the enterprise's competitiveness to a certain extent.

### 3.1.3 Classification of stakeholders

Stakeholders include those who have a contractual relationship with the subject and those who have a relationship with the public and society. However, it is almost impossible to draw

meaningful conclusions simply by integrating all stakeholders into an empirical study. For this reason, stakeholder theory tends to narrow the definition of stakeholders to major legitimate individuals and groups. In most cases, the stakeholder theory excludes stakeholders who have little connection with the enterprise operations and goals, because, to a large extent, if an enterprise spreads too much effort among various interest groups in order to satisfy their interests, it will be difficult for the enterprise to maintain its normal economic operation. Therefore, in practice, stakeholders must be scientifically categorized to achieve scientific management, and the commonly recognized classification methods are the multi-dimensional segmentation method and the Mitchell score-based approach.

### 3.1.3.1 The multi-dimensional segmentation method

Multidimensional segmentation is the process of categorizing corporate stakeholders in multiple levels to discover their differences in the specific characteristics. From the early 1980s to the mid-1990s, several scholars used multidimensional segmentation to classify stakeholders, including Freeman, Frederick, Charkham, Clarkson, Wheeler, and Sirgy.

Freeman categorizes the stakeholders of an enterprise in terms of ownership, economic dependence and social interest. The first is the shareholders who own shares in the enterprise, such as directors and managers; the second is the related groups who have a financial relationship with the enterprise, such as employees, creditors, internal affairs departments, consumers, suppliers, competitors, local communities, and regulatory authorities, and they are all asset-dependent stakeholders; the third is those related to the social interests of the enterprise, such as government departments, the media, and special groups, and they are called social stakeholders.

Frederick divides stakeholders into two categories according to their influence on the enterprise. One is direct stakeholders, including shareholders, employees, creditors, and suppliers who have direct market transaction relationship with the enterprise. The other is indirect stakeholders, including the central government, the local governments, social activist organizations, media and the public who have not-for-profit relationships with the enterprise.

Charkham classifies stakeholders into contractual stakeholders and public stakeholders based on whether they have signed a contract for transaction.

Clarkson classifies stakeholders into two main categories according to the various risks faced by the enterprise in the operation: those voluntary to provide tangible or intangible assets and those not voluntary to do so. They can also be divided into primary and secondary stakeholders according to their closeness to the enterprise.

Wheeler divides stakeholders into four categories based on their sociality and whether there is direct involvement of natural persons: (1) primary social stakeholders, namely, those who have a direct relationship with the enterprise and have involvement of natural persons; (2) secondary social stakeholders, whose relationship with the enterprise arises from social activities; (3) primary non-social stakeholders who have a direct influence on the business but with no detailed persons involved; (4) secondary non-social stakeholders who have an indirect influence on the business.

Serge classifies the stakeholders into three types according to their proximity. (1) Internal stakeholders, referring to members within the subject, either management or grassroots employees. (2) External stakeholders, referring to outside stakeholders that can influence the subject, such as investors and social environment. (3) Distal stakeholders, referring to stakeholders that have little influence on each other.

### 3.1.3.2 Mitchell score-based approach

The above classification of stakeholders from multiple dimensions has greatly deepened the understanding of corporate stakeholders. However, most of the current classification methods are limited to the academic level and lack operability, which limits the application of relevant theories in practice. Therefore, a score-based approach was proposed in 1997, which is clear and simple to be implemented (Mitchell et al., 1997). All stakeholders of an enterprise should have three characteristics: legitimacy, power and urgency. To be specific, legitimacy refers to the perceived validity of the stakeholder's claim to the legal, moral or specific rights to the enterprises. Power refers to the ability of a stakeholder to produce an influence on decision-making based on his status and capacity. Urgency refers to the degree to which the stakeholder's claim requires immediate attention of the enterprise managers. The stakeholders are scored according to legitimacy, power and urgency, and are divided into the following three categories by their scores.

(1) Definitive stakeholders. Definitive stakeholders have the characteristics of legitimacy, power and urgency at the same time, and are the most concerned and connected group to the enterprise, including shareholders, employees and customers.

(2) Expectant stakeholders. Expectant stakeholder can be further divided into three different sub-types. Dominant stakeholders have legitimacy and power, including investors, employees and government departments. Dependent stakeholders have legitimacy and urgency, including the media and social organizations. Dangerous stakeholder have urgency and power, but no legitimacy, including political and religious extremists and radicals.

(3) Latent stakeholders. Latent stakeholders include dormant, discretionary and demanding stakeholders.

(4) Other classification. Chinese scholars classify stakeholders into supportive, mixed, nonsupportive and marginal stakeholders from the perspective of cooperation and threat of stakeholders.

### 3.1.4 The evolution and development of research on stakeholder theory

In the 1960s, under the influence of the shareholder-focused theory, enterprises were always short-sighted in the pursuit of profit, without fully considering the long-term corporate development. However, the stakeholder theory takes into account the interests of various stakeholders in business operation, and fully integrates the concept of humane management. In the 1970s, corporate social responsibility gained increasingly more attention from the international community. Enterprises should shoulder not only economic responsibility, but also legal, environmental, ethical and philanthropic responsibilities, which is in line with the stakeholder theory. In the "corporate dependency" stage of stakeholder theory, scholars tend to view stakeholders as a necessary condition for the existence of enterprises, and the research focus is on analysis of the identity of stakeholders as well as the basis and rationality of stakeholder participation. The idea of applying stakeholder approach to research on strategic management emerges from viewpoints of Freeman in Strategic Management: A Stakeholder Approach. Since then, research on stakeholder has largely been carried out in accordance with his framework, which is also a typical paradigm for research on stakeholder. In this thesis, we explain the role of stakeholders in the process of corporate strategy analysis, planning and implementation, and highlight the important role of stakeholders in corporate strategic management from the perspective of their influence on enterprise. In the 1980s, a wave of "hostile takeover" emerged in the United States due to the deregulation of the U.S. government. In order to protect the interests of corporate stakeholders and reduce the adverse effects of hostile takeover, government and business executives in 29 states spearheaded amendments to corporate laws of each state which required that the interests of all stakeholders shall be protected. Strictly restrictive measures against hostile takeovers were proposed in merger and acquisition. The Pennsylvania state government enacted Senate Bill 1310 in 1990 by an overwhelming majority, which requires enterprises to give greater consideration to the interests of stakeholders in takeovers and anti-takeovers. This bill is a milestone and marks the beginning of the acceptance of stakeholder theory in the U.S. industry.

In the 1990s, scholars in Europe and the United States began to study corporate governance from the perspective of stakeholders. In other words, the theory has entered the stage of "participation in the distribution of ownership". In response to the accusation that the definition of stakeholders is too broad and rigid, follow-up theoretical research has defined stakeholders from more comprehensive perspectives of corporate governance and managers. It is concluded that corporate governance should involve the adjustment of the relationship between shareholders, managers, creditors and social interests, and its main purpose should be to maximize the corporate value without harming interests of any stakeholder. Based on analysis of transaction cost, Williamson (1985) argues that shareholders' rights should be prioritized because of the "asset specificity". The "gambling money" of shareholders is unique and directly determined the success or failure of the enterprise. Freeman and Evan (1990) believe that, on the contrary, stakeholders still "bet" or invest on assets with specific purposes, so asset specificity alone could justify that the interests of shareholders are superior to those of stakeholders. According to Donaldson and Preston (1995), the establishment of a complete theory should be based on three levels, namely, normative level, instrumental level and descriptive or empirical level. The three levels are interlinked and interrelated, but differ in argumentation and application. In addition, they believe that the three levels of stakeholder theory are mutually supported and the normative cornerstone of theory is the modern property right system. This research is the most complete and comprehensive literature review of the stakeholder theory so far.

In the mid-1990s, theoretical study of stakeholders in China were still lagging behind. In 1999, the OECD enacted the *Principles of Corporate Governance*, which elaborated on the importance of stakeholders in corporate governance. As circular economy and sustainable development has become an important direction for China's economic development, research on stakeholder theory has also become increasingly common. The connotation of stakeholder is specifically defined in the *Governance Standards for Listed Companies* issued in 2002. In 2008, the State-owned Assets Supervision and Administration Commission of the State Council issued the *Guiding Opinions on the Fulfillment of Social Responsibility by Central Enterprises* to make central enterprises adapt to the situation of reform and development. It helps promote the reform and development of central enterprises, urges them to pay more attention to social responsibility, and encourages them to achieve harmonious and sustainable development of enterprise, society and ecological environment in the process of production and operation, instead of merely pursing "profit maximization". Enterprises should assume responsibility for multiple stakeholders and protect the legitimate rights and interests of all parties.

With the evolution of corporate enterprises in China, the phenomenon of "separation of ownership and management" has emerged in the corporate governance structure of China. Based on Williamson's transaction cost analysis framework, Wang (2003) argues that the assets invested by shareholders have "asset specificity" and rights and interests of shareholders should be prioritized. Based on the incomplete contracting theory, Grossman and Hart further argue that shareholders should have residual control and corporate operation should be aimed at maximization of shareholders' interests. Freeman and Evan argue that asset specificity alone is unable to justify that the interests of shareholders are superior to those of stakeholders. Blair believe that human capital is also a kind of specific capital, which carries residual risk to a certain extent. The most representative scholars applying stakeholder theory to corporate governance in China are Yang Ruilong and Li Weian (2004). Yang has carried out in-depth exploration of the issues of corporate governance and control allocation, stakeholders in asset specificity theory, allocation of decision-making power in knowledge division of labor, and optimal equity allocation of the firm. He clarifies the advantages of ownership sharing and stakeholders in co-governance, and proposes multilateral governance on this basis. However, the subjects of corporate governance are mostly employees and creditors, and their roles are limited to supervision and restriction of power. Li thoroughly explores the mechanism of shareholder participation from the perspective of corporate governance and argue that the governance of Chinese state-owned enterprises should be shifted from "administrative governance" to "economic governance". He has established the "economic governance model" and proposed important concepts such as "corporate governance boundary", in which external governance of stakeholders is a very important link.

In China, there are two theoretical controversies regarding corporate governance. The first is the shareholder sovereignty model represented by Zhang Weiying, and the second is the employee director system, bank director system and employee supervisor system advocated by Yang Ruilong. Currently, the first option is generally adopted. However, the *Governance Standards for Listed Companies issued by the China Securities Regulatory Commission* in 2002 requires companies to respect the legitimate rights and interests of stakeholders such as creditors, employees, and consumers. Therefore, there is an important institutional basis for the protection of stakeholders' interests in the governance structure of Chinese listed companies. Although the reform of corporate system in China has been developed for more than ten years, there still lacks effective supervision, which has led to the occurrence of large shareholders encroaching on small and micro shareholders, insider control, and collusion between executives and the board of directors to the detriment of shareholders' interests.

In this context, most scholars agree to view stakeholder theory as a part of corporate governance. Chen et al. (2007) contend that shareholder participation in corporate governance can reduce market instability, improve long-term business performance, reduce agency costs, increase corporate profitability, and evaluate corporate social responsibility, thus exerting a favorable impact on the company's business performance. In addition, previous studies have also explored issues related to corporate governance of state-owned enterprises. In 2007, Zhang (2007) suggested that in order to innovate the governance structure of state-owned holding companies, a "synergistic" and "photographic" governance mechanism must be built. In terms of governance approach, X. F. Yang et al. (2004) put forward two governance structures to achieve stakeholder value maximization, namely, co-governance and timely governance. To be specific, one is corporate governance centered on the board of directors, and the other is corporate governance centered on the distribution of financial power. Wang and Du (2006) conclude from logical deduction that timely governance under stakeholder theory is ineffective and they propose a governance model of key stakeholders. Based on the modern theory of the firm proposed by Jensen and Meckling, Deng (2007) adopted expert scoring and analytic hierarchy process to study the interest demands of core stakeholders in resource-based enterprises from eastern to western China. Statistical results show that although stakeholders attach significantly different importance to the enterprise, they all shown concern for the longterm development and sustainability of the enterprise, and the co-governance model of the core stakeholders is a practical operation of the enterprise. However, since the definition of stakeholders is still unclear and the relevant research is still at the academic level, the competing interests of stakeholders have affected the effectiveness of corporate governance (Chen, 2007). The infinite expansion of the concept of stakeholder has led to many problems in corporate governance practice, such as the participation of stakeholders in corporate governance, the way and degree of participation, and how operators balance the interests of all parties. Some scholars question the participation of stakeholders in corporate governance. Wang and Zhang (2007) pointed out that although the stakeholder theory confirms its rationality from different perspectives, due to the loss of benefits caused by the conflict of interests and the difficulty of quantification of interests of stakeholders, the interested parties tend to maintain the existing balance of resources according to their own interests, thus reducing the pressure and crisis on them. Zhang and Duan (2004) argue that the ownership of an enterprise cannot be symmetrically distributed among all shareholders.

Such a symmetrical distribution will result in very high costs for the enterprise, which is contrary to the nature of economic subjects and could easily lead to the dilemma of "tragedy of

the commons". The existence of multiple goals of enterprises may lead to confusion between the issues concerned by the government and the enterprises, thus neglecting the dominance of the governing subjects. From the perspective of the stakeholder theory, it is difficult to design an incentive mechanism that makes managers accountable to all stakeholders, which is tantamount to making them responsible to no one (T. Wang, 2005). Thus, a proper definition of the scope of stakeholders is a basic prerequisite for institutional design.

### 3.1.5 Innovation of stakeholder theory

Since the 1990s, the stakeholder theory has been applied in all aspects of organization operation and strategic management, but its most significant value lies in its promotion of the development of corporate governance theory. The introduction of stakeholder participation in traditional corporate governance theory has allowed us to re-examine the rationality of "shareholder primacy" and find a breakthrough for other governance approaches in corporate governance theory. Jensen (2002), a famous scholar, made a formal response to the stakeholder theory. He argues that it is logically impractical for enterprises to set multi-dimensional objective functions, and it cannot clearly explain how to strike a balance in the conflicting interests of stakeholders. Therefore, stakeholder theory can prevent managers from making goal-oriented decisions. Different managers may have different considerations, and certain interests may be prioritized in one period while other interests may be prioritized in another period. Enterprises holding different managerial mindsets can produce very different results even if they adopt the same managerial behavior. Jensen also believes that in order to maximize shareholder value, enterprises should fully consider stakeholder value. In other words, only a profitable business is one that gives rewards to shareholders, and only a profitable business is one that offers security for its employees. Each stakeholder's expectation or interests should be respected, and only in this way can the enterprise ultimately realize sustainable development. At the same time, we must also recognize that there are still problems with the stakeholder theory currently, and these problems have exerted certain impacts on its application and development.

The development of stakeholder theory is based on the questioning and innovation of the "shareholder-focused theory", which is manifested in three main aspects (Costa & Menichini, 2013). The first is whether the enterprise is owned by the individuals or institutions that hold the common stock. The core view of the shareholder-focused theory is that shareholders own the enterprise and enjoy control and claim rights. In contrast, proponents of stakeholder theory

argue that enterprises are essentially entities subject to various market influences. They are not only influenced by the market environment, but also restricted by the institutional environment. The environment directly affects the investment and operating activities of the enterprise, rather than just the shareholder-dominated organizational system. Other stakeholders are all participants, who also contribute special resources and create substantial benefits for the enterprise, and the ownership of the enterprise is not solely held by the shareholders. As a whole, it is important to recognize the benefits they bring to the enterprise and give them the benefits they deserve. Blair argues that enterprise shareholders do not bear any theoretical risks. Except for capital, shareholders have few of the typical rights and responsibilities we expect as owners of enterprises. An enterprise does not belong to the shareholders; as the shareholders are simply a group of people who have an interest in the enterprise, and there is no reason to believe that the interests of shareholders are or should be superior to those of other interest holders. Blair further emphasizes that an enterprise is financed not only by its shareholders, but also by its employees, suppliers, creditors and customers. What these groups provide is not material or physical capital, but a special kind of human capital. Since they also make a special investment in the enterprise, they must enjoy the same ownership equally.

The second is the debate of corporate contract theory, which is one of the foundations of shareholder-focused theory. Western enterprises emphasize the spirit of contract and believe in competition and cooperation. According to its theoretical definition, an enterprise is a series of interconnected contracts. In the corporate contract theory, there are two influential theories: transaction cost theory and agency cost theory. According to the transaction cost theory, the human factors in the transaction process and the dynamic influence of the transaction environment lead to market failure, which leads to difficulty in market transactions as well as high transaction costs. Agency cost theory studies capital problems from the perspective of internal factors of enterprises. It shifts the perspective from capital structure trade-off issues in the traditional research to structural or institutional design, thus offering a new research idea for research on financing structure. The former theory focuses on the relationship between enterprises and the market, namely, how the enterprise survives, while the latter focuses on the internal structure and management relationship of the enterprise and how to design incentives to ensure the maximization of shareholder wealth. Professor Freeman believes the contract theory of the firm is a series of multilateral contracts signed with various interested parties, and the relevant stakeholders are the subjects of the contracts. All contract participants offer special resources to the enterprise, so, of course, they should have the right to negotiate equally to ensure that the interests of both parties to the contract are protected.

The third is the debate of property rights theory, which is another basis of shareholderfocused theory. According to the property rights theory, the enterprise owner has ownership of the enterprise's residual profits, so the owner has a strong incentive to continually improve the enterprise efficiency, which is the basis of shareholder psychology. However, according to Pejovich, understandings of property rights in the mainstream property rights theories of the firm are too narrow. Different property rights systems lead to quite different economic results and economic efficiencies. In other words, it is wrong to separate property rights from human rights, because defining one's property rights does not affect the rights of others, but there has to be a limit for the property rights. According to Coase, the originator of modern enterprise theory, "the rights of landowners are not unlimited under any law, and a system that does not limit individual rights is a system in which no rights will be acquired". The narrow definition of property rights theory leads to significant limitations of the theory as managers serve only the interests of shareholders. Therefore, stakeholder theory aims to redefine property rights from the perspective of various theories such as free will theory, utilitarian theory and social contract theory. Among them, the free will theory holds that individuals are free to use the resources at their disposal and can use all available people and things to achieve their own purposes. Utilitarianism, on the other hand, requires property owners to "keep the natural law and abolish the selfishness" so as to satisfy the interests of others. Social contract theory emphasizes the mutual expression and understanding of the rational distribution and use of private property. This plurality of property relations also gives different groups different interests. No single judgment is complete, and scholars tend to establish a pluralistic theory of property rights.

## 3.1.6 Defects and shortcomings of stakeholder theory

## 3.1.6.1 Adverse influence of stakeholder theory on corporate development

Stakeholder theory has exerted a certain influence on the enterprise development. In general, in the process of enterprise development, it is necessary to properly handle various interests and create a favorable internal and external environment for development. In the traditional enterprise theory, the sole purpose of an enterprise is to "maximize economic benefits", while the stakeholder theory believes that an enterprise should take on social and political obligations in addition to achievement of economic goals. The behavior of enterprises may be viewed as public welfare because of their social and environmental factors, putting them in a state of "attending to one thing and losing sight of another". In addition, it is not easy to develop a

uniform or operable management model among stakeholders. Due to the differences in enterprise characteristics, stakeholders have different levels of concern and influence on the corporate value. In contrast, shareholder governance has a unified model with a more complete system and it can maximize the interests of shareholders.

## 3.1.6.2 Excessively board definition of stakeholders

Although the existing stakeholder theory has basically taken shape, there is still much room for research, and many Chinese and foreign experts and scholars have put forward their views on the definition and classification of stakeholders, but most of them are still in the stage of discussion and assumption. No unified scoring standard has been formulated for the dozens of definitions of stakeholders so that we can identify which is the most important. There is no theory or method available to quantitatively measure the weight of many stakeholders. In the absence of an effective measure of stakeholders, it is impossible for people to seek value equilibrium in the game of interests, let alone set development goals that are practical and suitable for the enterprise, thus leading to a disconnect between the stakeholder theory and the reality.

### 3.1.6.3 Dilemma of application of stakeholder theory

Many scholars at home and abroad have researched and analyzed the feasibility of stakeholder from multiple perspectives, but the theoretical system is not sound. For example, the scope of stakeholder is too large, the participation of stakeholder in corporate governance lacks operability, and the scale of corporate participation in social public services lacks corresponding regulation. Although Freeman proposed the "stakeholder empowerment principle" to encourage stakeholder participation in corporate governance, there are no operational rules in the implementation process. Exploration of most stakeholder issues is still at the level of normative analysis. Although foreign scholars have made their attempts, but due to the lack of correlation and completeness between testable propositions, it is difficult to enter the level of utility application of stakeholder theory. The influence of heterogeneity of research objects on the research findings needs to be further studied to refine the research conclusion, which directly causes difficulty in carrying out empirical analysis of stakeholder theory.

