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Value Chain of Pharmaceutical Care in Chinese Hospitals: The Case of Guangdong (Provincial) General Hospital

LIN Jia

Doctor of Management

Supervisors:
PhD Virgínia Trigo, Professor,
ISCTE University Institute of Lisbon
PhD Maria José Madeira, Professor,
University of Beira Interior

December, 2021

BUSINESS
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LIN Jia

Declaration

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

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Abstract

China's health reform directly changed the pharmacy department from a profit center of medical institutions into a cost center. Against this background, how to develop a new model of pharmaceutical care with sustainable added value has become an important opportunity and challenge for pharmacy departments.

In this study, the large-scale public hospitals in Guangdong Province, China were selected as the research object. The research objective of this thesis is to explore the added value of hospital pharmaceutical departments and present the basic concept of the value chain in managing and analyzing the relatively systematic feasibility of the model. This study analyzes the integration and optimization of the value-added chain, supply chain, cooperation chain and information chain in the context of China's new healthcare reform. Subsequently, this thesis proposes relevant measures to optimize the value chain of pharmaceutical departments taking into account the functional benefits, emotional benefits, time costs, money costs, and energy costs. Furthermore, this study deduces the "patient-centered" strategic values.

"Patient-centeredness", as the concrete embodiment of "customer first", reflects the new concept of the pharmaceutical department to realize value appreciation for patients. The core is to provide patients with satisfactory pharmaceutical service, maintain the commercial vitality of its sustainable management and operation.

This thesis aims at exploring new formats of adding value based on the pharmaceutical care practice of large-scale public hospitals, as well as analyzing the modalities of the value-added chain, so as to deliver benefit to the majority of patients, reduce the burden of hospital pharmacists, and meet government expectations.

Keywords: value chain, pharmaceutical care, patient centeredness
JEL: I11; M21

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Resumo

Uma das mais importantes medidas introduzidas pela reforma do sistema de saúde na China foi a transformação do departamento de farmácia de centro de lucro em centro de custos. Esta transformação trouxe oportunidades e desafios aos departamentos de farmácia obrigando-os a desenvolver novos modelos de operação sustentáveis.

Centrando-se nos hospitais públicos de grande dimensão da Província de Guangdong, China, esta tese explora o conceito de valor acrescentado dos departamentos farmacêuticos hospitalares, através da cadeia de valor da gestão de saúde e analisando a viabilidade sistemática do modelo. Adicionalmente, a tese propõe medidas para a otimização da cadeia de valor dos departamentos farmacêuticos tendo em conta os benefícios operacionais e emocionais bem como os custos de tempo, monetários e energéticos numa perspetiva estratégica centrada no utente.

Os "cuidados de saúde centrados no paciente", como a personificação concreta do "cliente em primeiro lugar", reflete o novo conceito do departamento farmacêutico visando a valorização do paciente. O foco é fornecer um serviço farmacêutico adequado, manter a vitalidade comercial da gestão e garantir a sustentabilidade de toda a operação.

Este estudo visa explorar novos formatos de criação de valor a partir da prática de assistência farmacêutica de hospitais públicos de grande dimensão, bem como analisar as modalidades da cadeia de valor acrescentado, de modo a proporcionar benefícios à maioria dos pacientes, reduzir a carga dos farmacêuticos hospitalares e atender às expectativas do governo.

Palavras-chave: cadeia de valor, assistência farmacêutica, centralização no doente
JEL: I11; M21

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摘　要

中国医改直接将药学部门从医疗机构的利润中心转变为成本中心。在此背景下，如何发展具有可持续附加值的药学护理新模式，成为药学部门面临的重要机遇和挑战。

本研究选取中国广东省大型公立医院为研究对象。本论文的研究目的是探索医院药学部门的附加值，提出价值链管理的基本概念，分析该模型相对系统的可行性。本研究分析了中国新医改背景下增值链、供应链、合作链和信息链的整合与优化。随后,本文从功能收益、情感收益、时间成本、金钱成本和能源成本等方面提出了优化医药部门价值链的相关措施。此外，本研究推导出“以患者为中心”的战略价值。