## 3.2 The synergy theory

Synergetics is first proposed by Haken, a well-known physicist at the University of Stuttgart,

Germany. As one of the important branches of system science, it began to rise in the 1970s. Haken believes that in an ever-changing environment, people exchange matter or energy with the outside world through different factors according to their own purposes, and they in turn affect and are affected by the external environment so as to achieve resource integration. Through the collaboration among the organization members, the relationship between personnel and tasks is coordinated and the flexibility and adaptability of the organization is maintained so that the organizational goals can be effectively achieved to form a synergy effect. In the violent conflict of complex factors, a new system or a new organization suitable for the internal and external organizational environment is produced with an ordered synergistic structure. The synergy theory has been widely applied in many fields such as physics, astronomy, biology, chemistry, sociology, economics and management, and important results have been achieved in all fields. For example, we cannot usually describe the fate of an individual, but we can use the synergy theory to explore the "objective" nature of a group. For another example, in order to solve some complex systemic problems, the synergy theory can be used to create coordinated organizational systems that address cooperative effects and organizational phenomena to achieve job objectives. Currently, the synergy theory has been widely applied and developed in natural, social and economic research.

## 3.2.1 Research objects of the synergy theory

According to the synergy theory, different parameters, variables solved on the boundary of different solved regions or the rule of changes of their derivatives with time and place, and different fluctuations will produce different patterns. However, in another case, the same pattern can be produced in some completely different systems. It indicates that different patterns of the morphogenetic process can produce the same results. Most of the objects studied in synergetics are complex systems, which requires managers to be able to look at the complex system as a whole on a higher and deeper level in an integrated way and focus more on the global and holistic nature of the system.

## **3.2.2** The core of the synergy theory

The central concept of the synergy theory is synergistic order. The elements in a system are interactive, and a chaotic situation will occur when the elements are under certain influence. When the influence of external forces on the system reaches a certain level, the elements within the system will coordinate with each other so as to achieve an ordered state, which is the result

of synergy of all parts within an organization. Conflicts within the system will certainly increase internal friction of the system and lead to a chaotic situation. According to the synergy theory, in a social system, the formation and development of self-organization are influenced by both competition and cooperation. The transformation of a system from a disordered to ordered state depends on the ability of the subsystems to develop synergistic coherence under specific circumstances and nonlinear interactions and produce functional order and structural order (Cao & Chen, 2006). Different systems have different properties; however, in general, they are mutually influenced and cooperated. There are also common social issues, such as cooperation among industries, cooperation among institutions, competition among different companies, and mutual constraints and interventions within different systems. The synergistic approach can be extended to other categories by analogy, so that it can play a greater role in related fields, providing a powerful tool and theoretical basis for exploration of unknown new areas. It also enables the discovery of various factors that influence system changes, thus prompting cooperation among the subsystems (R. Z. Liu et al., 2010). According to synergetics (Haken, 1990), the unity of the world lies not only in the fact that its microstructure is uniform, but the fact that its macrostructure follows certain general laws.

Therefore, the birth of synergetics is designed to exclude all the contradictions and conflicts, avoid mutual separation, exclusion and substitution of each other, communicate with each other to achieve a common purpose or to accomplish a common task, and finally, integrate the limited resources effectively, so as to achieve an ordered system rather than a chaotic one.

Its includes basic principles and concepts as follows.

(1) Competition and Cooperation. In a complex and open system, competition among various subsystems for different reasons leads to the formation of various different relationships and rules. The changes of each subsystem are also influencing the changes of other systems, thus promoting the development of the system as a whole. Competition is the development and evolution process of the whole system. When two systems have different directions, they will compete with each other to become the dominant system. As the system evolves from chaos and disorder to stability and order, the various subsystems gradually form a system of synergistic movement under complex and nonlinear influences.

(2) Synergy. Synergy is the result of two or more processes interacting with each other to produce a joint effect greater than the cumulative effect produced when these processes are used separately. In this case, synergy plays a decisive role, driving the whole system to develop from chaos to order. During the overall operation, each system influences and cooperates with each other, and changes of one system can influence changes of other systems, thus promoting the

overall development. Finally, the comprehensive performance of the whole system is enhanced, rather than the simple accumulation of individual subsystems.

(3) System self-organization. It refers to interaction of a system with the surrounding environment in terms of matter, energy and information without any external command. Existing in a certain environment, a system cannot avoid interaction with the environment, and at the same time, as the environment changes, things can be adjusted internally to adapt to the new environment. The spontaneous permutation and recombination of the system promotes the orderly operation of each subsystem and improves the overall performance of the system, thereby generating a new, stable and ordered structure. There are many self-organizing systems in the nature. For example, in a chemical reaction, if the external conditions change, the reaction system will change accordingly. When a specific energy is supplied to a system, it will immediately produce a new property, or a completely new and macroscopically ordered feature out of microscopic chaos. In other words, a new order emerges, and the system becomes larger and more complete. This self-organized system has both self-generating and intrinsic characteristics. In the absence of external orders, the subsystems are able to generate their own special functions and organizations according to specific laws.

(4) Order parameters are generated as a result of the interactions between the many subsystems in a system. However, to some extent, the relationship between two variables may be hided in the interactions between all variables in a system may. In a general system, it is reasonable to have primary and secondary subsystems, because it is unlikely for system to have subsystems whose functions are exactly the same. Therefore, order parameters are important factors in the development and evolution of a system, and they even dominate the development and evolution of the whole system. On the other hand, order parameters are the mutual game and collaboration between a large number of subsystems in a system, and they exert a decisive influence on the overall nature of the system. Therefore, order parameters define and reflect the collaboration, and illustrate the form of order and organization of the system. There is a specific mutual constraint relationship between the system and its subsystems as well as between the subsystems themselves. In the operation of the whole system, there is mutual competition and collaboration between order parameters, which promotes the ordered evolution of the whole system.

### 3.2.3 Difficulties and key points in the application of the synergy theory

The design of synergy mechanism is a key issue as well as a difficult problem in the study of synergetics. In an integrated system, the elements are interconnected and mutually constrained to constitute a complex system. With different functions, the subsystems are geographically dispersed and independently organized, so it is difficult to form a benign overall mechanism without a unified coordination mechanism. Moreover, many subsystems are formed temporarily to meet policy needs or to achieve a common purpose. Therefore, an effective synergy mechanism is needed for coordination.

At present, the synergetics and synergistic management methods have been widely applied in many fields, but some influential scholars have too diversified research orientations or they focus on a certain field or a certain period of time, with few comprehensive and in-depth studies. The majority of research is carried out in public management and corporate management, and many valuable research results have been achieved. Although theories and knowledge of synergetics have been applied in healthcare, due to its late development, there are only a few relevant studies, and little is known about collaboration and changes among members. The research content is relatively limited to qualitative studies such as reviews, introductions and applications with few empirical studies, and most of the research is superficial and further indepth research is needed. There are few studies on the specific synergistic mechanisms among medical institutions, and most of the previous studies are based on foreign research theories and methods. Compared with foreign countries, research on synergetics in China starts late with relatively few research results, and most of the research on synergy in the healthcare field is limited to theoretical discussions. No consistent theoretical views have been reached among different scholars, and there is no organic integration of theoretical and empirical research, especially quantitative research. In summary, the research and application of synergetics in the healthcare field is feasible and previous studies have laid a foundation for further research. The application of synergetics has a strong practical guidance for the development and growth of China's healthcare industry, but its foundation is relatively weak and needs further in-depth and specific research.

Furthermore, synergetics suggests that to change the critical points of the macroscopic property of a system in its evolution will result in qualitative changes of the system, which means that the system may appear or disappear. Haken uses the term "fluctuation" to refer to such critical changes and recognizes its critical role in the system (H. Haken, 1983). Fluctuation is the external factor of the independent operation as well as the local linkage and randomness

of each subsystem, and it changes with the mutual influence of subsystems, resulting in the rise and fall of the order parameters of each subsystem. As a variable of system properties, fluctuation can dominate the system changes and reflect the trend of changes. To some extent, it is stable and predictable and has important scientific value and research significance, so it can be regarded as an important factor affecting system operation of the system. In this context, we apply synergetics to the construction of public medical institutions in China, aiming to provide new ideas of modern hospital management for hospitals nationwide. We should also recognize that management activities of leading government departments, medical management institutions and market organizations in the synergy system are particularly necessary and practically significant.

## 3.3 Integration of the stakeholder theory and the synergy theory

The integration of the stakeholder theory and the synergy theory provides a new theoretical perspective that will greatly contribute to the understanding of both theories. Most researchers propose different views from different perspectives of the stakeholder theory and draw on the synergy theory to discuss a particular issue. For example, based on stakeholder theory and collaborative governance theory, Shen explores how to achieve collaborative governance in the process of urban renewal of industrial land stock according to the logic of "interest demandcollaborative action-coordination focus", and finds that both the top-down and bottom-up models share the common goal of efficient land use. Although different actors have different interest demands under the framework of urban land policy, they still form a collaborative action under the common goal (Shen et al., 2022). Promotion of the stakeholder theory has led to lack of sense of responsibility in the managers; therefore, it is generally unacceptable in studies of the financial community. Lindsey et al. (2021) argue that entrepreneurs may derive utility from the positive outcomes of other stakeholders and they attempt to apply stakeholder theory and synergy theory in the case of business succession. It is found that in the case of business succession, the owners of the business, their communities and employees, and private equity firms all have an influence on business succession and they provide sales advice to business owners based on their values.

In the integration of stakeholder theory and synergy theory, in addition to the abovementioned synergistic research on conflicting interests, there is also research on synergistic optimization of integrated energy systems containing multiple cooperative stakeholders. For example, in order to realize mutual assistance and synergistic optimization of energy use among
different regions and the cross-regional allocation of regional resources, optimize the energy structure, promote the diversification of energy applications and renewable energy production and use, Huang et al. (2022) propose a multi-participant economic dispatching architecture and competitive-cooperative mechanism and construct a multi-park integrated energy system game cooperation optimization dispatching model based on the game cooperation theory, and the model is solved based on the alternating direction method of multipliers (ADMM). The cooperative dispatching model of multi-park integrated energy system realizes energy interaction between integrated energy systems and fully exploits the energy potential among parks. It not only effectively improves the utilization rate of new energy and the service life of power storage equipment, but also is environmentally friendly.

D. Liu et al. (2021) carried out research on the collaborative management of stakeholders in government-invested construction projects and proposed to clarify the interests of stakeholders in the project operation process. The results show that the influencing factors of collaborative management on stakeholders include resource information sharing and effective communication mechanism, contract management mechanism, and resolution of conflict of interests. Therefore, the application of collaborative management in management of government-invested construction projects can, one the one hand, help the government identify and classify stakeholders, promote the effective cooperation between the government and stakeholders, help the government deal with the relationship between them, improve government management efficiency and reduce the investment of government resources; on the other hand, it can adjust the relationship between core stakeholders, let them play their respective roles and advantages, reduce the cost of governance, improve the efficiency of governance, improve the effectiveness and effect of governance, avoid conflicts with each other, and thus reduce the generation of social problems and social conflicts. Participatory governance improves the legitimacy and effectiveness of local governance, as it allows stakeholders to take government construction as the center, give up their narrow self-interest, give full play to their own advantages, work for construction projects, and strive to improve the efficiency and quality of government-invested construction projects.

In the field of medical management, Yao and Dong (2021) carried out research on the dilemma of interest coordination and collaborative governance mechanism of medical alliance. The research is targeted at stakeholders in the complex and systematic medical alliance. Collaborative governance emphasizes cooperation of multiple governance subjects to form a community of interest. They established a theoretical framework for the comprehensive analysis of collaborative governance of medical alliance stakeholders, proposed the value

identification mechanism, cooperation improvement mechanism and benefit sharing mechanism for collaborative governance of medical alliance stakeholders, and achieved the purpose of building a public value spillover effect of medical alliance organizations.

## 3.4 Application of stakeholder theory at home and abroad

The stakeholder theory is in line with the characteristics of the era of knowledge economy. Human factors play a key role in the development of an enterprise, and corporate governance is related to the incentives and constraints of stakeholders in business development. The tendency of increasing the status of "human" in human capital has led enterprises to pay more attention to human needs, thus putting higher demands on the compensation and benefits system of enterprises. Focus on the enterprise stakeholders is also in line with the business philosophy of sustainable development, and this management philosophy has led to significant changes in human resource management within enterprises. It makes up for the shortcomings of the mainstream theory of "shareholder primacy". With the in-depth research on stakeholder theory, it has been introduced into various fields of social management in the twenty-first century, and the research field has been expanding. Application of stakeholder theory to study the business objectives of enterprises or teams has become a new research focus.

## 3.4.1 Enterprise management

Stakeholder theory was first applied in business operations. Through examination of the relationships between each stakeholder and analysis of their independence and relevance, managers can identify important stakeholders requiring special attention to effectively manage the enterprise. Specially, it includes research on enterprise relationship network system (Heugens et al., 2002), community project research, enterprise decision-making, enterprise planning, financial management.

## 3.4.2 Tourism industry

Due to the complexity of the tourism industry, it has much more stakeholders than other industries. In the development of the tourism industry, stakeholders will face problems in resources, power, and interests, and they tend to damage the interests of the entire industry in the pursuit of their own interests. If the decision-makers only care about the immediate interests, the long-term interests of the tourism industry will definitely be harmed. In such a situation

where interest demands and interest conflicts are prominent, after the game of multiple parties, a dynamic equilibrium mechanism will eventually be formed to coordinate the interests of stakeholders. The stakeholders are not independent, but interrelated, and the stakeholders' specific interest demands should all be considered to coordinate the conflict of interests between them.

### 3.4.3 Reform of state-owned enterprises

Chinese scholars have introduced stakeholder theory into the study of SOE reform. Under the condition that the government plays the role of owner, the corporate governance structure of SOEs after reform presents a model featuring government domination and intervention with the management. Such a governance model hinders the reform of SOEs in the following aspects. First, since the government pursues multiple goals, when it intervenes in the equity of the enterprise, it will fall into the dilemma in which "management" leads to excessive intervention and "neglect" leads to loss of control. Second, due to information asymmetry, SOE operators and managers are in a advantageous position in negotiations, which will lead to problems such as adverse selection and moral hazard. Third, in the process of supervision, government administrators violate national laws and regulations, use their authority to help seek benefits, and conspire with SOE managers to embezzle state property. Fourth, it is difficult for employees and small and medium-sized investors to effectively exercise their supervisory powers, so they will be unable to protect their rights and interests from being damaged. In order to overcome the above problems, it is necessary to innovate the corporate governance structure and require the enterprise to adopt a more standardized and transparent corporate governance structure, which is significant for the sustainable development of the enterprise. The core is to abandon the stereotype of "shareholder primacy", improve the organizational structure and system of the corresponding organs of authority, decision-making and supervision, and form a mechanism of checks and balances between them and the management. Following the logic of "co-governance" is consistent with China's national conditions and historical development trends.

### 3.4.4 Network information protection

Personal information involves multiple stakeholders including individuals, the state, and the public, and has multiple values and interests (Mandeville et al., 2014). On the one hand, the extensive collection of personal information may increase the risk of personal information leakage. On the other hand, the reduced use of information may lead to certain social and public

interest damage. Therefore, from the perspective of stakeholder interests, a comprehensive and efficient consideration, measurement and use of information based on laws and regulations should be established in a specific social environment. The first countermeasure is to build a personal information protection mechanism featuring "loose access and strict management" to protect the privacy of most individuals. The second countermeasure is to strengthen the use of special personal information, such as the use of infectious disease information by the health department and the use of criminal records by the public security department, so as to protect the safety and interests of social groups.

## 3.4.5 Application in healthcare

Researchers in the United States first applied the stakeholder theory in the healthcare industry, specifically in the analysis and management of health policies for the medical institutions (Nudurupati et al., 2015). Iavicoli et al. (2011) argue the existence of stakeholders cannot be overlooked in health policy reform, and it is necessary to use the stakeholder theory to systematically collect and analyze health policies. The stakeholder theory should be used to analyze knowledge, interests, power, positions, potential alliances, and other characteristics and capabilities of health policy stakeholders who may influence the policy-making process to develop appropriate strategies to reduce resistance to reform implementation and increase political feasibility. According to Sha (2016), the most important task of stakeholder analysis is to understand the positions and powers of stakeholders and judge their importance to serve as a reference for decision making. In this case, decision-makers will figure out what the stakeholders are not willing to give up and how many resources they stakeholders can mobilize to achieve their goals.

### 3.4.6 Reform of the medical and health care system in China

Research on application of the stakeholder theory in the health care industry is mainly focused on initial diagnosis at the primary level, two-way referral, integration of medical systems between counties and rural areas, and the construction of medical associations and medical groups (M. H. Li et al., 2014). Stakeholders of the health care industry include tertiary hospitals, secondary hospitals, community medical institutions, health administration departments, medical insurance departments, financial departments, patients, and the medical personnel. On the one hand, since financial appropriation from the government is insufficient and the coverage of medical insurance is low, public hospitals have to assume sole responsibility for their own profits or losses. On the other hand, as required to be public welfare institutions, public hospitals are not for-profit organizations and must consider the interests of all stakeholders. Although the government has been committed to promoting medical reform such as implementation of hierarchical diagnosis and treatment, the appeals of stakeholders are too diversified to be unified and coordinated. The stakeholders lack common responsibilities and incentives, and the inability to balance the interests of all parties greatly reduces the motive force for development. Therefore, the government must take the lead in the implementation of medical and health care system reform, underline the not-for-profit nature of the health care business, regulate the behavior of stakeholders, and formulate quantitative evaluation standards and management regulations.

## 3.5 Application of the synergy theory at home and abroad

The synergy theory views the operation of a system as the coordinated activities of each subsystem, rather than a simple combination of the subsystems. In the complex system operation process, a virtuous circle will be formed eventually. It plays a role of mutual coordination and mutual promotion in the synergistic activities of each subsystem to maximize the efficiency and effectiveness of the system and realize the goal optimal operation, thus achieving an effect of 1+1>2. The synergy theory can be practically applied to an objective and open physical system to promote the synergy among all elements and subsystems of the system, so as to form a synergy effect featuring "plural complementarism" with self-organization characteristics. The overall purpose of the system elements and the subsystems are coordinated and identical to make sure the organizational structure of the system is stable and ordered.

The synergy theory has been extensively applied in strategic alliances. Simons integrates the corporate development process with the experience of the management and employees and uses the synergy theory to explain their relationship so as to maximize the role of the management and employees. It is empirically confirmed that clients and corporate synergy are positively related to operational capabilities of the company.

Powell (1987) believes that strategic alliances enable the sharing of technology and experience among firms, thus greatly enhancing their risk resistance capability, and different types of strategic alliances promote the competitiveness of firms in different ways. Mohr (1994) contends that strategic alliances evolve with social development, and the relationship between strategic alliances also becomes complicated. Various forces coexist in the strategic alliances, with competition and contradiction as well as coordination and cooperation between them.

According to Mentzer (2000), corporate culture and corporate values vary from company to company, and the nature of the company and the industry have a certain influence on corporate values. Correct corporate values not only help to protect the rights and interests of employees, but also serve as a cornerstone of corporate development. Corporate culture is the driving force for the survival and development of a company, and it reflects the company's overall values. Therefore, if companies of a strategic alliance have similar corporate cultural and institutional norms, the synergy effect will be stronger.

Henderson believes that if a company has a poor cooperative relationship, its development will be greatly hindered and its viability will be reduced. According to Cataldo, the history of human civilization is a history of the evolution of cooperation, and the essence of every innovative leap is the evolution and deepening of cooperation, so innovation must be made constantly. In order to enhance competitiveness, enterprises must be good at make innovations and dare to make innovations to adapt to the changes in the real environment.

Research on the synergy theory in China started in the 1980s. Fu et al. (2015) pointed out in the *Review of Synergetic Theory and Applied Research* that Professor Wang Yutian is one of the earliest scholars to study the synergy theory in China, and he interprets his understanding of the synergy theory in Cybernetics, Informatics, System Science and Philosophy published in 1986. In the 1980s, the research of Wang Yutian, Jin Guantao and Shen Xiaofeng had laid a foundation for future research on synergetics. Since then, more Chinese scholars began to carry out research on the synergy theory. Research on the synergy theory in China mainly focuses on enterprise management, education and teaching, transportation, and social management. T. Wang (2005) explored the meaning of competition, synergy, order parameters, and servo in the synergy theory and illustrated the application of the synergy theory in complex systems with living examples. He also discussed the problems of the synergy theory in collaboration mechanisms as well as the mechanism of action of order parameters. Gu (2003) studied the technology spillover effect of multinational enterprises and analyzed the value created by the enterprises. He argues that enterprise managers must realize the management of enterprises through various forms to enhance their synergistic ability and achieve synergy. Zou (2005) conducted an empirical study on the synergistic ability of enterprise groups and came up with ten major factors affecting synergistic ability of enterprise groups. Bai and Pan (2005) explored the feasibility, research advantage and necessity of applying synergistic approaches in management, and discussed the performance in practical application. They also explained the basic connotations and classifications of synergistic approaches and elaborated on the five basic principles, conditions of use, and operational mechanism. Wang and Wan (2015) studied the

effect of customer knowledge management process on the development of products and services of the enterprises based on cases of collaborative capability. In addition, through search of the keyword of synergetics in Google Scholar, it is found that there have been an increasing number of studies in the fields of architectural engineering (W. Luo et al., 2015), pedagogy and economics (J. Liu & Jiang, 2018), environmental science and ecology (E. G. Huang et al., 2019), energy engineering (Jia et al., 2019).

The synergy theory can also provide new ideas and perspectives for research in healthcare management. Similar to business operations, synergy between medical institutions and medical systems can be divided into internal and external synergy. Internal synergy refers to the internal governance of the medical organization, while external synergy refers to the realization of various synergy effects and coordination of functions based on the environment and position of the individual medical institutions. A medical service system is composed of several different medical organizations which are the subsystems of the medical system as a whole, and the subsystem includes medical staff, information, and technical equipment. Internationally speaking, different types of medical institutions at different levels have achieved "breakthroughs" in cooperation at different levels. Despite the diversity of representative universal health care systems, their division of labor and responsibilities between the various institutions is extremely clear. Each institution performs its own role in accordance with its functional positioning. Community health service institutions are responsible for primary health care services, secondary and tertiary hospitals offer emergency medical service and inpatient service, rehabilitation facilities offer rehabilitation services for the elderly and the disabled, and charitable organizations are responsible for fundraising. With economic development and continuous promotion of social governance reform, the government advocates and supports social organizations to participate in social governance and offer socialized and specialized services in all areas of society. In this context, medical institutions cooperate with each other to provide diversified health services to the society.

However, the significant difference between the medical institutions requires effective cooperation between the government and hospital administrators so as to make the whole system operate more efficiently. The overall effectiveness of the system depends on the synergy of the subsystems. In a medical system, if individual institutions reject each other and do not make concerted efforts, the ultimate result will be in separation, containment, and constraint. The system will be not only dysfunctional, but also chaotic. In addition, internal governance of the hospitals and hospital policies should be strengthened to promote internal and external operation of the hospitals, which requires the medical system to promote its decision-making,

implementation, control and feedback functions.

At present, medical institutions across China have begun to cooperate with each other based on treatment of chronic diseases to promote hierarchical diagnosis and treatment. In the current medical reform, the Ministry of Health proposes that medical institutions should strengthen chronic disease management and disease surveillance management to identify their service objectives and service contents with chronic diseases such as hypertension, diabetes and tuberculosis as a breakthrough point. They should start cooperation from the prevention and treatment of chronic diseases, build a hierarchical diagnosis and treatment system, guide the public to seek medical treatment in a scientific and orderly manner, and provide continuous medical care for the patients.

## 3.6 Application of stakeholder theory in research on medical alliance

Medical alliances have been established in the U.S. since the 1960s, and by now, there are more than 500 medical alliances across the United States. The most representative alliances are two major pharmaceutical companies, Hospital Corporation of America (HCA) and Kaiser Permanente. HCA focuses on protecting the interests of all groups. (1) Interests of the patients. HCA provides a large number of services based on software and hardware for patients to win their trust. (2) Interests of the doctors. HCA creates a favorable working condition for all doctors to promote their career. (3) Interests of the payers. About 90% of inpatients in HCA recommended by the government healthcare programs and medical insurance companies, and over 95% of the expenses are covered by the government and medical insurance companies.

Since the 1990s, the UK and Singapore have also gradually attached importance to the construction of doctor-patient alliances. Medical institution alliances of different levels, functions and scales have realized resource integration and sharing to improve the quality of medical services. The HCA in the US, the Smiths Interconnect in the UK, and the SingHealth in Singapore are all examples of overseas medical alliances.

Blair and Whitehead (1988) were among the first researchers to introduce stakeholder theory and methods into the healthcare field. Later, scholars such as Dymond, Frost and Fottler integrated theories and methods of other disciplines in the research on stakeholder, which enriches the research methods and research contents of stakeholder theory. Since 1990s, research on stakeholder theory has been widely applied in medical decision-making and medical organization operation. The vast majority of medical organizations in the United States

adopt a corporate model of management and governance, so stakeholder analysis of these organizations is similar to that of purely commercial businesses, which aims to analyze the short-term corporate development goals, development environment, and possibility of interorganizational cooperation. Dymond et al. (1995) studied pharmaceutical distribution network in 1995, Topping and Fottler (1990) explored how to improve management and promote performance of health maintenance organizations in 1990, and Blair (1990) discussed cooperation between medical institutions in 1990. What these studies have in common is excessive focus on the attitudes of stakeholders and the role of stakeholders in decision making, with relatively little systematic analysis of the contents and effects of stakeholder analysis.

It has been recognized that the traditional model of decision making has inherent imperfections as it is established based on perfect information and rational choice. In many cases, decision makers do not represent the interests of the general public, and therefore cannot obtain public support and recognition. The decision-making process is not decided by the logic and preferences of decision-makers. Instead, decisions should be made based on the balance of all interest groups. Against this background, Kingdon and Stano (1984) and Smith (1993) began to explore the stakeholder issues in the formulation of government policies (including health policies). For example, Kingdon argues that the policy process is the upfront input of policy makers in order to obtain benefits, which is similar to the economists' definition of stakeholders. A very important point is that the influence of stakeholders on policy is directly related to the policy effects. Once the interests of stakeholders are threatened, policy implementation will be hindered to a certain extent, which will affect the policy effect and lead to policy distortion. Previous stakeholder analysis mostly focuses on the stakeholders' perceptions or possible influence on the government's policy making in the current or most recent period of time, while ignoring the influence of long-term temporal factors. However, in real life, the attitudes, positions, and even interests of stakeholders change over time, and in general, government decisions at the national level need to remain relatively stable over a specific period of time.

## 3.7 Application of the synergy theory in research on medical alliance

A medical alliance is a medical consortium consisting of various hospitals with different sizes and functions, mainly including primary community service hospitals, secondary hospitals, tertiary hospitals and rehabilitation hospitals. Each organization plays a different role in the medical alliance system according to its functional positioning and business capabilities. Currently, there are several kinds of models for medical alliances in China.

### (1) Regional collaborative healthcare model

Guo and Huang (2009) proposed to establish standardized clinical pathways to effectively regulate medical behavior, improve medical quality, and ensure medical safety. Establishment of a regional cooperation model can integrate the clinical service resources of the medical alliance in a more effective manner, which not only improves the level of medical services for patients, but also reduces the operating costs of hospitals. Strengthening information exchange and cooperation between hospitals is conducive to promoting the rational flow of medical resources and improving the efficiency of medical resource utilization. In addition, normative medical practices can also improve patients' awareness of participation.

Quan et al. (2009) explored the establishment of a regional cooperative medical platform and proposed to establish a new medical service model and promote digitalization of business processes. In this case, an integrated online and offline service model will be established, which will improve the overall effectiveness of the medical service system. The integration of regional medical resources and the establishment of a regional cooperative medical platform are of great significance for improvement of medical service quality and homogenization of medical technology. Through coordination, distribution and sharing of medical resources within a region, medical costs can be effectively controlled and reduced, and patient information can be shared more efficiently.

According to Xie et al. (2011), regional collaborative healthcare is the effective cooperation of different medical resources and medical institutions in a certain region realized through the study of modern services and the use of information systems, and its purpose is to increase the utilization of telemedicine networks, promote the vertical flow of medical resources, and improve the accessibility and service efficiency of high-quality medical resources, so as to maximize resource sharing and utilization. In short, this model is designed to facilitate two-way referrals between hospitals at all levels and promote exchanges between community health centers and large and medium-sized hospitals. With the adoption of a new digitalized medical model as well as modern management tools such as supply chain and value chain, the regional medical information sharing platform can help realize information exchange and sharing among medical institutions in the region.

S. Wang et al. (2010) constructed a model of a regional collaborative healthcare system based on synergetics and validated the mathematical model with simulations. The synergy values obtained from the simulation experiment were considered as the key parameters of the model. They also carried out research on the self-organization and synergy mechanism of the regional collaborative healthcare system.

The top-level policy design of the Chinese government in 2011 was intended to solve problems of unreasonable allocation of existing medical resources, undesirable two-way referral practices and technical barriers in medical institutions, promote information exchange and resource sharing among medical institutions, and enhance the emergency response capability of medical networks. Regional collaborative healthcare model is a coordinated medical service model established within a certain geographical area based on the modern service philosophy and the current information technology. The model is designed to realize two-way referrals among hospitals at all levels in the region, effectively utilize resources, and promote collaboration among primary healthcare institutions, secondary hospitals, tertiary hospitals, and rehabilitation institutions. Regional healthcare informatization is an inevitable requirement for realization of regional collaboration, and the most advanced and effective method at present is to establish a regional collaborative medical service platform to achieve interaction between patients and medical personnel, medical institutions and medical equipment. The information technology, communication technology, and computer technology have broken down the information silos for patients between different regions and medical institutions by application of data clouding technology and promoted efficient sharing of medical resources. A medical service pattern of regional synergy, information sharing, integrated services and multidisciplinary cooperation is formed with municipal hospitals as the core, county hospitals and community health service centers as the major force, and township hospitals and village clinics as the supplement. On this basis, the collaborative healthcare service platform can promote sharing of medical resources and improvement of service capacity, and realize functions of data and information sharing, remote consultation and two-way referral. The development of cloud computing technology promotes the establishment of a regional medical cooperation model, as a cloud computing-based medical service platform can provide strong technical support for the operation of medical services, advancement of medical technology, and effective development of healthcare in addition to the original functions.

(2) Horizontal integration model

In the horizontal integration model, medical institutions at the same level are integrated to serve as an integrated whole, and their functions are realized through specific professional cooperation. For example, all the community health service institutions within a region can be integrated to a whole under the guidance of the local health administration department. For another example, a well-known specialized hospital in a certain region can take the lead to cooperate with other specialized hospitals focusing on the same specialty in the same region or across regions to form a specialist treatment center with distinctive characteristics through horizontal integration of medical resources.

Some researchers have explored organizational collaboration in medical groups based on their work experience. Synergy is viewed as an organizational design that is uncommon in medical groups. Since synergy reflects the close connection between the work and resources of the working partners, the overall performance of a system is better than the sum of the performance of all the departments. The rationale for using synergy in organizational design is to compress hierarchical structures. The core elements of collaboration are rights (control, resource allocation and planning), money (salary, dividends and profits), and fair treatment of each physician. In a medical group consisting of hospitals and reference laboratories, synergy is applied in management systems, policies, systems, guidelines, and business operations. Enterprises make decisions on resource allocation, service distribution, and strategic planning on the basis of collective resolutions, and shareholders will receive the same salary, dividends and profits without regardless of their age or working years. With common interests, the vitality, cooperation, trust and enthusiasm of enterprises will be relatively high. It would be better if the following effects can be achieved: a specific goal with a clear mission and vision statement; careful selection of partners with the same education, experience, expectation and aspiration to build shared values of the group; possession of a small and typical synergistic medical group; continuous pursuit of excellence to avoid deviation from the initial goals and vision.

Levine (2008) explored the development of collaboration between medical institutions and medical colleges on a case-by-case basis. The medical institutions should strengthen cooperation with the medical colleges by supporting the academic research of medical colleges, and this reflects a hospital's fulfillment of its collective mission. In a coordinated decision-making model, the hospital monitors all the clinical activities including the internship programs of medical students. The model also provides stable funding for the hospital. There are a series of agreements signed to formalize the partnership between medical colleges and hospitals, including a shared board of directors and a commitment from the hospitals to continue to provide financial support to the medical colleges.

In China, representative horizontal integration models include the Shanghai Shenkang Hospital Development Center and the Beijing Children's Hospital Pediatric Specialty Alliance. Shanghai Shenkang Hospital Development Center was established by the Shanghai Municipal Government in September 2005 as a not-for-profit state-owned enterprise, which is responsible for the construction of public hospitals and government-run medical institutions, comprehensive planning and management of 38 hospitals in Shanghai, and allocation of medical resources among the 38 hospitals. The Beijing Children's Hospital Pediatric Specialty Alliance was formally established in 2015 by 13 university affiliated children's (pediatric) hospitals or pediatric departments of general hospitals. At present, shortage of pediatricians in China is very serious and will remain so in the short term. The construction of large specialized children's hospitals is very difficult in practice, and a practical countermeasure to the shortage of pediatric resources is to integrate the current medical resources to establish specialty alliances.

China is now trapped with long-term shortage of medical resources, so the horizontal integration approach should be adopted to pool the specialist medical resources together to form a specialty alliance. Accessibility to high-quality medical resources should be extended to the grassroots level to alleviate the medical pressure of primary health service institutions. Only through reasonable combination and allocation of medical resources, can the hospitals achieve sustainable high-quality development and offer medical services with better quality more efficiently.

(3) Vertical integration model

The vertical integration model is also a common form of medical alliance. In this model, hospitals at all levels in a region are integrated into a whole, with one tertiary hospital taking the lead to integrate other lower-level hospitals, community health service institutions, rehabilitation hospitals and nursing homes. The medical resource sharing is achieved through internal division of labor and collaborate among the members of the medical alliance. In areas where the conditions permit, the alliance can management the talents, properties and materials of each medical institution in a unified manner to form a common interest group. In areas where the conditions do not permit, approaches such as higher-level technical support, counterpart support, expert and specialty co-construction, and business guidance can be adopted to extend accessibility to high-quality medical resources to the grassroots level so as to improve the professional capability and service capability of the primary health service institutions. One of the most representative case of this model is Jiangsu Rehabilitation Medical Group. It possesses a complete medical industry chain through asset integration, and its members include tertiary hospitals, secondary hospitals, specialized hospitals and primary hospitals across Zhenjiang. It has built an imaging information integration platform in which results of imaging examinations are accepted by all hospitals in the group. Thanks to this platform, the primary hospitals only need to retain all their technicians, while the imaging information, X-ray film interpretation and issuance of reports can all be done through the information platform, which truly realizes information sharing and resource sharing. By breaking down the information silos between different medical institutions within the group through application of data clouding technology,

the medical alliance has promoted the efficient sharing of medical resources, enabling the general public to get access to high-end medical services at the grassroots level.

(4) Hospital trusteeship model

The hospital trusteeship model refers to the implementation of the management model of large hospitals in the small medical institutions under their trusteeship and provision of medical equipment, technical support and service standard specifications to the trusted small medical institutions. The development of hospital trusteeship model in China goes through two stages. The first stage features the private capital trusteeship of hospitals, including lease and trusteeship of departments or enterprise-owned hospitals. The second stage features trusteeship between different types of medical institutions, generally led by high-level medical institutions who trustee several medical institutions of different levels and ownership. A case in point is the management model of municipal hospital trusteeship of its subordinate hospitals implemented in Beijing. Under the trusteeship of Guang'anmen Hospital, China Academy of Chinese Medical Sciences, Beijing Daxing Hospital of Traditional Chinese Medicine (South Campus of Guang'anmen Hospital) witnesses an increase in the number of patients in the emergency department by 79% and an increase in business income by 72% compared to the same period last year, as well as an increase in discharges and bed utilization.

Analysis of the management experience and practical experience of medical institution trusteeship indicates that it is an effective model to realize the vertical integration of highquality medical resources. The implementation of the trusteeship model is conducive to promoting the rational flow of medical resources and improving the efficiency of medical resources utilization. It can also raise the remuneration of personnel in the medical institutions and significantly improve the quality of medical services. However, the allocation of resources in the form of trusteeship can easily produce some drawbacks, such as lack of competition and sense of responsibility among the medical staff of hospitals in trust, decline of service efficiency, poor service quality, and the great pressure to the trustee hospitals due to long-term provision of resources. For the medical institutions in trust, short-term financial support cannot sustain their long-term development, and, at the same time, few hospitals are ready to accept this rigid management model. In terms of the current policy and development of medical alliance, medical cooperation of trusteeship is a good medical model, but an effective management system must be in place to achieve sustainable high-quality development of the hospitals. It means that the future medical alliances will encourage competition to promote development.

(5) Medical group model

The medical group model is a medical service model of "hospital director responsibility

system" with tertiary public hospitals playing the dominant role and primary hospitals playing the supporting role. Within the group, hierarchical management of hospitals is adopted so that hospitals at each level have the right to handle their own affairs and they can accomplish their own goals as long as the overall goal of the group can be achieved. The talent structure has also been gradually optimized through introduction of high-caliber talents and training of talents in multiple forms, and professional qualities of the medical and nursing staff have been effectively improved. The sharing of resources within the group helps the hospitals to achieve mutual complementarity of advantages and establish a group technical support and service platform. A case in point is the Shenzhen Luohu Hospital Group. In January 2015, Luohu District released the goals of "five reforms", which charted the course for the reform of public hospitals. Officially launched in August 2015, the Luohu Hospital Group was composed of 48 healthcare institutions including public hospitals and healthcare service centers and all of them were under the unified management of the Hospital Group. The group advantages help expand the influence of the hospitals, increase their medical resources, and enhance their comprehensive competitiveness. Unified management of medical talents and resources has further improved the service capacity and operational efficiency of the hospitals so that they can better meet the public demands for healthcare services.

Currently, since the medical service system involves various participants, and the level of the professional and technical personnel of each participating institution varies, the medical service quality in each institution varies widely. The varying needs of interests among the subjects, coupled with incomplete information asymmetry among medical practitioners, have led to the complexity of the healthcare system in China. The healthcare system is therefore fragmented and isolated, resulting in inequality in healthcare resources. The chaotic order of patient treatment not only reduces the quality of medical services, which adversely affects the doctor-patient relationship, but also disrupts the normal work order and efficiency. The fierce competition among medical institutions has led to the phenomenon of "grabbing patients", "excessive treatment of small diseases" and "pseudo hospitalization", and some hospitals even have the phenomenon of group hospitalization. These acts are a serious waste of medical resources, making it more expensive and difficult for patients to get medical service. Therefore, how to integrate the existing medical and health service system, how to strengthen scientific coordination and scientific management to build a division of labor and collaboration mechanism in the medical institutions, and how to optimize the allocation of resources in hospitals, improve the rules and regulations, and promote the high-quality development of hospitals have become the major issues that need to be solved by scholars and health administrators. The medical synergy can improve the quality of health services in medical institutions and enable more patients to get the right treatment, and its ultimate goal is to improve the quality of patients' survival, life and work and reduce medical costs, so as to establish a harmonious doctor-patient relationship.

# **Chapter 4: Research Methodology**

# 4.1 Theoretical research method

Through an in-depth study of the stakeholder theory and the synergy theory, we clarify the historical development, the treatment purpose, and the definition of medical alliances, as well as the division of labor and collaboration among stakeholders, and discuss the role of stakeholders in the Western Baiyun District Stroke Alliance and the relationship between the stakeholders.

# 4.2 Stakeholder identification methods

To study medical alliance from a stakeholder perspective, we first need to identify the stakeholders of the Western Baiyun District Stroke Alliance. In this section, scientific methods with good reliability such as literature research, semi-structured interview, the Delphi method, and the Mitchell score-based approach are adopted to identify stakeholders of the Western Baiyun District Stroke Alliance.

## 4.2.1 Analysis of stakeholders of the Western Baiyun District Stroke Alliance

Based on the author's work experience in hospital administration, the various stakeholders who are closely associated with the Western Baiyun District Stroke Alliance are identified using the literature research method and semi-structured interview method.

## 4.2.2 Semi-structured interview method

Based on the classification of stakeholders, we first identify the interviewees with different core interests and design corresponding interview outlines to understand their cognition of the Stroke Alliance, their interest demands, and existing problems of and suggestions for the Stroke Alliance. For the interview, we intend to invite 20 interviewees, mainly including the administrators of the municipal and district-level health administrative departments and medical insurance departments, the managers and doctors of hospitals in the alliance, and the residents (patients) living in the area covered by the Alliance. The semi-structured interviews

lay the foundation for the formulation of stakeholder questionnaires.