“以患者为中心”作为“客户至上”的具体体现，体现了药学部门实现患者价值增值的新理念。核心是为患者提供满意的药学服务，保持自身可持续经营经营的商业活力。

本文旨在基于大型公立医院药学服务实践探索增值新业态，分析增值链的模式，让广大患者受益，减轻医院药剂师负担，并满足政府的期望。

关键词：价值链，药学服务，以患者为中心

JEL: I11; M21

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Contents

Chapter 1: Introduction 1
1.1 Research background 1
1.2 Research content and research framework 2
1.3 Research implication 4
Chapter 2: Literature Review 7
2.1 Theoretical bases 7
2.1.1 Value chain 7
2.1.2 Framework analysis of value chain 8
2.1.3 Dimensions of value chain analysis 16
2.1.4 Value chains and supply chains 18
2.1.5 Typical applications of value chain analysis 18
2.1.6 The case for innovation in applied value chains 19
2.1.7 Outlook of the value chain 20
2.2 Transformation of pharmacy in the context of the new healthcare reform 23
2.2.1 Policy Interpretation 23
2.2.2 Policy directions for pharmaceutical care 30
2.3 Current development of clinical pharmacy abroad 43
Chapter 3: Research Methods 51
3.1 Research design 51
3.2 Selection of research methods 52
3.3 Data collection 53
3.3.1 National and international academic journals 55
3.3.2 Yearbooks and journals of the pharmaceutical societies 55
3.3.3 Web resources 55
3.3.4 Interviews 55
3.3.5 Field visit 56
3.4 Data processing 56
3.4.1 Data encoding process 59
3.4.2 Collection and coding of secondary data 62
3.4.3 Reliability and validity 62

Chapter 4: Value Chain of Pharmaceutical Care 65
4.1 The pharmacy value chain before the new healthcare reform 65
4.2 The pharmacy value chain in the post-healthcare reform era 67
4.3 The role and analysis of the value chain of pharmaceutical care 68
4.3.1 Supply chain 68
4.3.2 Collaborative chain 72
4.3.3 Value chain 75
4.3.4 Information chain 81
4.4 Enhancing the value chain of pharmaceutical care 84
4.4.1 Functional benefits 84
4.4.2 Emotional benefits 88
4.4.3 Cost of money 93
4.4.4 Time costs 95
4.4.5 Energy costs 96
4.5 The value chain and new business of pharmaceutical care 100
Chapter 5: Driving Strategic Value Change: Patients Centered 103
5.1 The transition from “drug-centeredness” to “patient-centeredness” 103
5.1.1 Strengthening patient-centered thinking in the dispensing of medicines 103
5.1.2 Strengthening patient-centered thinking in the process of prescription review 104
5.1.3 Enhancing patient-centered thinking in the medication guidance process 104
5.1.4 Strengthening patient-centered thinking in pharmacy science promotion 104
5.1.5 Strengthening the assumption of “patient-centered” thinking in information technology consultation channels 105
5.1.6 Strengthening the assumption of “patient-centered” thinking in pharmacy monitoring 105
5.2 The transformation from “back-office support” into “front office service” 108
5.3 Transformation of a “drug-issuing job” into “professional and technical job” 109
5.4 The transition from “passive process completion” to “active service delivery” 110
Chapter 6: Conclusions and Outlook 113
6.1 Conclusion and significance 113
6.2 Current situation: limitations and shortcomings of public hospitals 114
6.2.1 Difficulty in third-tired cities 115
6.2.1 Some initiatives facing policy risks 115
6.2.3 Lack of access to pharmaceutical care 116

6.2.4 The current state of building a team of pharmaceutical care professionals .. 116
6.3 Looking ahead: reforming the pharmacy service system in the post-epidemic era . 117
6.3.1 Deepening Internet medical services and promoting the integration of Internet medical and pharmacy 117
6.3.2 Promoting the implementation of pharmacist prescription review, an important step forward for the pharmacist function 119
6.3.3 The concept of "surgical pharmacists" 120
6.3.4 Individualized pharmaceutical care 121
6.4 Research limitations and outlook 121
Bibliography 125
Annex A: Other Diagrams 133
Annex B: Questionnaire 137
Annex C: The history of drug price reduction by the National Development and Reform Commission over the years (2005--2012) 143
Annex D: List of formal interviewees 147

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List of Tables

Table 2.1 Before and after changes in the economic upgrading of global value chains 8
Table 2.2 Characteristics of the two global commodity chains..... 9
Table 2.3 Major investment projects in China's semiconductor industry since January 2000 (global companies) 10
Table 2.4 Components of the business model 13
Table 2.5 Review of published VCA studies..... 21
Table 2.6 Healthcare expenditure as a proportion of fiscal expenditure since the 1980s 24
Table 2.7 Breakdown of drug dispensing fees in Japan 31
Table 2.8 Description, summary, QHES and ICER scores for the economic evaluation of PC 45
Table 3.1 Descriptive statistics for data collection..... 54
Table 3.2 Basic principles of data coding..... 59
Table 3.3 Summary of coding methods of secondary data in national policy documents (n=308) 62
Table 4.1 Summary of three national centralised procurements 69
Table 4.2 PC collaboration chain questionnaire 72
Table 4.3 PC collaboration chain survey results 72
Table 4.4 Market status of products and services in pharmacogenomics, 1998 to 2008 (in USD million) 79
Table 4.5 Percentage of sample role orientation for the "Exploring New Models of PC" survey scale 84
Table 4.6 Functional benefit results of the "Exploring New Models of PC" survey scale 85
Table 4.7 Results of the Patient Emotional Relationships section of the PC Exploring New Models survey scale 89
Table 4.8 List of hospitals with pharmacist clinics in pharmacy departments in Guangdong Province..... 93
Table 4.9 Questionnaire for delivery of peritoneal dialysis fluid..... 99
Table 5.1 "patient-centered" section of the "Exploring New Models of PC" survey scale ... 106
Table 5.2 "Consolidation and enhancement" section of the "Exploring New Models of PC" scale 109