### 4.2.3 Delphi survey

Based on the results of semi-structured interviews as well as literature research and the author's experience in hospital administration, the stakeholders who have close association with the Western Baiyun District Stroke Alliance are enumerated. A reasonable survey questionnaire designed according to the Delphi method based on the principles of brevity, clarity, and explicitness is used to identify stakeholders of the Western Baiyun District Stroke Alliance. The questionnaire concisely describes the content and purpose of the survey to make sure that its structure is clear and explicit. There can be both structured questions and open-ended questions so as to collect the ideas of the interviewees in a more comprehensive manner. Two rounds of survey will be carried out using either electronic or printed questionnaire. The results and statistical analysis of each round of survey as well as the criteria for the retention and deletion of indicators will be explained in detail to the experts to facilitate their judgment.

### 4.2.4 Classification of stakeholders by the Mitchell score-based approach

The Mitchell score-based approach is adopted to score the stakeholders from the three aspects of power, legitimacy, and urgency from one to five points. One-point stands for the lowest level of each dimension, and five-points stands for the highest level of each dimension. Those scoring three points and above in at least two dimensions belong to the core stakeholders, those scoring two to three points in at least two dimensions belong to the marginal stakeholders, and those scoring less than two points in at least two dimensions belong to latent stakeholders.

## 4.3 The synergy theory

### 4.3.1 Selection of synergy factors

According to the identification of stakeholders of the Stroke Alliance, the core stakeholders are the health commission (health administrative department), the medical insurance department (urban residents/workers/new rural cooperative medical system), hospitals at all levels (tertiary hospitals, secondary hospitals, and community hospitals) and patients/residents. It is believed that administrative departments are managers who promote the development of medical alliances and are the leading organizations that affect the synergy of the Stroke Alliance; hospitals at all levels affect the synergy of the Stroke Alliance from the perspectives of stroke emergency response, treatment, rehabilitation and prevention and are the major service providers that affect the synergy of the Stroke Alliance; the general public are the direct beneficiaries of the Stroke Alliance and the major service recipients that affect the synergy of the Stroke Alliance.

With the relationship structure of government-institution-the public as the reference framework, the author retrieved relevant literature on synergistic capabilities of public medical groups and medical alliances and obtained 21 synergy factors such as system synergy and organizational synergy. The synergy factors and scale are identified and established with reference to *Research on Synergistic Capability of Public Medical Groups in China* (Z. N. Luo, 2014). Both the medical group and stroke alliance are established in the form of medical consortium and the research objects in medical group and stroke alliance are the same. The scale has a good reliability with the Cronbach's a coefficient > 0.7. The items in the scale are all about the various synergistic capabilities of medical groups with appropriate design and explicit expression.

### 4.3.2 Dimensions of theoretical models of synergy

There are a large number of analyses and studies concerning enterprise synergy and group synergy carried out by researchers in the management field, and their theoretical results and practical experience can all be used as a reference for the analysis of synergy of the regional stroke alliance.

Marcelo proposed that synergy refers to the improved core competitiveness of companies and groups after mergers and acquisitions with better overall performance than the sum of their individual performances before M & A. In previous research, company and group synergy is classified into the macro-level synergy, meso-level synergy, and micro-level synergy, and this classification is also adopted in the research on public medical groups.

### 4.3.3 In-depth analysis of synergy based on expert interviews

Collaborative capability of the regional stroke alliance refers to the arrangement and combination of synergies in the macro-meso-micro levels in the management and operation of the medical alliance according to a certain structure, which can promote the ordered and stable advancement of the medical alliance to achieve a great improvement in the overall function and benefit of the stroke alliance. Improving the collaborative capability of the alliance can effectively solve various problems and issues faced by the medical alliance and improve its

overall service capacity, operation level, social benefits and economic benefits. Based on theories related to synergy, the regional stroke alliance is considered as a complete system, and the interaction of synergies at the micro, meso and macro level forms the synergy of the alliance as a whole. Theoretically speaking, the synergy effects of the stroke alliance at different levels are identified through expert interview, literature review and analytical summary.

Synergy factors at the macro level are relatively abstract, macroscopic, theoretical, and instructive. In modern enterprise management, the highest level of synergy between enterprises is strategic synergy which requires unity of the enterprises in the aspects of corporate value, team spirit, social responsibility, and code of conduct. Only with strategic unity and cultural unity, can synergy be realized in the alliance to create more value. Therefore, in the theoretical model of this thesis, synergy of the regional stroke alliance at the macro level is mainly composed of strategic synergy and cultural synergy.

Synergy factors at the micro level are specific and fundamental transactions and behaviors with strong operability. For example, business synergy involves business exchanges between hospitals at all levels, mutual complementarity of service content, sharing and mutual recognition of examination reports, and collaborative development of medical affairs between member hospitals. Process synergy involves procurement of drugs, materials and equipment, design of medical service procedures, supply of medical services, seamless two-way referrals, and linkage of different levels of medical service processes. Therefore, in the theoretical model of this thesis, synergy of the stroke alliance at the micro level is mainly composed of business synergy and process synergy.

Synergy factors at the meso level are neither macro nor micro. Since system is a behavioral constraint mechanism based on maximization of medical alliance interests and the strategic goals of the alliance, it can effectively prevent conflicts inside the alliance and contribute to the synergistic development and sharing of resources and information of the medical alliance, thereby improving the overall benefits. On the basis of system synergy, the medical alliance should also strengthen its innovation ability. An open, standardized, and advanced basic research platform, R & D platform, and technological innovation platform should be established so that members of the medical alliance can conduct research, technical innovation, technical exchanges and sharing on the platform, which will enhance the communication and innovation capabilities of the medical alliance. System synergy and innovation synergy serve as a connecting link in the synergy relationship. In addition, it is also necessary to build an information platform in the medical alliance to achieve the flow and sharing of information, strengthen the convenience of collaboration for hospitals at all levels, and thereby enhance the

treatment effect of stroke patients. Therefore, in the theoretical model of this thesis, synergy of the regional stroke alliance at the meso level is mainly composed of system synergy, innovation synergy and information synergy.

## 4.3.4 Steps of model establishment

In recent years, structural equation modeling (SEM), as a general framework of statistical analysis, has been widely used in data analysis of social sciences. In this study, since the synergy of the regional stroke alliance is an abstract and hypothetical concept, which cannot be measured directly, it is proposed to quantitatively analyze and verify the synergy through the structural equation modeling. The steps are as follows.

(1) Model formulation

The initial theoretical model is formed based on the existing experience or theory. The steps include: determine the latent variable, select measurable variables and formulate a theoretical model.

(2) Model identification

An initial theoretical model is established based on selection of the latent variables and measurable variables to determine whether each parameter to be estimated can be obtained from the observed variables.

(3) Model estimation

An initial model is established after judgement of each parameter to be estimated. Estimation is how we use our model, or how we allow the parameters to be figured out.

(4) Model evaluation

After obtaining the parameter estimates of the model, it is necessary to evaluate the modeldata fit. If the model and data fit well, the modeling can be terminated after this step.

(5) Model modification

If the model fit is tested to be poor after parameter estimation of the regional stroke alliance model, the model needs to be modified, and modification methods include "influence relationship adjustment" and "automatic covariance adjustment" can be used. If the above two methods still cannot solve the model fitting problem, the structural equation model can be split into several smaller models for analysis, or the model type can be changed to reduce the complexity. Once the model is reset, the above 4 steps shall be repeated.

# 4.3.5 Establishment of structural equation model in research on synergy of regional stroke alliance

According to the theoretical model of synergy of regional stroke alliance (Figure 4.1), the author analyzes the components of synergy, further explores synergy at the macro, meso and micro levels, and proposes hypotheses as follows.

Hypothesis 1: The synergy of the regional stroke alliance is divided into three dimensions of macro level synergy, meso level synergy and micro level synergy, and the three dimensions constitute a complete and unified system with mutual influence and mutual promotion.

Hypothesis 2: The macro level synergy reflects the leadership of the regional stroke alliance and includes cultural synergy and strategic synergy, and the two synergies are positively related to the macro level synergy.

Hypothesis 3: The meso level synergy reflects the cohesion of the regional stroke alliance and includes system synergy, information synergy and innovation synergy, and the three synergies are positively related to the meso level synergy.

Hypothesis 4: The micro level synergy reflects the integration of the regional stroke alliance and includes business synergy and process synergy, and the two synergies are positively related to the micro level synergy.

Hypothesis 5: The macro level synergy is positively related to the meso level synergy.Hypothesis 6: The macro level synergy is positively related to the micro level synergy.Hypothesis 7: The meso level synergy is positively related to the micro level synergy.These hypotheses will be verified by the structural equation modeling.



Figure 4.1 Theoretical model of regional stroke alliance synergy

## 4.3.6 Measurement of variables

The first step is to establish a measurement model of regional stroke alliance synergy as shown in Figure 4.2. For effective model formulation, the latent variables should first be identified and the measurable variables should be selected. The relationship between the latent and measurable variables is reflected through the measurement model. The exogenous latent variable of the measurement model is the regional stroke alliance synergy, while the endogenous latent variables are the synergies of the regional stroke alliances at all levels (macro, meso and micro level). As per Figure 4.2, the measurement model of regional stroke alliance synergy is a second-order factor measurement model. The regional stroke alliance synergy is a second-order factor measurement model. The regional stroke alliance synergy as second-order factor, which is derived from three first-order factors: macro level synergy, meso level synergy and micro level synergy of the regional stroke alliance.



Figure 4.2 Measurement model of regional stroke alliance synergy

(1) Measurement of macro level synergy

According to the analysis and elaboration of macro synergy of the regional stroke alliance in this research, macro level synergy is composed of cultural synergy and strategic synergy. The measurement items are shown as per Table 4.1. The calculation formula of macro level synergy (Macro-S) is:

$$Macr - S = \sum \alpha_m \left[ \sum \lambda_i \kappa (n, m, i) \right]_{\dots}$$
(4.1)

In the Macro-S formula,  $\kappa$  (n, m, i) represents the score of sample *n* on the measurement item *i* in the level *m*,  $\lambda_i$  represents the weight of the measurement item *i*, and  $\alpha_m$  represents the weight of the level *m*.

(2) Measurement of meso level synergy

According to the analysis and elaboration of the meso level synergy of the regional stroke alliance in this research, meso level synergy is composed of system synergy, information synergy and innovation synergy. The measurement items are shown as per Table 4.1. The calculation formula of meso level synergy (Meso-S) is:

$$Meso - S = \sum \beta_m \left[\sum \mu_i j(n,m,i)\right]$$
(4.2)

In the Meso-S formula, j (n, m, i) represents the score of sample n on the measurement

item *i* in the level *m*,  $\mu_i$  represents the weight of the measurement item *i*, and  $\beta_m$  represents the weight of the level *m*.

(3) Measurement of micro level synergy

According to the analysis and elaboration of the micro level synergy of the regional stroke alliance in this research, micro level synergy is composed of process synergy and business synergy. The measurement items are shown as per Table 4.1. The calculation formula of micro level synergy (Micro-S) is:

$$Micro - S = \sum \gamma_m \left[\sum \rho_i h(n,m,i)\right]$$
(4.3)

In the Micro-S formula, h (n, m, i) represents the score of sample *n* on the measurement item *i* in the level *m*,  $\rho_i$  represents the weight of the measurement item *i*, and  $\gamma_m$  represents the weight of the level *m*.

(4) Measurement of regional stroke alliance synergy

The synergy of the regional stroke alliance is mainly composed of macro level synergy, meso level synergy and micro level synergy. Therefore, the synergy of regional stroke alliance can be calculated by the following formula:

$$XT = \delta 1 Marco - S + \delta 2 Meso - S + \delta 3 Micro - S$$
(4.4)

XT represents the synergy of regional stroke alliance, Macro-S represents macro level synergy, Meso-S represents meso level synergy, Micro-S represents micro level synergy, and the measurement of the three hierarchies is described above.  $\delta_1$ ,  $\delta_2$ ,  $\delta_3$  represent the corresponding weights.

#### 4.3.7 Data collection and analysis

Based on expert consultation and research group discussion and with reference to the existing research results at home and abroad, measurement items for the regional stroke alliance synergy are designed according to the seven factors in the macro, meso, and micro level (See Table 4.1 for specific measurement items). The research questionnaire adopts the Likert five-point scale method, in which the views of the respondents on the items are represented by the scores they give to each item. The response options include excellent (five points), above average (four points), average (three points), below average (two points) and very poor (one point).

Level	Factor	Measurement items
Maaro	Strategic synergy	The regional stroke alliance establishes a strategic program with unified goals. There is top-level design of a framework for collaborative governance of the stroke alliance. An organization for collaborative governance of the stroke alliance is established
synergy	Cultural synergy	Members of the regional stroke alliance have shared operation philosophy and strong sense of alliance. The regional stroke alliance establishes unified values and big-picture thinking. The regional stroke alliance develops and implements a unified code of conduct.
	System synergy	The regional stroke alliance has a complete structures and institutional system with strong operability. The rules and regulations and systems established by the alliance are all designed to maximize the interests of the members. A specialized organization is established at the regional stroke alliance level to load and manage the member medical institutions.
Meso synergy	Innovation synergy	Hospitals at all levels in the regional stroke alliance work together to form an organization for reform and innovation. Hospitals at all levels in the alliance share experience of reform and innovation with each other. Hospitals at all levels exchange new technologies and demonstrate their innovation results.
	Information synergy	The regional stroke alliance uses an information system to manage hospitals at all levels and integrates and discloses information in a categorized manner. Hospitals at all levels in the alliance can easily and conveniently use the information system for diversified communication and collaboration. Hospitals at all levels in the alliance establish specialized departments for affairs of the regional stroke alliance to facilitate the transfer of information between the alliance and its member hospitals.
Micro	Business synergy	Hospitals at different levels in the alliance communicate with each other on specific matters, and they cooperate with each other to achiever mutual promotion. Hospitals at all levels complement each other in business development. The application, circulation and recognition of patient examination results is realized among hospitals at all levels and all the departments. Hospitals within the alliance jointly purchase drugs medical supplies and
synergy	Process synergy	<ul> <li>Hospitals within the annalect jointry purchase drugs, medical supplies, and medical equipment.</li> <li>Hospitals at all levels of the regional stroke alliance share the alliance brand with standardized marketing and promotion methods.</li> <li>The treatment processes of all hospitals in the regional stroke alliance are consistent and transparent, and two-way referral is implemented in a desirable manner.</li> </ul>

Table 4.1 Measurement scale of regional stroke alliance synergy

# **Chapter 5: Results**

## 5.1 Identification of stakeholders of Western Baiyun District Stroke Alliance

Experts and scholars with high professional quality and rich working experience were invited to participate in the questionnaire consultation. A total of 25 experts were invited, including 11 government officials from health administration and medical insurance departments, and 14 management staff from medical institutions (six hospital leaders and eight department heads and chief nurses). All experts have the bachelor's degree or above, among which 17 have master's degree and 3 have doctor's degree. All of them have senior professional titles and 72.73% of them have been engaged in the healthcare industry for more than 10 years. Before formation of the expert consultation questionnaire for stakeholder identification of the Western Baiyun District Stroke Alliance, a free-association feedback from experts was conducted, in which open-ended questions on the stakeholders of the Stroke Alliance are raised to list stakeholder candidates as many as possible. After standardizing the terminology of each stakeholder, institutions offering similar services such as the nursing homes, senior service centers, and care homes were classified into one category of stakeholder, namely nursing homes. As a result, a total of 36 stroke alliance stakeholders were listed by 25 experts, among which 22 stakeholders were selected by more than 12 experts, and these 22 stakeholders were included in the expert consultation questionnaire for stakeholder identification of the Western Baiyun District Stroke Alliance. The data were analyzed from three aspects of expert active participation, expert authority, and concentration degree of expert opinions to control the quality of the Delphi method.

### 5.1.1 Delphi results

### 5.1.1.1 Expert active participation

The response rate of the expert consultation questionnaire can reflect the degree of active participation of the experts in this survey. Good participation is the basis for data integrity and impartiality. A response rate of 50% is the threshold for analysis and report, with 60% being good, and 70% and above being very good.

The response rate of the first round of expert consultation questionnaire was 88%. The

response rate of the second round was 100%, and the questionnaire validity rate was 100%. The details are shown as per Table 5.1, which indicates a high level of participation of experts in this survey.

Table 5.1 Comparison of expert active participation

Round of survey	Distributed questionnaire	Returned questionnaire	Response rate
Round 1	25	22	88%
Round 2	22	22	100%

## 5.1.1.2 Degree of expert authority

The degree of expert authority (Cr) is determined by the basis of judgment (Ca) and familiarity with the study (Cs), and the calculation formula is Cr=(Ca+Cs)/2. First, the four dimensions of the basis of judgment (Ca) were assigned values based on relevant domestic and foreign studies, including intuition (assigned 0.20), peer understanding (assigned 0.40), theoretical analysis (assigned 0.60), and practical experience (assigned 0.80). Then, the five dimensions of familiarity (Cs) with the study were assigned, including not at all unfamiliar (assigned 0), slightly familiar (assigned 0.25), somewhat familiar (assigned 0.5), moderately familiar (assigned 0.75), and extremely familiar (assigned 1). The degree of expert authority is related to the prediction accuracy of the study, and the values fluctuate from 0 to 0.95. It is generally recognized that the expert authority coefficient Cr > 0.7 means acceptable reliability, and Cr > 0.8 means good reliability.

Through calculation, in round 1, the Ca was 0.74, the Cs was 0.82, and the Cr was 0.78; in round 2, the Ca was 0.76, the Cs was 0.88, and the Cr was 0.82. The degree of expert authority in the questionnaire was statistically reliability, as shown in Table 5.2, Table 5.3 and Table 5.4. Table 5.2 Analysis of expert authority in Round 1 questionnaire (n = 22)

	Dimension	Option	Frequency (person)	Percentage (%)
_	Judgment basis	Practical experience	16	72.73%
		Theoretical analysis	5	22.73%
		Peer understanding	1	4.55%
		Intuition	0	0.00%
	Familiarity	Extremely familiar	12	54.55%
		Moderately familiar	4	18.18%
		Somewhat familiar	6	27.27%
		Slightly familiar	0	0.00%
		Not at all familiar	0	0.00%
Table $5.\overline{3}$	Analysis of exper	t authority in Round 2 qu	uestionnaire (n = $22$ )	
Dir	nension	Option	Frequency (person)	Percentage (%)
Jud	lgment basis	Practical experience	18	81.82%
		Theoretical analysis	4	18.18%
		Peer understanding	0	0.00%
		Intuition	0	0.00%

Familiarity Extremely far		Extremely familiar	15		68.18%
Moderately familiar		3		13.64%	
Somewhat familiar		4	18.18%		
Slightly familiar		0		0.00%	
Not at all f		Not at all familiar	0		0.00%
Table 5.4 Degree of expert authority in two consultations					
Round	of survey	Ca		Cs	Cr
Ro	ound 1	0.74	(	0.82	0.78
Ro	ound 2	0.76	(	0.88	0.82

### 5.1.1.3 Expert selection of candidate stakeholders

Through the first round of expert consultation, the support rate of experts for various stakeholders of Western Baiyun District Stroke Alliance can be obtained. The second round of expert consultation questionnaire was formed on the basis of the first one. The results of the two rounds of survey were integrated, and the support votes and support rate of specific candidate stakeholders were demonstrated as per Table 5.5.

SN	Stakeholder	Support votes (Round 1)	Support rate (Round 1)	Support votes (Round 2)	Support rate (Round 2)
1	Health commission (health administrative department)	22	100.00%	22	100.00%
2	Tertiary hospitals	22	100.00%	22	100.00%
3	Secondary hospitals	21	95.45%	22	100.00%
4	Community hospitals	21	95.45%	22	100.00%
5	Patients/residents	22	100.00%	22	100.00%
	Medical insurance departments				
6	(urban residents/workers/new rural	19	86.36%	20	90.91%
7	cooperative medical insurance) For-profit commercial medical	17	77.27%	16	72.73%
	Human resources and social				
8	security departments	18	81.82%	18	81.82%
9	Medical industry associations	16	72 73%	17	77 27%
10	Medical education institutions	10	45 45%	14	63 64%
11	Science and technology management departments	10	45.45%	12	54.55%
12	Pharmaceutical consumables suppliers	19	86.36%	18	81.82%
13	Relevant media	12	54.55%	16	72.73%
14	Financial departments	19	86.36%	20	90.91%
15	Public hospitals outside the alliance	17	77.27%	18	81.82%
16	Private hospitals outside the alliance	17	77.27%	16	72.73%
17	Blood banks	10	45.45%	10	45.45%
18	Public security organs, procuratorial organs and people's	6	27.27%	8	36.36%
19	courts Industrial and commercial	5	22.73%	6	27.27%

Table 5.5 Support votes and support rate of two rounds of expert consultation (n = 22)

SN	Stakeholder	Support votes (Round 1)	Support rate (Round 1)	Support votes (Round 2)	Support rate (Round 2)
	administration departments				
20	Social retail pharmacies	14	63.64%	12	54.55%
21	Centers for disease control and prevention	6	27.27%	5	22.73%
22	Nursing homes	18	81.82%	18	81.82%

## 5.2 Classification of stakeholders of Western Baiyun District Stroke Alliance

After identification of the stakeholders of the Western Baiyun District Stroke Alliance using the Delphi method, the Mitchell score-based approach was used to classify the stakeholders to lay a foundation for further exploration of stakeholder claims and conflicts. The classification of stakeholders in the Western Baiyun District Stroke Alliance was based on scoring of the three dimensions of power, legitimacy, and urgency. Those with at least two dimensions scoring between two and three were marginal stakeholders, and those with at least two dimensions scoring below two were latent stakeholders. The scores of the three dimensions of each stakeholder are shown as per Table 5.6.

SN	Stakeholder	Power	Legitimacy	Urgency	Mean
1	Health commission (health administrative department)	4.82	4.45	4.14	4.47
2	Tertiary hospitals	4.23	3.82	4.18	4.08
3	Secondary hospitals	4.00	4.14	3.91	4.02
4	Community hospitals	4.09	4.14	4.45	4.23
5	Patients/residents	3.91	3.95	4.00	3.95
	Medical insurance departments (urban				
6	residents/workers/new rural cooperative	4.05	3.95	3.77	3.92
	medical insurance)				
7	For-profit commercial medical insurance	2 95	3 64	2 64	3.08
1	institutions	2.75	5.04	2.04	5.00
8	Human resources and social security	3 59	2.64	2.32	2.85
U	department	5.69	2.01	2.32	2.00
9	Medical industry associations	2.73	3.45	2.50	2.89
10	Medical education institutions	1.55	2.23	1.50	1.76
11	Science and technology management departments	1.41	1.64	1.50	1.52
12	Pharmaceutical consumables suppliers	1.50	2.05	1.45	1.67
13	Relevant media	2.55	2.68	2.59	2.61
14	Financial departments	3.23	2.50	2.23	2.65
15	Public hospitals outside the alliance	2.27	3.27	2.18	2.58
16	Private hospitals outside the alliance	2.14	3.45	2.23	2.61
17	Blood banks	1.50	1.41	1.59	1.50
18	Public security organs, procuratorial organs	1.68	1.45	1.50	1.55

Table 5.6 Scores of the three dimensions of stakeholders

Emergency Response Model of Stroke in the Regional Medical Alliance

SN	Stakeholder	Power	Legitimacy	Urgency	Mean
	and people's courts				
19	Industrial and commercial administration departments	1.64	1.27	1.59	1.50
20	Social retail pharmacies	1.50	2.18	1.45	1.71
21	Centers for disease control and prevention	1.45	1.55	1.50	1.50
22	Nursing homes	2.18	2.32	2.27	2.26

### 5.2.1 Analysis of the dimension of power

According to the definition of power and the Mitchell scoring rules, experts believe that the stakeholders scoring over three points in the dimension of power are considered to have a great influence on the decision-making process of Western Baiyun District Stroke Alliance. According to the statistics, there are 8 stakeholders scoring over three points in the dimension of power: health commission (health administrative department) (4.82), tertiary hospitals (4.23), secondary hospitals (4.00), community hospitals (4.09), patients/residents (3.91), medical insurances (urban residents/workers/new rural cooperative medical insurance) (4.05), human resources and social security departments (3.59), and financial departments (3.23).

Those scoring between two and three points in the dimension of power are considered to have a medium influence on the decision-making process of the Western Baiyun District Stroke Alliance, and there are six stakeholders specifically: for-profit commercial medical insurance organizations (2.95), medical industry associations (2.73), relevant media (2.55), public hospitals outside the alliance (2.27), private hospitals outside the alliance (2.14), and nursing homes (2.18).

Those scoring below two points in the dimension of power are considered to have a relatively weak influence on the decision-making process of the Western Baiyun District Stroke Alliance, and there are eight stakeholders specifically: medical education institutions (1.55), science and technology management departments (1.41), pharmaceutical consumables suppliers (1.50), blood banks (1.50), public security organs, procuratorial organs and people's courts (1.68), industrial and commercial administration departments (1.64), centers for disease prevention and control (1.45), and social retail pharmacies (1.50).

### 5.2.2 Analysis of the dimension of legitimacy

According to the definition of legitimacy and the Mitchell scoring rules, experts believe that if the stakeholders score over three points in the dimension of legitimacy, their interest demands on the construction of the Western Baiyun District Stroke Alliance are considered to be highly reasonable. There are ten stakeholders scoring over three points in the dimension of legitimacy: health commission (health administrative department) (4.45), tertiary hospitals (3.82), secondary hospitals (4.14), community hospitals (4.14), patients/residents (3.95), medical insurance departments (urban residents/workers/new rural cooperative medical insurance) (3.95), for-profit commercial medical insurance institutions (3.64), medical industry associations (3.45), public hospitals outside the alliance (3.27), and private hospitals outside the alliance (3.45).

For those scoring between two and three points in the dimension of legitimacy, their interest demands on the construction of the Western Baiyun District Stroke Alliance are considered to be moderately reasonable. There are seven stakeholders specifically: human resources and social security departments (2.50), medical education institutions (2.23), relevant media (2.68), financial departments (2.50), social retail pharmacies (2.18), nursing homes (2.32), and pharmaceutical consumables suppliers (2.05).

For those scoring below two points in the dimension of legitimacy, their interest demands on the construction of the Western Baiyun District Stroke Alliance are considered to be slightly reasonable. There are five stakeholders specifically: science and technology management departments (1.64), blood banks (1.41), public security organs, procuratorial organs and people's courts (1.68), industrial and commercial administration departments (1.45), industrial and commercial administration departments (1.27), and centers for disease prevention and control (1.55).

### 5.2.3 Analysis of the dimension of urgency

According to the definition of urgency and the Mitchell scoring rules, experts believe that if the stakeholders score over three points in the dimension of urgency, their demands will attract immediate attention from the management of the Western Baiyun District Stroke Alliance. There are six stakeholders scoring over three points in the dimension of urgency: health commission (health administrative departments) (4.14), tertiary hospitals (4.18), secondary hospitals (3.91), community hospitals (4.45), patients/residents (4.00), and medical insurance departments (urban residents/workers/new rural cooperative medical insurance) (3.77).

For those scoring between two and three points in the dimension of urgency, their demands will attract immediate attention from the management of the Western Baiyun District Stroke Alliance only to a certain extent. There are eight stakeholders specifically: for-profit commercial medical insurance institutions (2.64), human resources and social security departments (2.32), medical industry associations (2.50), relevant media (2.59), financial

departments (2.23), public hospitals outside the alliance (2.18), private hospitals outside the alliance (2.23), and nursing homes (2.27).

For those scoring below two points in the dimension of urgency, their demands will hardly attract immediate attention from the management of the Western Baiyun District Stroke Alliance. There are eight stakeholders specifically: medical education institutions (1.50), science and technology management departments (1.50), pharmaceutical consumables suppliers (1.45), blood banks (1.59), public security organs, procuratorial organs and people's courts (1.50), industrial and commercial administration departments (1.59), centers for disease prevention and control (1.50), and social retail pharmacies (1.45).

### 5.2.4 Three-dimension classification results of stakeholders

Based on the scores of the stakeholders of the Western Baiyun District Stroke Alliance given by the experts (Table 5.6), the stakeholders are classified into three categories.

Core stakeholders: Core stakeholders are those scoring over three points in at least two dimensions out of power, legitimacy and urgency, and include health commission (health administrative department), tertiary hospitals, secondary hospitals, community hospitals, patients/residents and medical insurances (urban residents/workers/new rural cooperative medical insurance).

Latent stakeholders: Latent stakeholders are those scoring between two and three points in at least two dimensions, and include for-profit commercial medical insurance institutions, human resources and social security departments, medical industry associations, relevant media, financial departments, public hospitals outside the alliance, private hospitals outside the alliance and nursing homes.

Marginal stakeholders: Marginal stakeholders are those scoring below two points in at least two dimensions, and include medical education institutions, science and technology management departments, pharmaceutical consumables suppliers, blood banks, public security organs, procuratorial organs and people's courts, industrial and commercial administration departments, social retail pharmacies and centers for disease prevention and control.

### 5.2.5 Analysis of the central members of core stakeholders

The stakeholder centrality analysis method is applied to explore the centrality position of a member and reflect the position differences of members in a group. Among the six core stakeholders, most experts identify hospitals as the central point to connect patients and

government agencies, and hospitals at all levels are also connected to each other (Figure 5.1). Therefore, "hospitals" are summarized to be the central members of the core stakeholders of the Western Baiyun District Stroke Alliance, which lays a foundation for subsequent research on synergy of the Western Baiyun District Stroke Alliance.



Figure 5.1 Connect of central members of core stakeholders

## 5.3 Research on synergy of Western Baiyun District Stroke Alliance

## 5.3.1 Data collection and analysis method

Questionnaire survey in this section is targeted at the Stroke Alliance. Considering the operability of field investigation and data accessibility, ten hospitals within the Stroke Alliance were selected for the survey. A total of 400 questionnaires on synergy of the Western Baiyun District Stroke Alliance (Annex 3) were distributed, and 346 questionnaires were valid after excluding those with errors, unanswered questions (more than 50%), and unfilled key information, with an ultimate response rate of 86.5%. When the response rate reaches 70% to 75% and above, the questionnaire survey can be used as the basis for the study. The two kinds of statistical analysis software used in the research are IBM SPSS 26.0 and IBM SPSS AMOS 24.0. The basic information of the respondents to the questionnaire of Research on Synergy of the Western Baiyun District Stroke Alliance is shown as per Table 5.7.

Basic information	Frequency	Proportion
Gender		
Male	219	63.29%
Female	127	36.71%
Age		
< 30 years old	6	1.73%
30-40 years old	114	32.95%
40-50 years old	159	45.96%
> 50 years old	67	19.36%
Work seniority		
< 10 years	48	13.87%
10-20 years	134	38.73%
>20 years	164	47.4%
Professional title		
Primary	35	10.12%
Intermediate	160	46.24%
Deputy senior above	151	43.64%
Education		
Junior college or below	66	19.08%
Undergraduate	231	67.76%
Master	39	11.27%
Doctor	10	2.89%

Table 5.7 Basic information of respondents to questionnaire of research on synergy of the Western Baiyun District Stroke Alliance

The basic information of the respondents indicates that they are a group of relatively homogeneous population, with good quality and even age distribution, and their professional title and educational background are in line with the actual situation of medical workers in reality.

### 5.3.2 Reliability analysis of the questionnaire data

The reliability of the questionnaire for synergy of the Western Baiyun District Stroke Alliance was tested using the "internal consistency" method, in which the consistency and stability of the applied scale for the measurement of variables were tested. The Cronbach's a coefficient is usually used to indicate the degree of internal consistency, and the theoretical value of Cronbach's a coefficient ranges from 0 to 1. The larger the value of Cronbach's a, the higher the degree of internal consistency, and the greater the correlation between the indicators in the scale. A Cronbach's a coefficient lower than 0.35 indicates low reliability, a Cronbach's a coefficient higher than 0.5 but lower than 0.7 indicates temporarily acceptable reliability, and a Cronbach's a coefficient higher than 0.7 indicates high reliability. IBM SPSS 22.0 was used to test the internal consistency of the data. The macro-level, meso-level and micro-level reliability of the questionnaire are shown as per Table 5.8. The Macro-S reliability is 0.892 (>0.7), the Meso-S reliability is 0.937 (>0.7), and the Micro-S reliability is 0.907 (>0.7), indicating that

Table 5.8 Reliability test of three levels of the questionnaire							
Level	Cronbach's a	Amount of measurement items					
Macro synergy	0.892	6					
Meso synergy	0.937	9					
Micro synergy	0.907	6					

the reliability of the questionnaire meets the requirements.

### 5.3.2.1 Reliability analysis of Macro-S

The results of the Macro-S reliability analysis are shown as per Table 5.9. The Cronbach's a values for cultural synergy and strategic synergy are 0.858 and 0.810 respectively, and the Cronbach's a value for the Macro-S is 0.892, indicating that the reliability of Macro-S meets the requirements.

Table 5.9 Reliability analysis of macro synergy

Level		Measurement items	Cronbach's a	Measurement items
M	Cultural Synergy	Members of the regional stroke alliance have shared operation philosophy and strong sense of alliance. The regional stroke alliance establishes unified values and big-picture thinking. The regional stroke alliance develops and implements a unified code of conduct.	0.858	3
Macro- S	Strategic Synergy	The regional stroke alliance establishes a strategic program with unified goals. There is top-level design of a framework for collaborative governance of the stroke alliance. An organization for collaborative governance of the stroke alliance is established.	0.810	3
Overall re	eliability		0.892	

## 5.3.2.2 Reliability analysis of Meso-S

The results of the Meso-S reliability analysis are shown as per Table 5.10. The Cronbach's a values for system synergy, innovation and information synergy are 0.909, 0.903 and 0.764 respectively, and the Cronbach's a value for the Meso-S is 0.937, indicating that the reliability of Meso-S meets the requirements.
Level		Measurement items	Cronbach's a	Measurement
				items
Meso-S	System	The regional stroke alliance has a	0.903	3
	synergy	complete structures and institutional		
		system with strong operability.		
		The rules and regulations and		
		systems established by the alliance		
		are all designed to maximize the		
		interests of the members.		
		A specialized organization is		
		established at the regional stroke		
		alliance level to lead and manage the		
		member medical institutions.		
	Innovation	Hospitals at all levels in the regional	0.909	3
	synergy	stroke alliance work together to form		
		an organization for reform and		
		innovation.		
		Hospitals at all levels in the alliance		
		share experience of reform and		
		innovation with each other.		
		Hospitals at all levels exchange new		
		technologies and demonstrate their		
		innovation results.		
	Information	The regional stroke alliance uses an	0.764	3
	synergy	information system to manage		
		hospitals at all levels and integrates		
		and discloses information in a		
		categorized manner.		
		Hospitals at all levels in the alliance		
		can easily and conveniently use the		
		information system for diversified		
		communication and collaboration.		
		Hospitals at all levels in the alliance		
		establish specialized departments for		
		affairs of the regional stroke alliance		
		to facilitate the transfer of		
		information between the alliance and		
		its member hospitals.		
Over	all reliability		0.937	

Table 5.10 Reliability analysis of meso synergy

# 5.3.2.3 Reliability analysis of Micro-S

The results of the Micro-S reliability analysis are shown as per Table 5.11. The Cronbach's a values for business synergy and process synergy are 0.904 and 0.899 respectively, and the Cronbach's a value for the Micro-S is 0.907, indicating that the reliability of Micro-S meets the requirements.

Level		Measurement items	Cronbach's a	Measurement items
Micro-	Business synergy	Hospitals at different levels in the alliance communicate with each other on specific matters, and they cooperate with each other to achiever mutual promotion. Hospitals at all levels complement each other in business development. The application, circulation and recognition of patient examination results is realized among hospitals at all levels and all the departments.	0.904	3
S	Process synergy	<ul> <li>Hospitals within the affiance jointly</li> <li>purchase drugs, medical supplies, and</li> <li>medical equipment.</li> <li>Hospitals at all levels of the regional</li> <li>stroke alliance share the alliance brand</li> <li>with standardized marketing and</li> <li>promotion methods.</li> <li>The treatment processes of all hospitals</li> <li>in the regional stroke alliance are</li> <li>consistent and transparent, and two-way</li> <li>referral is implemented in a desirable</li> <li>manner.</li> </ul>	0.899	3
Overall	reliability		0.907	

Table 5.11 Reliability analysis of micro synergy

#### 5.3.3 Validity analysis of the questionnaire data

After testing the reliability of the questionnaire for Synergy of the Western Baiyun District Stroke Alliance, it is necessary to examine the extent to which the questionnaire can accurately measure the properties of the sample under survey, namely, the validity of the questionnaire. Theoretically, there are three types of validity, including criterion validity (also known as "criterion-related validity", and it measures how well one measure predicts an outcome for another measure.), content validity (also known as logical validity, and it refers to the ability of the selected items to reflect the variables of the construct in the measure.), and construct validity (it refers to the extent to which the measurements used, often questionnaires, actually test the hypothesis or theory they are measuring). In practice, criterion validity and content validity are often difficult to be tested, while construct validity is relatively easy to test.

In statistics, confirmatory factor analysis (CFA) is a special form of factor analysis, most commonly used in social research. It is used to test whether measures of a construct are consistent with a researcher's understanding of the nature of that construct (or factor). As such, the objective of confirmatory factor analysis is to test whether the data fit a hypothesized measurement model. This hypothesized model is based on theory and/or previous analytic

research. Therefore, in this section, confirmatory factor analysis is used to test the fitting degree of the synergy model of regional stroke alliance, so as to evaluate the construct validity of the scale.





Figure 5.2 illustrates the second-order confirmatory factor analysis model of synergy of the Western Baiyun District Stroke Alliance, with Macro-S, Meso-S, and Micro-S as the endogenous latent variables and synergy of the Regional Stroke Alliance as the exogenous latent variable. After the model was analyzed and verified by IBM SPSS Amos 24.0, the model proved to have good convergent validity. The factor loadings of the 21 measurement items on their corresponding first-order factors, namely, Macro-S, Meso-S, and Micro-S, were 0.8, 0.93 and 0.88 respectively, all greater than 0.7, indicating a good model fit.

According to the results of the second-order confirmatory factor analysis of the Regional Stroke Alliance as per Table 5.12, the RMSEA value is still unsatisfactory, and the remaining data met the fit criteria. Therefore, it is believed to be acceptable to establish the medical alliance model using confirmatory factor analysis. In addition, the fitting degree of the construct

validity of the model is acceptable as all the indexes indicate good model fit except for chisquare divided by the degrees of freedom ( $\chi^2/df$ ).

Model fit index	Test results	Fit criterion	Model fit judgment
Chi-square divided by the degrees of freedom ( $\chi^2/df$ )	4.351	Less than 3: excellent, 3-5: acceptable	Acceptable fit
Root mean square residual (RMR)	0.016	Less than 0.05, the smaller the better	Good fit
Goodness-of-fit index (GFI)	0.960	Greater than 0.9, the larger the better	Good fit
Adjusted goodness-of-fit index (AGFI)	0.899	Greater than 0.8, the larger the better	Good fit
Normed fit index (NFI)	0.946	Greater than 0.9, the closer to 1, the better	Good fit
Incremental fit index (IFI)	0.978	Greater than 0.9, the closer to 1, the better	Good fit
Comparative fit index (CFI)	0.978	Greater than 0.9, the closer to 1, the better	Good fit
Root mean square error of approximation (RMSEA)	0.099	Less than 0.05: good Less than 0.08: acceptable	Poor fit

Table 5.12 Results of second-order confirmatory factor analysis

In addition, according to the second-order confirmatory factor analysis model of synergy of the Regional Stroke Alliance in Figure 5.2, the overall synergy of the Stroke Alliance is an exogenous latent variable, and macro synergy, meso synergy and micro synergy are three endogenous latent variables, with normalized parameter values of 0.8, 0.93, and 0.88 respectively, all greater than 0.8, indicating that the three variables have significant correlation with the overall synergy of the Regional Stroke Alliance. It can be seen that the normalized parameter value of meso synergy is the largest, followed by micro synergy, and the normalized parameter value of macro synergy is the smallest. In other words, meso synergy plays a crucial role in the overall synergy of the Regional Stroke Alliance. Therefore, these data support Hypothesis 1: The synergy of the regional stroke alliance is divided into three dimensions of macro level synergy, meso level synergy and micro level synergy, and the three dimensions constitute a complete and unified system with mutual influence and mutual promotion.

As for the macro level synergy, the two measured variables are strategic synergy and cultural synergy, and their normalized parameter values are 0.878 and 0.831 respectively, which supports Hypothesis 2: The macro level synergy reflects the leadership of the regional stroke alliance and includes cultural synergy and strategic synergy, and the two synergies are positively related to macro level synergy.

As for the meso level synergy, the three measured variables are system synergy, innovation synergy and information synergy, and their normalized parameter values are 0.874, 0.962 and 0.809 respectively, which supports Hypothesis 3: The meso level synergy reflects the cohesion

of the regional stroke alliance and includes system synergy, information synergy and innovation synergy, and the three synergies are positively related to the meso level synergy.

As for the micro level synergy, the two measured variables are business synergy and process synergy, and their normalized parameter values are 0.818 and 0.781 respectively, which supports Hypothesis 4: The micro level synergy reflects the integration of the regional stroke alliance and includes business synergy and process synergy, and the two synergies are positively related to the micro level synergy.

Meanwhile, according to the sorting of parameter values of each variables in Macro-S, Meso-S, and Micro-S, strategic synergy (0.878) ranks the highest in Macro-S, system synergy (0.962) ranks the highest in Meso-S, and business synergy (0.818) ranks the highest in Micro-S.

	Factor	Parameter value	Sorting
M	Strategic synergy	0.878	1
Macro synergy	Cultural synergy	0.831	2
	System synergy	synergy 0.962	
Meso synergy	Innovation synergy	0.874	2
	Information synergy	0.809	3
<i>\С</i>	Business synergy	0.818	1
Micro synergy	Process synergy	0.781	2

Table 5.13 Sorting of the parameter values of synergy factors

# 5.3.4 Model construction and modification

#### 5.3.4.1 Causal loop diagram

Structural equation model, also known as latent variable model, is often used in social science to analyze the relationship between observed variables. Latent variables usually cannot be measured directly, but can be measured through a group of observed variables.

The latent variables of the regional stroke alliance are analyzed as follows:

Macro level synergy (latent variable) includes two factors of cultural synergy and strategic synergy;

Meso level synergy (latent variable) includes three factors of system synergy, innovation synergy and information synergy;

Micro level synergy (latent variable) includes two factors of business synergy and process synergy.

On this basis, IBM SPSS Amos 24.0 is used to establish the structural equation model of regional stroke alliance synergy (Figure 5.3). In the model, the oval-shaped diagrams represent the latent variables, the rectangle-shaped diagrams represent the seven synergy factors, and the

circle-shaped diagrams represent the error variance.



Figure 5.3 Causal loop diagram of regional stroke alliance synergy

# 5.3.4.2 Data processing

The sample size of the regional stroke alliance model is very important, and it has been proved in previous literature that a convincing survey should have more than 200 samples. In this research, 346 valid questionnaires were finally collected for statistical analysis with the use of IBM SPSS AMOS 24.0 (Table 5.14).

Table 5 14	Datimation	of standard:	- ad/www.ata	a doudinod		a a officiarianta
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			Estimated unstandardiz ed regression coefficient	S.E. Standard error	C.R. Critical ratio	р	Estimated standardized regression coefficient
Macro-S	<>	Meso-S	0.349	0.035	9.937	***	0.744
Macro-S	<>	Micro-S	0.293	0.034	8.502	***	0.707
Meso-S	<>	Micro-S	0.383	0.039	9.831	***	0.823
Strategic	<	Macro-S	1				0.878
synergy							
Cultural	<	Macro-S	0.959	0.06	15.957	***	0.831
synergy							
System	<	Meso-S	1				0.962
svnergy							

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		Estimated unstandardiz ed regression coefficient	S.E. Standard error	C.R. Critical ratio	р	Estimated standardized regression coefficient
<	Meso-S	0.902	0.034	26.531	***	0.874
<	Meso-S	0.749	0.034	22.054	***	0.809
<	Micro-S	1				0.781
<	Micro-S	0.966	0.068	14.226	***	0.818
	< < <	< Meso-S < Meso-S < Micro-S < Micro-S	Estimated         unstandardiz         ed regression         coefficient         <	Estimated unstandardiz ed regression coefficientS.E. Standard error<	Estimated unstandardiz ed regression coefficientS.E. Standard errorC.R. Critical ratio<	Estimated unstandardiz ed regression coefficientS.E. Standard errorC.R. Critical ratiop<

Note: \*\*\* means < 0.001

Unstandardized coefficients are usually intuitive to interpret and understand. Since they represent the relation between raw data, they can be used directly in calculations and analysis. They can also be used to make comparisons within the regression equation when just one measurement scale is in use. If several measurement scales are in use, standardized coefficients are preferred for comparison. For example, if the estimated unstandardized regression coefficient of strategic synergy to Macro-S is set as the reference value "1", the unstandardized coefficient of cultural synergy to Macro-S will be 0.959. When the standardized regression coefficient is selected for comparison, we can find that in Macro-S, the standardized coefficient of strategic synergy (0.878) is higher than that of cultural synergy (0.831); in Meso-S, the standardized coefficient of system synergy (0.962) is highest, followed by innovation synergy (0.874) and information synergy (0.809); in Micro-S, the standardized coefficient of business synergy (0.818) is higher than that of process synergy (0.781). Since all *p* values are < 0.001, the model has statistical significance.

The relationship between the seven synergies and their corresponding macro, meso and micro levels of the regional stroke alliance model still needs to be tested to obtain model fit indexes so as to determine whether there are unreasonable results. Results in Table 5.15 show that all the basic fit indexes of the regional stroke alliance meet the requirements.

	Estimated	Standard arror (SE)	Critical ratio	n
	variance	Standard error (SE)	(CR)	p
Macro-S F1	0.419	0.045	9.372	***
Meso-S F2	0.526	0.044	11.893	***
Micro-S F3	0.411	0.052	7.962	***
e1	0.124	0.022	5.740	***
e2	0.173	0.022	7.782	***
e4	0.043	0.010	4.209	***
e3	0.133	0.013	10.158	***
e7	0.262	0.029	9.091	***
e6	0.190	0.024	7.835	***
e5	0.156	0.013	11.587	***

Table 5.15 Validation of basic fix indexes of the model

Note: \*\*\* means < 0.001

#### 5.3.4.3 Model modification

The chi-square value of the model was 47.856, the degree of freedom was 11, the chi-square divided by the degrees of freedom ( $\chi^2$ /df) was 4.351 (p < 0.001), and the RMSEA 0 099 was still unsatisfactory. Therefore, it is considered to modify the model through modification index. The results of the modification index (M.I.) are shown as per Table 5.16.

Table 5.16 Modification index of the regional stroke alliance

Covariances			M.I.	Par Change
e5	<>	Micro-S F3	13.795	-0.042
e5	<>	Meso-S F2	6.81	0.027
e7	<>	e5	6.554	-0.034
e3	<>	Micro-S F3	11.755	0.037
e3	<>	Meso-S F2	14.843	-0.038
e3	<>	Macro-S F1	6.539	0.028
e3	<>	e5	4.481	-0.019
e3	<>	e6	7.657	0.031
e4	<>	e5	10.271	0.022
e1	<>	e3	6.804	0.026
<b>Regression Weights:</b>			M.I.	Par Change
Q3 Information synergy	<	Q2 Business synergy	4.248	-0.061
Q3 Information synergy	<	Q1 Process synergy	6.806	-0.071
Q5 System synergy	<	Q2 Business synergy	7.489	0.077
Q5 System synergy	<	Q6 Strategic synergy	6.607	0.075

The results of the modified regional stroke alliance model are shown as per Table 5.17. The chi-square divided by the degrees of freedom ( $\chi^2/df$ ) is 1.612, and RMSEA is 0.042, which is good. The modified model is valid for analysis. Path diagram of structural equation model of regional stroke alliance synergy after modification is shown as per Figure 5.4.

Model fit index	Before modific ation	After modific ation	Fit criterion	Model fit judgm ent
Chi-square divided by the degrees of freedom ( $\chi^2/df$ )	4.351	1.612	Less than 3: excellent, 3-5: acceptable	good
Root mean square residual (RMR)	0.016	0.009	Less than 0.05, the smaller the better	good
Goodness-of-fit index (GFI)	0.960	0.987	Greater than 0.9, the larger the better	good
Adjusted goodness-of-fit index (AGFI)	0.899	0.964	Greater than 0.8, the larger the better	good
Normed fit index (NFI)	0.972	0.991	Greater than 0.9, the closer to 1, the better	good
Incremental fit index (IFI)	0.978	0.996	Greater than 0.9, the closer to 1, the better	good
Comparative fit index (CFI)	0.978	0.996	Greater than 0.9, the closer to 1, the better	good
Root mean square error of approximation (RMSEA)	0.099	0.042	Less than 0.05: good Less than 0.08: acceptable	good

Table 5.17 Fitness index results before and after model correction



Figure 5.4 Path diagram of SEM of regional stroke alliance synergy after modification

#### 5.3.4.4 Model path effect analysis

Table 5.18 shows the path relationship among the variables of the structural equation model. There is a significant positive correlation among the macro level synergy, meso level synergy and micro level synergy (p < 0.05). Therefore, the three levels of synergy cannot be improved alone. In addition, the three levels of synergy do not exist in isolation. Instead, they are interrelated. As long as there is a problem with the synergy of one level, it is bound to have an impact on the other levels. The correlation between meso synergy and micro synergy is the highest (standardized regression coefficient 0.862), followed by the correlation between macro synergy and micro synergy (standardized regression coefficient 0.771), and the correlation between macro synergy and micro synergy (standardized regression coefficient 0.705), with all standardized regression coefficients greater than 0.7. Thus, Hypotheses 5, 6 and 7 are supported.

Hypothesis 5: The macro level synergy is positively related to the meso level synergy;

Hypothesis 6: The macro level synergy is positively related to the micro level synergy;

Hypothesis 7: The meso level synergy is positively related to the micro level synergy.

Tab	le $5.18$	8 Stan	dardized	l regression	coefficients	of SEM	of regional	l stroke a	lliance	syner	g
-----	-----------	--------	----------	--------------	--------------	--------	-------------	------------	---------	-------	---

			Standard regression coefficient
Macro synergy	<>	Meso synergy	0.771
Macro synergy	<>	Micro synergy	0.705
Meso synergy	<>	Micro synergy	0.862
Strategic synergy	<	Macro synergy	0.886
Cultural synergy	<	Macro synergy	0.824
System synergy	<	Meso synergy	0.910
Innovation synergy	<	Meso synergy	0.917
Information synergy	<	Meso synergy	0.730
Process synergy	<	Micro synergy	0.779
Business synergy	<	Micro synergy	0.821

#### 5.3.5 Comprehensive index of regional stroke alliance synergy

Through the establishment of the regional stroke alliance synergy model, the overall synergy of the regional stroke alliance can be calculated, and the calculation formulas are as follows.

The calculation formula of macro level synergy (Macro-S) is:

$$Macro - S = \sum \alpha_m \left[\sum \lambda_i \kappa (n, m, i)\right]$$
(5.1)

In the Macro-S formula,  $\kappa$  (n, m, i) represents the score of sample *n* on the measurement item *i* in the level *m*,  $\lambda_i$  represents the weight of the measurement item *i*, and  $\alpha_m$  represents the weight of the level *m*.

The calculation formula of meso level synergy (Meso-S) is:

$$Meso - S = \sum \beta_m \left[\sum \mu_i j(n, m, i)\right]$$
(5.2)

In the Meso-S formula, j (n, m, i) represents the score of sample *n* on the measurement item *i* in the level *m*,  $\mu_i$  represents the weight of the measurement item *i*, and  $\beta_m$  represents the weight of the level *m*.

The calculation formula of micro level synergy (Micro-S) is:

$$Micro - S = \sum \gamma_m \left[\sum \rho_i h(n,m,i)\right]$$
(5.3)

In the Micro-S formula, h (n, m, i) represents the score of sample *n* on the measurement item *i* in the level *m*,  $\rho_i$  represents the weight of the measurement item *i*, and  $\gamma_m$  represents the weight of the level *m*.

The synergy of regional stroke alliance is mainly composed of three levels: macro level synergy, meso level synergy and micro level synergy. Therefore, the synergy of regional stroke alliance can be expressed by the following formula:

$$XT = \delta 1 Marco - S + \delta 2 Meso - S + \delta 3 Micro - S \qquad (5.4)$$

XT represents the synergy of regional stroke alliance, Macro-S represents macro level synergy, Meso-S represents meso level synergy, Micro-S represents micro level synergy, and the measurement of the three hierarchies is described above.  $\delta_1$ ,  $\delta_2$ ,  $\delta_3$  represent the corresponding weights.

According to the above analysis, the comprehensive average index formula of the overall synergy of the regional stroke alliance is:

$$IxT = \frac{1}{S} \cdot \frac{1}{R} \sum_{n=1}^{R} XT$$
(5.5)

S represents the standard value and R represents the total number of respondents. The theoretical value range of  $I_{XT}$  is from 0 to 1.

According to the above formulas and existing data, the comprehensive average index of the overall synergy of the regional stroke alliance is calculated as 0.7929. The closer the index value is to 1, the stronger the synergy is.

As for the average score for the three levels of synergy, the Macro-S is 4.0082, the Meso-S is 3.9540, the Micro-S is 3.9308, and the regional stroke alliance synergy score is 3.9646 (See Table 5.19 for details).

Macro-S		Meso-S		Micro-S	
Factor	Average score	Factor	Average score	Factor	Average score
Cultural synergy	4.1960	System synergy	3.9697	Business synergy	4.0377
Strategic synergy	3.8204	Innovation synergy Information Synergy	3.9721 3.9196	Process synergy	3.8172

Table 5.19 Average scores of the factors at all levels of the regional stroke alliance

# **Chapter 6: Discussion**

# 6.1 Results of research on stakeholders

## 6.1.1 Inclusion criteria of stakeholders

Before the establishment of the Western Baiyun District Regional Stroke Alliance, no analysis has been carried out to identify the stakeholders of the alliance. However, literature in other industries indicate that stakeholders are important for research on the industry and medical alliance also has its unique stakeholders.

According to the traditional corporate philosophy, it is advocated that a continuous increase of the revenue of the shareholders should be the top priority of the business management. Freeman argues that in addition to individuals or groups that exerting an impact on the corporate goals, other interested parties such as government departments, communities, and environmentalists should also be viewed as the stakeholders, which greatly promotes the participation of various stakeholders (Freeman, 2010). The stakeholders refer to the interest groups who have certain investment in the enterprise, bear the unavoidable risks in the business operation, and have the right to participate in enterprise management. Mitchell et al. explored the emergence and development of the stakeholder theory and elaborated on the concept of interested parties. Most scholars agree to define the stakeholders of an organization from two perspectives of "affected by organizational activities" and "having relevant interests" (Clarkson, 1995; Mitchell et al., 1997).

Based on review of literature on the stakeholder theory and semi-structured interview as well as the author's practical working experience in health administration, we preliminarily identify the stakeholders of the Western Baiyun District Stroke Alliance in Baiyun District. They include 22 individuals, groups, and organizations who have different interest demands and can exert certain influence on the development and operation of the Alliance. Among these 22 stakeholders, "nursing homes" are included in the analysis of stakeholders of the stroke alliance for the first time in China. Due to the implementation of the family planning policy, separated living of the elderly and their children as well as population migration to the urban areas, the function of caring for the elderly in traditional families has been severely weakened, and the needs of the old people for elderly services are becoming increasingly more urgent. The

elderly in the nursing home are high-risk groups of stroke, and many elderly people who have been disabled after stroke also live in the nursing homes (W. W. Gao et al., 2019). Therefore, nursing homes are closely associated with stroke as a disease and deserve analysis among the stakeholders of the stroke alliance. The results of the two rounds of questionnaires showed that experts supported the inclusion of nursing homes as a stakeholder of the Stroke Alliance with a support rate of 81.82%, which failed to reach the threshold of core stakeholders, but deserved attention for scholars in the research on stroke alliance. For the moment, nursing home services are still subject to imperfect policies and systems and inadequate regulation (R. N. Gu et al., 2021). However, the forms of nursing homes have been diversified and standardized year by year, with the emergence of institutions combining medical care with elderly care. According to Several Opinions of the State Council on Accelerating the Development of the Elderly Service Industry and Several Opinions of the State Council on Promoting the Development of the Health Service Industry, integration of medical and elderly care services refers to the integration of medical institutions and elderly care service institutions (State Council, 2013a, 2013b). In practical terms, the combined medical care and elderly care institutions include community service centers established by hospitals that mainly offer elderly care services couple with medical care services. In a stroke alliance, it is feasible to include institutions combining medical care and elderly care into the alliance to promote the rehabilitation of the stroke patients and improve the quality of life of patients with stroke sequelae through comprehensive rehabilitation interventions to improve their motor function and daily living ability.

# 6.1.2 Analysis of research on classification of stakeholders

The stakeholders of the medical alliance can be classified as core stakeholders, latent stakeholders, and marginal stakeholders according to the Mitchell score-based approach. The results of this study are mostly consistent with the findings reported by Jin et al (2013). It is found that governments at all levels, hospitals and patients are all stakeholders of the medical alliance. The government-level stakeholders include the health commission (health administrative department) and the medical insurance departments (urban residents / workers / new rural cooperative medical insurance), and the hospital-level stakeholders include tertiary hospitals, secondary hospitals and community hospitals in the area covered by the stroke alliance.

In the establishment and operation of the medical alliance, corresponding management countermeasures must be adopted according to the importance of different stakeholders to make sure that the needs of various stakeholders can be coordinated and satisfied to the greatest extent, so as to ensure the normal operation of the medical institutions within the medical alliance.

Core stakeholders are the most important stakeholders who exert the highest degree of influence on the medical alliance. The core stakeholders in this study include governments at all levels, hospitals and patients. From the perspective of the government, it needs to improve social satisfaction and design a reasonable operation model. From the perspective of the hospitals, they need to reasonably distribute the salary of employees and provide opportunities for individual development of the employees. From the perspective of patients/residents, they need hospitals with high-level medical technology and convenient access to medical treatment.

Latent stakeholders play a secondary role compared to the core stakeholders in the medical alliance. However, they affect or are affected by the medical alliance to a large extent. Therefore, we should actively seek latent stakeholders to support the construction and operation of the medical alliance and their interest demands should be valued and satisfied by the medical alliance. For example, the guideline consensus proposed by the medical industry association is used to regulate clinical diagnosis and treatment; relevant media release publicity reports to improve patients' awareness of health monitoring.

Marginal stakeholders have less influence on the medical alliance and their interest demands are less urgent to be handled. Although marginal stakeholders are at the lowest position in the regional stroke alliance and may not seem to be important, failure to satisfy the relevant demands of this group can also negatively affect the construction and operation of the regional stroke alliance.

#### 6.1.3 Analysis of the central members of core stakeholders

With reference to studies on stakeholders such as medical consortia and medical alliances at home and abroad, the possible interest demands of the core stakeholders are analyzed as follows.

Interest demands of the government departments: the health administrative departments are held accountable to guarantee the quantity and quality of the medical service supply and ensure the equity and accessibility of healthcare services; the medical insurance departments (urban residents / employees / new rural cooperative medical insurance) are responsible for medical cost control. At present, in some regions, the basic medical insurance for urban workers, the basic medical insurance for urban residents and the new rural cooperative medical care system have been integrated as a unified payer for the medical insurance (Lv, 2013). In a broad sense, the main practical purpose of government departments, as the core stakeholders of the medical

alliance, is to further regulate medical practices and improve the health status of the general public.

Interest demands of patients/residents: residents are the main beneficiaries of health care reform, and their interests are the key to health care system reform. In the case of stroke treatment, as people are demanding for sophisticated medical technology and more efficient medical service, they prefer to seek treatment in hospitals, and as a result, registration is extremely difficult in large hospitals.

Interest demands of hospitals at all levels: hospitals at all levels are the executors of the stroke alliance. It is necessary to improve the enthusiasm of member hospitals of the stroke alliance to participate in the alliance to make sure that the distribution of benefits among major hospitals is reasonable. Tertiary hospitals should be willing to share some of their economic benefits to secondary and community hospitals so as to strengthen the significance of lower level hospitals to participate in the regional medical alliance, which is conducive to helping lower level hospitals improve their medical and management levels and eventually gain the trust of patients. In addition, tertiary hospitals can improve their level of treatment and popularity by receiving patients with difficult and complicated diseases, which will attract more high-quality patients. Through the establishment of the regional medical alliance, hospitals at all levels within the alliance can gain economic benefits.

In summary, hospitals at all levels are the central members of the core stakeholders and are important executors of the stroke alliance. The linkages and interactions between hospitals at all levels are the test criterion for the excellence of the stroke alliance. Synergy of the regional stroke alliance refers to the arrangement, combination, interaction, coordination and synchronous development of various synergy levels and synergy factors in a certain way in the management and development of the medical alliance. An in-depth discussion on the synergy of the regional stroke alliance is also carried out in the following section.

## 6.2 Discussion on research results of the synergy theory

#### 6.2.1 Synergy of the regional stroke alliance

Through the establishment of a structural equation model, it has been verified that the overall synergy of the regional stroke alliance is composed of macro level synergy, meso level synergy, and micro level synergy. According to research results in Chapter 5, the parameters of the macro level synergy, meso level synergy, and micro level synergy are 0.8, 0.93, and 0.88, respectively.

Although the RMSEA value is slightly unsatisfactory (0.099), all other indexes meet the basic requirements, indicating a fair model fit. The normalized parameter values are also statistically significant, indicating a significant correlation between synergies in the macro, meso and micro levels and the overall synergy of the regional stroke alliance. Therefore, the hypothesis proposed in this study that the overall synergy of the regional stroke alliance is composed of macro level synergy, meso level synergy and micro level synergy is supported.

## 6.2.2 Importance of the three levels of synergy

According to the order of the normalized parameters at the three levels, the normalized parameter value of the meso level synergy is the largest, while the normalized parameter value of the micro level synergy is larger than that of the macro level. It indicates that the meso level synergy is the most important factor in the overall synergy of the regional stroke alliance and the meso level synergy exerts a significant effect on the overall synergy of the regional stroke alliance. A possible explanation may be that the meso level is between the micro level and the macro level and serves as a link between the macro-level abstract theory and guiding direction and the micro-level specific matters and basic processes. In the meso level synergy, system synergy is the most important. The system is a behavioral restraint mechanism adjusted or formulated according to the strategic goals of the alliance and the principle of maximizing the benefits of the medical alliances to avoid various management or economic internal conflicts brought about by system inconsistency, so that the resources and information within the medical alliance can be developed and shared in a collaborative manner to promote the overall effectiveness of the stroke alliance. In the macro level synergy, strategic synergy is the most important. The overall development plan and strategic goals of a regional stroke alliance are usually in line with the government's orientation, so strategic synergy is an important influencing factor in a regional alliance. In the micro level synergy, business synergy is the most important. Business synergy refers to the exchanges and interaction of medical business activities between hospitals at all levels, and it is an important link in the regional stroke alliance.

#### 6.2.3 Modification of the regional stroke alliance synergy model

In the regional stroke alliance model fit, the RMSEA value is slightly unsatisfactory (0.099). Modification index is therefore adopted to modify the model. The E4 <--> E5 is selected with the M.I. value of 10.271. After one time of modification, the chi-square divided by the degrees of freedom ( $\chi$ 2/df) is 1.612, and the RMSEA value is 0.042. All indexes indicate good model

fit. The path coefficients of all the variables of the modified regional stroke alliance synergy model indicate are statistically significant at the level of p < 0.05. Therefore, it is proved that there is a significant positive correlation between macro level synergy, meso level synergy and micro level synergy.

# 6.3 Literature theory

#### 6.3.1 Stakeholder theory

Stakeholders can be understood as any group or individual who can affect or be affected by the achievement of organizational goals (Freeman, 2004). The concept of stakeholders is very extensive, which suggests that an organization often needs to deal with needs of multiple or even competing stakeholders at the same time. Therefore, the stakeholder theory is applicable to explain how and why decision makers choose to respond to the dynamics of particular stakeholders (Mitchell et al., 1997). With increasing questioning on the traditional shareholder supremacy theory advocated in the United States and the United Kingdom, the stakeholder theory has witnessed continuous development. By analyzing the independence and dependence of each stakeholder, corporate managers can identify the core stakeholders that are currently concerned by the management (Hwabamungu et al., 2018). With the identification of the core stakeholder, the corporate managers attempt to seek maximized benefits and dynamic regulation to achieve efficient management of the business. In the 1990s, the stakeholder theory began to be applied to various other fields, further expanding the application of the stakeholder theory. For example, research on the identification of different impacts of climate change, choice of policy priorities and preferred nature-based solutions (NBS) of the stakeholders can help mitigate the adverse impacts of climate change (Ferreira et al., 2022). For another example, researchers use the stakeholder theory to understand the strategy formulated by Internet-based companies on the issue of corporate social responsibility (CSR) (Y. Q. Li & Yang, 2022).

The stakeholder theory has also been studied in depth in the healthcare field. For example, in the medical field, there has been research on stakeholder from the perspective of a disease or a process. Through research on consensus reached by patients and professional stakeholders, Avery explored the core outcome set (COS), a consistent minimum set of outcomes measured and reported across all studies assessing the introduction and evaluation of new surgical techniques, and discussed its role in the seamless and standardized evaluation of innovative surgical procedures and equipment (Avery et al., 2021). In the field of medical management,

the stakeholder theory has also been widely applied. Nandraj, et al. (2001) proposed to attach great importance to the demands of stakeholders at all levels who are related to the development of the hospital. Javanparast (2009) proposed a method to stratify the various stakeholders so that health decision-makings can be adjusted according to different needs.

#### 6.3.2 Synergy theory

Synergy is originally a physical concept that refers to an integral whole formed by the interaction between an object or a system, or the interaction between factors within a system, or the mutual coordination and dependence of various subsystems (Schmidt, 1986).

With the continuous deepening of theoretical research, the concept of synergy has been gradually applied to social and management research on urban and rural development, industrial clusters, and ecological management, and a series of research achievements have been made (Wolfe et al., 1990). For example, Hattab applied the synergy theory collaborative theory in the sustainable Architecture, Engineering and Construction (AEC) industry to explore integration of Building Information Modeling (BIM) and sustainability (Al Hattab, 2021). The research mainly chose six dimensions to study different synergies, including Building Information Modeling (BIM) function, BIM software, sustainability, project phase, green certification system, and industry stakeholders. The social network theory was applied to draw and measure the associations between the dimensional components so as to analyze the dynamics of their synergies across the three dimensions. The results showed a significant shift in the diversity, scale, and expansion of linkages between BIM and sustainability across the supply chain. The structural equation model (SEM) is a type of model that analyzes and processes complex data and is used to solve variables that cannot be directly observed (P. J. Jin, 2019). SEM is widely used in many fields because it not only deals with multiple factors simultaneously, but also allows for inclusion of errors in both independent and dependent variables, which solves the shortcomings of the traditional statistical analysis methods. In recent years, some scholars have applied structural equation modeling to study the relationship between COVID-19 stressors and health behaviors (Keng et al., 2022). Questionnaire techniques (QET) can quantify an abstract problem so that theoretical research can become quantitative rather than qualitative and empirical rather than speculative (Jiang, 2019). Structural equation modeling, often applied in combination with questionnaire techniques, allows for the quantification of research on synergy of the medical alliance. In this research, a regional stroke alliance synergy model is established to analyze the path relationships among the variables, and it has been proved that there is a

significant positive correlation between the macro level synergy, meso level synergy, and micro level synergy.

# 6.4 Implications on management practice

#### 6.4.1 Implications of the stakeholder theory on management practice

With the continuous improvement of the stakeholder theory and further classification and definition of stakeholders in the field of healthcare management, the research on the stakeholder theory in medical alliances is also changing rapidly. In the early days, the stakeholder theory was mainly used in corporate governance and company management to clarify the position of shareholders in the company so that they can assume the corresponding responsibilities and risks. Therefore, the study of the stakeholder theory is to seek a stable strategy while satisfy and coordinate the interests of all stakeholders. At present, the health care system in China has many characteristics, such as involvement of diverse stakeholders, intricate and complicated levels of medical institutions, and extensive range of services. More importantly, the current system and vested interest groups constrains and interferes with the division of labor and collaboration within health care institutions, inevitably resulting in uncoordinated division of labor and collaboration among health care institutions.

The hierarchical diagnosis and treatment system has not been comprehensively established in China. There are many reasons and one important reason is the imbalance of interests between various stakeholders, such as relevant administrative departments, medical institutions at all levels (health service providers) and patients (recipients of health services). To be specific, there are different interests between the government, medical institutions and medical service recipients, due to their different positions in the society and an uneven distribution of medicalrelated interests. In the implementation of hierarchical diagnosis and treatment, there are still deficiencies such as unclear division of responsibilities, insufficient establishment of systems and slow growth of professional capacity of medical entities, all of which stem from the competition for vested interests of each stakeholder. In order to solve this contradiction and break through the "bottleneck", the government can take the initiative to build an effective, fair and reasonable interest balancing mechanism between the medical institutions and their service recipients through medical insurance.

Although the establishment of medical organizations such as medical consortia or medical alliance plays a positive role in promoting the development of the medical and health care

system, the establishment and operation of the medical alliance will inevitably affect the interests of each stakeholder. Neglect of the interests of any stakeholder will lead to difficulty to obtain any tangible results. By means of the literature research method, semi-structured interview method, the Delphi method, and the Mitchell score-based approach, the stakeholders of the Western Baiyun District Stroke Alliance are analyzed.

In this thesis, the core stakeholders of the Western Baiyun District Stroke Alliance are defined as stakeholders scoring over three points in at least two dimensions out of the three dimensions of power, legitimacy and urgency. There are six core stakeholders, including health administrative departments, tertiary hospitals, secondary hospitals, community hospitals, patients/residents, medical insurance departments (urban residents/workers/new rural cooperative medical insurance). The health administrative departments, as the competent departments, are the policy maker, executor and supervisor of the medical alliance. Through the implementation of medical consortia or medical alliances, the health administrative department hopes that hospitals at all levels can make the best of their own resources to promote development of the medical system in western Guangzhou. In this case, the high-quality resources owned by large high-level hospitals can be shared by lower-level hospitals to promote implementation of hierarchical diagnosis and treatment and achieve a win-win situation. The behavior of the health administrative department is oriented by mandatory policies, which tend to ignore the needs of the institutions providing medical services under its jurisdiction. As a result, the medical institutions may generate confrontational responses, which will affect the sustainability and innovation of the policies implemented. In addition, as an organization directly related to the medical alliance, the payment model of the medical insurance department can directly guide the behavior of the medical alliance. At present, medical insurance institutions in China have not been involved in the construction of regional stroke alliances and there lacks a corresponding health insurance system. The "Global Budget" payment method adopted in some regions in China can be used as a reference (G. Q. Zhang, 2021). Research on the insurance payment also faces quality and productivity challenges in international healthcare systems and needs to focus on providing better value. However, value has multidimensional meanings in the eyes of different stakeholders. In the clinical dimension, value involves the effectiveness of treatment; in the operational dimension, value involves the efficiency and productivity of service delivery; and in the experiential dimension, value involves patient preferences and needs. In research on stakeholders, including patients, it is necessary to articulate and share their value perspectives, test their ideas, and jointly design medical facilities and systems to meet the needs of users. Smith applied Production Preparation Process (3P) to facilitate dialogue of multiple stakeholder groups (including patients, clinicians, and administrators) in a more comprehensive manner. The Lean 3P approach can be adapted to include important dimensions of service-led value and quality, such as patient experience and satisfaction (I. Smith et al., 2020).

Among the six core stakeholders in this study, through interviews with experts through questionnaire and application of the stakeholder centrality analysis method, the centrality position of a member within the group is explored to reflect the difference of the positions of members in the group. The majority of the experts identify hospitals as the central point of contact with patients and government departments, and the hospitals at all levels are also connected to each other, which leads to the conclusion that "hospitals" are the central members of the core stakeholders of the Western Baiyun District Stroke Alliance. In the subsequent research, the lean 3P approach can be used to explore the value perspectives, real thoughts and needs of the core stakeholders. In the exploration of the value perspectives of the core stakeholders, a set of indicators should be set. It is suggested that the characteristics of the indicators should include certainty, also known as scientific rationality, responsiveness or sensitivity to change, and feasibility of measurement, implementation and monitoring (Piggott et al., 2022).

#### 6.4.2 Implications of the synergy theory on management practice

In the establishment and development of the regional stroke alliance, the structural equation modeling is adopted to verify that the regional stroke alliance has synergy, and the synergy of the regional stroke alliance is a system of synergistic capability in the macro, meso and micro levels. Synergy of the regional stroke alliance is defined as the arrangement, interaction, coordination and synchronous development of the synergistic dimensions and capabilities in the management and operation of the alliance. The synergy of the regional stroke alliance can further generate order parameters that dominate the overall development of the alliance, so that it can develop in an ordered and stable manner, resulting in an amplification or even a multiplication of the functions and efficiency of the alliance.

Enhancing the synergy of the regional stroke alliance can help eliminate the obstacles and disadvantages in the current development of the alliance and promote the overall improvement of its service skills, operational capacity, and social and economic benefits. The study views the regional stroke alliance as a holistic system and explores its development based on the synergy

theory, contending that the overall synergy of the regional stroke alliance includes three micro level synergy, meso level synergy, and macro level synergy. The three levels of synergy and the seven synergistic factors are constructed and developed according to a specific goal to produce greater synergy and maximize the value of the alliance, thus obtaining better social and economic benefits.

In the exploration and practical operation of the regional stroke alliance, many achievements have been made. However, there are also many problems. After converting the values of composite average index of synergy to a centesimal system, the scores can be used to reflect the quality of synergy. A score lower than 60 means poor synergy, a score between 60 and 70 means average synergy, a score between 70 and 80 means moderate synergy, a score between 80 and 90 means good synergy, and a score higher than 90 means excellent synergy. The higher the score, the more significant the synergy. In this study, this criterion is used to measure the overall level of synergy of the regional stroke alliance, and the results suggest that the regional stroke alliance is scored 79.29, which belongs to moderate synergy. The overall synergy of the alliance and the meso level synergy and micro level synergy all belong to moderate synergy. According to the current development of the regional stroke alliance, hospitals at all levels of the alliance can reach a consensus on development strategies and goals, and the hospital cultures and management philosophies of them are integrated, indicating that they have good consistency with each other at the strategic and cultural levels. Generally speaking, the macro level synergy of the stroke alliance is good. In the meso level, managements of hospitals at all levels in the alliance remain relatively independent. In terms of system, although each hospital has developed a management system concerning the regional stroke alliance, they will adjust the system according to the actual situation and characteristics of their own hospitals. It is difficult for them to achieve consistency in key performance assessment and personnel management. Implementation of the system established in the alliance is not satisfactory, failing to maximize the interests of the regional stroke alliance. Therefore, system synergy of the regional stroke alliance is at an average level. In terms of innovation synergy, hospitals at all levels have done a good job of exchanging innovative experiences and results, but the degree of exchange varies from hospital to hospital, and the scientific research resources of the regional stroke alliance have not been integrated. Therefore, the innovation synergy of the alliance is at an average level. Innovation is important in all sectors of society. As Gupta pointed out, in a complex and changing business environment, a company's ability to innovate is essential to achieve a sustained advantage and thus continuously outperform its competitors, which can help a company to grow rapidly, survive in

a tough and competitive business environment, and eventually become a market leader (Gupta, 2021). Gupta conducted a perception-based survey based on existing subjective scales to examine corporate performance through a measurement model constructed by SPSS AMOS (IBM). It is found that product and market innovation have a significant effect on corporate performance, while process innovation exerts an indirect effect. The core knowledge of the regional stroke alliance lies in the exchange of experience accumulated in their respective innovation processes and the sharing of technology and research and development achievements among hospitals at all levels of the regional stroke alliance. The management of technical knowledge at the level of innovation synergy is one of the main sources of the development advantages of the regional stroke alliance. Nielsen (2005) suggested that reciprocal learning mechanisms and knowledge management played an important role in the evolution of the alliance. In terms of information synergy, even member institutions of the medical alliance have relatively independent and poorly connected medical information systems, let alone independent medical institutions. Information sharing and mutual recognition of test results between different hospitals are still not in place, so the information synergy of the regional stroke alliance is at a general level. At the micro level, since the regional stroke alliance has been in operation for a certain period of time, there has been normal interaction, support and assistance between the hospitals in an ordered manner, so the business synergy of the regional stroke alliance is relatively good. However, since the alliance has been established only for a short period of time, more cooperation is needed to promote its synergy. In terms of process synergy, hospitals at all levels do not have common procurement of drugs, materials and equipment for the time being, but they have common or similar drug and device lists, and they can comply with standard documents such as guidelines and expert consensus for patient care. Hospitals at all levels can share the regional stroke alliance brand and marketing methods and channels. The service processes in the hospitals are relatively the same, but there are still differences in details, and there are still barriers in two-way referral of patients. Therefore, process synergy is at an average level.

To promote cooperation among hospitals at all levels within the Regional Stroke Alliance so as to achieve synergy, it is important to strengthen the legal system and institutional guarantee of the Alliance, improve its internal management system, and build a scientific and rational cooperation system that will be implemented under the guidance of the development strategy of the Alliance.

#### 6.4.3 Research on stakeholder synergy theory

In this research, the stakeholder theory and the synergy theory have been integrated. Stakeholders of the Regional Stroke Alliance were first discussed, and the centrality analysis method of stakeholders was applied to explore the centrality position of a member in the group to reflect the position differences of members in the group. The majority of the experts identified hospitals as the central point of contact with patients and government departments, and hospitals at all levels are also interconnected with each other, which leads to the conclusion that hospitals are the central members of the core stakeholders of the Western Baiyun District Stroke Alliance. By applying structural equation modeling, it was verified that the Regional Stroke Alliance has synergistic capacity, and the overall synergy of the Alliance is a system of macro, meso and micro level synergy. There are plenty of studies that integrate the stakeholder theory and synergy theory. The integration of the two theories can provide a hierarchical and in-depth analysis of the actual problem, which is conducive to solving the problem and presenting the solution to the problem. However, how to integrate the stakeholder theory and the synergy theory still needs to be explored. Review of literature shows that researchers have applied the integrated approach. For example, Lindsey (2021) tried to apply stakeholder synergy theory in the case study of business succession. Since the stakeholder theory leads to a lack of managerial accountability, making it generally unacceptable in the financial community. Lindsey argue that entrepreneurs may gain utility from the positive outcomes of other stakeholders and attempt to apply stakeholder synergy theory in the case of business succession. The results show that in the case of business succession, the owners of the firms to be sold, their communities and employees, and private equity firms all have an impact on business succession and Lindsey provides sales advice to business owners based on their value.

Research on synergy among stakeholders has also been applied to investigate strategic issues and trends in synergy between health regulators and health technology assessment (HTA) agencies (T Wang et al., 2018), as the pathway to market for new drugs depends on two sequential processes: regulatory approval and insurance reimbursement. The role of the Health Technology Assessment (HTA) organizations is to provide reimbursement recommendations based on the value of the new drug. Pharmaceutical companies therefore need to demonstrate the efficacy, safety and cost-effectiveness of new drugs as they are developed. However, there are still challenges to the evidence required by regulators and HTA institutions. The regulators focus on the balance of benefits and risks of a drug based on clinical trial results provided under ideal circumstances, while HTA institutions focus on the assessment of the effectiveness of

interventions in the general context of clinical practice. Such variability creates uncertainty in drug development decisions and can lead to a potential mismatch between regulatory and HTA results. In order to address the discrepancy between regulatory and HTA requirements, Wang et al. (2018) assessed the current practices and procedures of companies and regulators, and identified synergies between regulatory and HTA institutions with evidence requirements in common areas as the cornerstone to achieving coordination,.

# **Chapter 7: Conclusion**

## 7.1 Summary of conclusions

Establishment of the Western Baiyun District Regional Stroke Alliance represents an important direction in the reform of the medical and health care system in China, which is the promotion of regional medical alliance. It is a significantly important approach to promote hierarchical diagnosis and treatment, improve medical service capacity, and resolve the problem of difficult and expensive access to medical treatment. In this research, we carried out an in-depth analysis of the construction of the Western Baiyun District Regional Stroke Alliances using the stakeholder theory and the synergy theory, and reached the following conclusions.

#### 7.1.1 Conclusion of research on the stakeholder theory

Based on review of literature on the stakeholder theory and semi-structured interview as well as the author's practical working experience in health administration, we preliminarily identify the stakeholders of the Western Baiyun District Stroke Alliance in Baiyun District. They include 22 individuals, groups, and organizations who have different interest demands and can exert certain influence on the development and operation of the Alliance. Among these 22 stakeholders, "nursing homes" are included in the analysis of stakeholders of the stroke alliance for the first time in China.

A reasonable questionnaire is designed using the Delphi method to identify the stakeholders of the Western Baiyun District Stroke Alliance. The stakeholders are evaluated according to the Mitchell score-based approach, and they are divided into three major categories of core stakeholders, latent stakeholders, and marginal stakeholders. Core stakeholders are those scoring over 3 points in at least two of the three dimensions of power, legitimacy, and urgency. There are six core stakeholders, including the Health Commission, tertiary hospitals, secondary hospitals, community hospitals, patients/residents, and the medical insurance departments (urban residents/workers/new rural cooperative medical insurance). The centrality analysis method of stakeholders is applied to explore the centrality position of a member in the group to reflect the position differences of members in the group. The majority of the experts identify hospitals as the central point of contact with patients and government departments, and hospitals at all levels are also interconnected with each other, which leads to the conclusion that hospitals are the central members of the core stakeholders of the Western Baiyun District Stroke Alliance.

Latent stakeholders are those scoring between 2 and 3 points in at least two out of the three dimensions of power, legitimacy and urgency. There are eight latent stakeholders, including for-profit commercial medical insurance institutions, human resources and social security departments, medical industry associations, relevant media, financial departments, public hospitals outside the alliance, private hospitals outside the alliance, and nursing homes. The results of the two rounds of questionnaires show that experts support the inclusion of nursing homes as a stakeholder of the Stroke Alliance with a support rate of 81.82%, which fails to reach the threshold of core stakeholders, but deserves attention for scholars in the research on Stroke Alliance. For the moment, nursing home services are still subject to imperfect policies and systems and inadequate regulation. It is suggested that in the future, institutions integrating medical and elderly care services can be included in the Stroke Alliance to improve the rehabilitation and treatment of stroke patients and provide comprehensive rehabilitation interventions to them to improve their quality of life.

Marginal stakeholders are those scoring below 2 points in at least two of the three dimensions of power, legitimacy and urgency. There are eight marginal stakeholders, including medical education institutions, science and technology management departments, pharmaceutical consumables suppliers, blood banks, public security organs, procuratorial organs and people's courts, industrial and commercial administration departments, social retail pharmacies, and centers for disease prevention and control.

#### 7.1.2 Conclusion of research on the synergy theory

Since hospitals at all levels are the central point to connect patients and government departments, and there are also interconnections between the hospitals, they are considered as an integral whole and the synergy theory is used to design the interaction of synergistic capabilities at the micro, meso, and macro levels. In the theoretical model, the synergy factors at each level of synergy of the Regional Stroke Alliance are summarized through expert interview and literature review and analysis.

The macro level synergy includes strategic synergy and cultural synergy, the meso level synergy includes system synergy, innovation synergy and information synergy, and the micro level synergy includes business synergy and process synergy. There are seven measurement items of synergy in the three levels, and each measurement item contains three questions.

The establishment of the theoretical model of the synergy of the Western Biayun District Stroke Alliance has verified that the Regional Stroke Alliance has synergy, and the synergy is formed by the organic integration of the macro level synergy, meso level synergy, and micro level synergy. In the standardized assessment model, except for the information synergy, the first-order factor loadings and the second-order factor loadings of measured variables are all ideal, indicating a good model fit. Then, the model is modified using the modification index to improve the RMSEA value, and the indexes in the final model all meet the criteria for good model fit. The path relationship between the variables in the modified synergy model verifies a significant positive correlation between the macro level synergy, meso level synergy and micro level synergy.

Therefore, it can be concluded that for a regional stroke alliance, it cannot focus on improving synergy at simply one level. Instead, it should take into account the synergy factors at all levels so as to comprehensively improve the overall synergy. In addition, the three levels of synergy are not completely independent, but interlinked, and problems in any one level will affect the other two levels.

#### 7.1.3 Evaluation of synergy of regional stroke alliance

The score of synergy of the Regional Stroke Alliance is 3.9646, or 79.29 on a centesimal scale, which indicates that the synergy is still in a moderate level. To be specific, the score of macro level synergy is 3.9646, the score of meso level synergy is 3.9540, and the score of micro level synergy is 3.9308. The macro level synergy is good and the meso level synergy and micro level synergy are average. Therefore, the following recommendations are made for the management of the Regional Stroke Alliance. To promote cooperation among hospitals at all levels within the Regional Stroke Alliance so as to achieve synergy, it is important to strengthen the legal system and institutional guarantee of the Alliance, improve its internal management system, and build a scientific and rational cooperation system that will be implemented under the guidance of the development strategy of the Alliance. The synergy of the Regional Stroke Alliance will be reflected in its management and development.

The interaction, coordination and synchronous development of the various synergy levels and synergy factors will lead to an ordered and stable development of the whole Alliance, so that the overall function and efficiency of the whole Medical Alliance can be improved and enhanced.

# 7.1.4 Promotion of the management of the Regional Stroke Alliance

# 7.1.4.1 Clarification of the strategic development objectives and integration of cultural concepts

In modern management, the highest level of synergy in the whole system is strategic synergy. Hospitals at all levels must clarify their strategic development objectives before formulating a unified strategic goal for the Regional Stroke Alliance. They should be carefully and effectively organized and coordinated to implement strategic actions, bring into play synergistic effects and create greater benefits. Hospital culture refers to the distinctive characteristics of hospitals at all levels. The clash of different cultures and concepts will lead to losses, which in turn will affect the overall cohesion and lead to unordered structure, low morale and lack of cohesion. Therefore, medical workers of the hospitals in the Alliance need to accept and support the culture of the Alliance, and their own cultures should be integrated to the culture of the Alliance so as to promote the overall development of the Alliance.

# 7.1.4.2 Improvement of system synergy and promotion of innovation ability

The system of the Regional Stroke Alliance is a behavioral restraint mechanism developed or adjusted according to the strategic goals of the Alliance and the principle of maximizing the benefits of the Alliance and, but it is difficult to achieve consistency in key performance assessment and personnel management because hospitals at all levels are involved. The system now still fails to maximize the benefits of the Alliance, and should be adjusted based on the actual situation and characteristics of the hospitals and the common interests of the Alliance to improve its system synergy. Innovation is vital to all sectors of the society. The core knowledge of the Regional Stroke Alliance lies in the sharing of innovation experience and results, sharing of technology and R&D results, and the interchangeable use of technology among hospitals at all levels in the Alliance. The management of technical knowledge in innovation synergy is one of the major sources of advantage for the development of the Regional Stroke Alliance. The three levels of synergy are not isolated, and must be considered in a holistic manner so as to achieve a better overall synergy.

# 7.1.4.3 Facilitation of business integration and promotion of process improvement

The businesses and processes of a medical alliance are very specific and basic affairs and actions that are highly operable and practical. Since the Western Baiyun District Regional Stroke Alliance has been established for some time, the communication and interaction and support and assistance between the members at all levels proceed in an ordered manner, so the

business synergy of the Alliance is also quite good. However, it is still necessary to strengthen the communication and interaction between hospitals at all levels, improve the entire medical service process through promotion the synergistic development, and promote the standardization and unification of medical services, so as to ensure a seamless connection for two-way referrals.

## 7.2 Research limitations

With a combination of theoretical research and empirical research, we identify the stakeholders of the Western Baiyun District Regional Stroke Alliance, carry out an in-depth analysis of its development and capability, establish its organizational structure and theoretical model, and have achieved certain theoretical and practical results. However, due to subjective and objective reasons, this research still has its limitations and deficiencies.

#### 7.2.1 Lack of research depth in stakeholder theory

In this research, we only identify the stakeholders of the Western Baiyun District Regional Stroke Alliance, and a total of 22 stakeholders are included. Whether there are any omissions of the stakeholders needs to be analyzed in a comprehensive analysis through literature review and brainstorming in the follow-up study.

The Delphi questionnaire used in this study still needs to be improved. First used in military management, the Delphi questionnaire collect expert opinions on a particular issue through a questionnaire in an efficient and controlled manner. The expert opinions are then quantified by the investigators to reach a relatively optimal and feasible conclusion or solution. The Delphi method is also widely used in various fields and has been constantly improved. The number of stakeholders involved in this study is 22, which is not large. Multiple rounds of questionnaires can be conducted on the basis of expanding the range of stakeholders. An important operation of the Delphi method is to collect opinions from the experts one by one and give them feedback on the questionnaire results. Issues with different opinions need to be discussed and analyzed in a timely manner.

#### 7.2.2 Lack of in-depth discussion on the contradictions of stakeholders

As for the conflict of interests of the stakeholders, the specific manifestation of the conflict and its causes need to be further explored. Since there are already many studies in this respect, we have not analyzed the specific manifestations of the conflict of interests of different stakeholders and the causes, which can be strengthened in subsequent studies.

The main conflict between the stakeholders of the medical alliance is the conflict between patients and the health administrative department. In face of illness, patients tend to choose specialists from large hospitals so as to ensure their lives and health. The patients' preference for large hospitals is in conflict with the government's attempt to promote medical alliance. However, this conflict is all about solving the practical problem of difficult access to medical treatment. The government hopes to integrate medical resources and share high-quality resources with primary level hospitals to guide the transfer of patients. At present, the conflict has been initially mitigated by various measures to improve the skills and comprehensive ability of medical workers through training and assistance, and the adjustment of medical insurance policies. Within a medical alliance, there is also conflict between the alliance hospitals and the health administrative departments, as the health administrative departments usually formulate compulsory policies. The hospitals are in a passive position, when receiving administrative orders to support the primary level hospitals, they have to let their staff be delegated to the supporting hospitals in the primary level, and participate in the administrative work of the supporting hospitals. The workload of the medical staff has increased, but the technical level has not been substantially improved, while the income has not increased. To resolve this conflict, regulations have been issued to stipulate that the experience and achievements of participating in the primary healthcare assistance project will be considered in assessment and promotion of the medical staff, which has, to some extent, increased the enthusiasm of the medical staff, but there are still contradictions in the implementation of the policy.

## 7.2.3 Limitations of theoretical research

On the one hand, the theoretical research of this study is mostly limited to the field of medical management. The wide application of the stakeholder theory and the synergy theory in other fields has not been fully reflected in the literature review. On the other hand, the research results provide suggestions to the development of medical alliances from the perspectives of macro level synergy, meso level synergy, and micro level synergy, but the temporal change in synergy from the time when the alliance was initially established to now is not reflected.

Regional stroke alliances need to be evaluated by multidimensional indicators. This study focuses on finding out whether the regional stroke alliance has synergy. By constructing a theoretical model of the synergy of the Western Baiyun District Stroke Alliance, it is verified that the Alliance has synergy, and the synergy is a comprehensive capacity system composed of macro level synergy, meso level synergy, and micro level synergy. However, the synergy of the Western Baiyun District Stroke Alliance is still at a medium level.

# 7.3 Suggestions for future research

# 7.3.1 Subdivide the evaluation indicators of the operation results of the regional stroke alliance

With the deepening of public hospital reform in China, more provinces and regions will explore to establish regional medical alliances. In future studies, researchers can compare the synergies of mature regional stroke alliances and developing regional stroke alliances, and explore the effect of delicacy management on the improvement of synergy. A scientific and practical evaluation index, such as patient satisfaction, should be established to objectively evaluate the hospital improvement effects.

# 7.3.2 Further analyze the demands of stakeholders

The interest demands of the core stakeholders should be considered, and the conflicts among the various parties should be analyzed, which can promote the development of regional medical alliances in China. In future research, scholars should further analyze the specific manifestations of the conflicts of interests among the stakeholders and the reasons behind them. Similar studies suggest that the main conflicts of stakeholders in medical alliances are between patients and health administrative departments as well as between alliance hospitals and the health administrative departments. The conflicts between the core, marginal and latent stakeholders proposed in this thesis have not been studied in depth. In the follow-up research, the interest demands of the stakeholders can be classified and categorized. They can also be included in the questionnaire to identify the content and importance of the interest demands of stakeholders, and to analyze their specific manifestations, reasons and results.

# 7.3.3 Integrate the stakeholder theory and the synergy theory

There are many studies in which the stakeholder theory and the synergy theory are integrated. The integration of the two theories can provide a hierarchical and in-depth analysis of the actual problems, which is conducive to solving the problems and presenting the solution to the problems. However, the methods of integrating the stakeholder theory and the synergy theory still need to be explored.

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### Annex A

### Expert consultation questionnaire for stakeholder definition of Western Baiyun District Stroke Alliance (Round 1)

Dear experts,

We sincerely to invite you to be the consultant expert for the research project of Stakeholder Conflict in the Construction of the Western Baiyun District Stroke Alliance, and hope you can finish the questionnaire out of your tight schedule. The main purpose of this consultation is to identify and classify the specific stakeholders of the Western Baiyun District Stroke Alliance. Thank you very much for your support. Hope everything goes well with your work.

Research group of Western Baiyun District Stroke Alliance

#### 1. Please fill in your basic personal information

- (1) Name:
- (2) Gender:
- (3) Age:
- (4) Education:
- (5) Occupation:
- (6) Workplace:
- (7) Working years:
- (8) Professional title:

#### 2. Description of relevant concepts

Medical alliance: It is an alliance of common interests, responsibility and development established by medical institutions of different types and levels within a certain region regardless of their administrative jurisdiction and asset ownership.

Medical alliance stakeholders: They refer to individuals or organizations that have certain interest demands on the construction of the medical alliance, will be affected in the process of medical alliance construction, and can also affect the realization of the medical alliance goals to a certain extent.

Power: It refers to the extent to which a particular stakeholder group can influence decisionmaking of the medical alliance.

Legitimacy: It refers to the extent to which the interest demands of a particular stakeholder group on the medical alliance is legitimate.

Urgency: It refers to the extent to which the requirements of a particular stakeholder group immediately attract the attention of the management of the medical alliance.

3. After filling in your personal basic information, please identify whether the individuals, groups and institutions listed in the following table belong to stakeholders of the healthcare alliance. If you believe that they are the stakeholders of the medical alliance, please tick " $\sqrt{}$ ", otherwise, please tick " $\times$ ". In addition, please give a score from 1 to 5 to evaluate their power, legitimacy and urgency. 5-point represents the highest and 1-point represents the lowest. Please note in the end if you have other candidates.

Table 1 expert consultation and evaluation form (the first round)

Serial Number	Stakeholder candidates	Yes / no $(\sqrt{/\times})$	Mitche Power	ll score-based Legitimacy	approach Urgency
1	Health commission (health administrative				
1	department)				
2	Tertiary hospitals				
3	Secondary hospitals				
4	Community hospitals				
5	Patients / residents				
	Medical insurance departments(urban				
6	residents / workers / new rural cooperative				
	medical insurance)				
7	For-profit commercial medical insurance				
1	institutions				
8	Human resources and social security				
0	department				
9	Medical industry association				
10	Medical education institutions				
11	Science and technology management				
11	department				
12	Pharmaceutical consumables suppliers				
13	Relevant media				
14	Financial department				
15	Public hospitals outside the alliance				
16	Private hospitals outside the alliance				
17	Blood banks				
18	Public security organs, procuratorial				
10	organs and people's courts				
10	Industrial and commercial administration				
19	department				
20	Social retail pharmacy				
21	Centers for disease control and prevention				
22	Nursing homes				
Do yo	ou think it is necessary to add other stakehold	ers to the car	ndidates of	f stakeholders	in the

medical alliance? If yes, please specify.

Your main basis for making the above judgment is (tick "√" in the agreed option): 1. Practical experience ( ) 3. Peer understanding ( ) 2. Theoretical analysis ( ) 4. Intuitive judgment ( ) How familiar are you with the medical alliance? (tick "√" in the agreed option) 1. Very familiar ( ) 2. Relatively familiar ( ) 3. General ( ) 4. Relatively unfamiliar ( ) 5. Very unfamiliar ( )

Thank you for your support and wish you every success!

### Annex **B**

Expert consultation questionnaire for stakeholder definition of Western Baiyun District Stroke Alliance (Round 2)

Dear experts,

We sincerely to invite you to be the consultant expert for the research project of Stakeholder Conflict in the Construction of the Western Baiyun District Stroke Alliance, and hope you can finish the questionnaire out of your tight schedule. The main purpose of this consultation is to identify and classify the specific stakeholders of the Western Baiyun District Stroke Alliance. Thank you very much for your support. Hope everything goes well with your work.

Research group of Western Baiyun District Stroke Alliance

				Mitchell	score-based approa	ch
S N	Stakeholder candidates	Amount of "Yes" in Round 1	Yes / no (√/ ×)	Power	Legitimacy	U r g e n c y
1	Health commission (health administrative department)	22				
2	Tertiary hospitals	22				
3	Secondary hospitals	21				
4	Community hospitals	21				
5	Patients / residents	22				
6	Medical insurance departments (urban residents / workers / new rural cooperative medical insurance)	19				
7	For-profit commercial medical insurance institutions	17				
8	Human resources and social security department	18				
9	Medical industry association	16				

10	Medical education institutions	10
11	Science and technology management department	10
12	Pharmaceutical consumables suppliers	19
13	Relevant media	12
14	Financial department	19
15	Public hospitals outside the alliance	17
16	Private hospitals outside the alliance	17
17	Blood banks	10
18	Public security organs, procuratorial organs and people's courts	6
19	Industrial and commercial administration department	5
20	Social retail pharmacy	14
21	Centers for disease control and prevention	6
22	Nursing homes	18
Do	you think it is necessary to add other stakeh	olders to the candidates of stakeholders in the medical alliance? yes, please specify.
	Your main basis for making the a	above judgment is (tick " $$ " in the agreed option):

four main basis for making the above judgment is (lick v in the agreed option).	
1. Practical experience ( ) 3. Peer understanding ( )	
2. Theoretical analysis ( ) 4. Intuitive judgment ( )	
How familiar are you with the medical alliance? (tick " $$ " in the agreed option)	
1. Very familiar ( ) 2. Relatively familiar ( ) 3. General ( ) 4. Relatively unfamiliar (	) 5. Very
unfamiliar ( )	

Thank you for your support and wish you every success!

## Annex C

Questionnaire for synergy in the Western Baiyun District Stroke Alliance

Dear stroke alliance members,

Thank you very much for taking part in this questionnaire out of your busy schedule. The purpose of this survey is to find out how your organization is doing in the synergy of the Western Baiyun District Stroke Alliance. Please fill out the questionnaire according to your knowledge and experience and make sure to answer all the questions. Thank you very much for your support! Hope everything goes well with your work.

Research group of Western Baiyun District Stroke Alliance

### 1. Please fill in your basic personal information

- (1) Name:
- (2) Gender:
- (3) Age:
- (4) Education:
- (5) Occupation:
- (6) Workplace:
- (7) Working years:
- (8) Professional title:

### 2. Evaluation of synergy

(Please score the performance of Western Baiyun District Stroke Alliance in the following measurement items, with "5" indicating that you believe it is done with an excellent performance, "4" indicating that you believe it is done with an above-average performance, "3" indicating that you believe it is basically done with an average performance, "2" indicating that you believe it is basically not done with a below-average performance, and "1" indicating that you believe it is not done or done with a very poor performance.)

					Score		
			5	4	3	2	1
Level	Factor	Measurement items	Excellent	Above	Average	Below	Very
				average	e	average	poor
		The regional stroke alliance establishes a strategic					
		program with unified goals.					
	Strategic synergy	There is top-level design of a framework for					
		An organizational for collaborative governance of					
		the stroke alliance is established.					
Macro		Members of the regional stroke alliance have					
		shared operation philosophy and strong sense of					
		alliance.					
	Cultural synergy	The regional stroke alliance establishes unified					
		values and big-picture thinking.					
		implements a unified code of conduct					
		The regional stroke alliance has a complete					
		structures and institutional system with strong					
		operability.					
		The rules and regulations and systems established					
	System synergy	by the alliance are all designed to maximize the					
		interests of the members.					
		A specialized organization is established at the					
		the member medical institutions					
Meso		Hospitals at all levels in the regional stroke					
		alliance work together to form an organization for					
		reform and innovation.					
	Innovation gymonau	Hospitals at all levels in the alliance share					
	mnovation synergy	experience of reform and innovation with each					
		other.					
		Hospitals at all levels exchange new technologies					
	Information arm	and demonstrate their innovation results.					
	mormation synergy	The regional stroke allance uses an information					

Emergency Response Model of Stroke in the Regional Medical Alliance

		system to manage hospitals at all levels and
		integrates and discloses information in a
		categorized manner.
		Hospitals at all levels in the alliance can easily and
		conveniently use the information system for
		diversified communication and collaboration.
		Hospitals at all levels in the alliance establish
		specialized departments for affairs of the regional
		stroke alliance to facilitate the transfer of
		information between the alliance and its member
		hospitals.
		Hospitals at different levels in the alliance
		communicate with each other on specific matters,
	Business synergy	and they cooperate with each other to achiever
		mutual promotion.
		Hospitals at all levels complement each other in
		business development
		The application, circulation and recognition of
		patient examination results is realized among
Micro		hospitals at all levels and all the departments.
		Hospitals within the alliance jointly purchase
		drugs, medical supplies, and medical equipment.
	Process synergy	Hospitals at all levels of the regional stroke
		alliance share the alliance brand with standardized
		marketing and promotion methods.
		The treatment processes of all hospitals in the
		regional stroke alliance are consistent and
		transparent, and two-way referral is implemented
		in a desirable manner.

Thank you for your support and wish you all the best!