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List of Figures

Figure 1.1 Components of a classic value-profit chain 3
Figure 2.1 Schematic representation of the changing structure of the apparel industry 11
Figure 2.2 Assessment of potential collaborators 11
Figure 2.3 Model of a typical value creation network 12
Figure 2.4 Exploring the scope of collaboration/partnership assessment in the value system 15
Figure 2.5 Assessing partner/collaborative innovation decisions 16
Figure 2.6 Publication of business model articles in the business/management field in recent years 21
Figure 3.1 Some coding structures 61

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List of Abbreviations

ACCP	American College of Clinical Pharmacy
COPD	chronic obstructive pulmonary disease
COVID-19	coronavirus
CPC	Communist Party of China
CPS	clinical pharmacy services
DEA	data envelopment analysis
ESRD	end stage renal disease
FICI-GP	General Practitioners in Tertiary Care Hospitals
FMCG	fast moving consumer goods
GCP	good clinical practice
GOP	Group purchasing organization
GPHL	Guangzhou Pharmaceutical Company Limited
GPs	general practitioners
GVC	global value chain
HIS	health information system
ICER	Incremental Cost Effectiveness Ratio
ICH	international council for harmonization
MTM	medication therapy management
NDRC	National Development and Reform Commission
PC	pharmaceutical care
PCR	polymerase chain reaction
PIVAS	pharmacy intravenous admixture service
QALYs	quality adjusted life years
QCC	Quality Control Circle
QHES	Quality of Health Economic Studies Instrument
R&D	research and development
SFDA	State Food and Drug Administration
SME	small and medium enterprises
SOP	standard operating procedure
TCM	traditional Chinese medicine

TDM	Therapeutic Drug Monitoring
VCA	value chain analysis

Chapter 1: Introduction

1.1 Research background

With China's continuous economic growth and technological progress since the reform and opening up, people's material living conditions have been enriched and satisfied. It has become a general trend that all industries should change their client-centric buyer's market. At the same time, as a large developing country with a population of 1.3 billion, China has a huge responsibility and mission to provide healthcare services as a safeguard for the basic human rights of its citizens. Faced with a new environment and a new market in which demand for services and products are diversifying, the optimization and reform of the healthcare system and hospital management system seem to have entered the deep-water zone where tough challenges must be met.

Compared with other industries, the reform of the medical industry has distinctive features and unique resistance. On the one hand, unlike general manufacturing and service industries, the medical industry has to maintain a certain degree of commerciality to realize its sustainable management and operational vitality, but also has a certain degree of public welfare to meet the expectations and requirements of the government and the public. On the other hand, due to the highly technical and risky nature of medical practice and the obvious differences and complexity of customer needs, there is a serious asymmetry in the information on medicine between doctors and patients. In addition, as China's hierarchical diagnosis and treatment system are still in the process of making, the number of patients exposed to each level of medical institutions is seriously unevenly distributed, worsening the lack of in-depth communication between doctors and patients.

In such a climate, if the existing hospital management ideas and methods are followed, it is difficult to truly touch the core issues of management system reform and nurture new organizational behavior patterns and business growth points, leaving the reform in a state of "much cry and little wool" for a long time.

However, since 2010, three dramatic changes in the environment have forced healthcare institutions (especially the pharmacy departments in healthcare institutions) to quickly come up with transformation solutions. Firstly, the overall pharmaceutical market is booming, and

the scope of retailing pharmacies in society is expanding, which gradually undermines the long-standing monopoly of traditional hospital pharmacies in medication supply. Secondly, with the widening access to pharmacy knowledge on the Internet, an increasing number of patients seek more differentiated, preventive, and advisory pharmacy guidance, which in turn places higher demands on the skill level and pharmacy quality of hospital pharmacists. Thirdly, strong policy interventions by government departments at all levels target at abolishing drug price make-up (hereinafter referred to as zero make-up) which required that pharmaceutical manufacturers issue an invoice to pharmaceutical distribution companies, and pharmaceutical distribution companies issue invoices to medical institutions to reduce the flow of drugs (hereinafter referred to as the "two-invoice system" adjusting the price of medical service, open and transparent drug procurement, and medical service improvement. These administrative measurements force medical institutions to step out of the comfort zone of a "drug-based medical care model" that achieves a high added value of drugs with doctors' labor and maintains the normal operation of hospitals by driving the economic benefits of hospitals with high profits of drugs. A series of measurements have changed the role of drugs from a profit center to a cost center for healthcare institutions (Ye, 2018).

It is fair to say that the transformation of pharmacy in healthcare institutions is no longer a slogan. How can pharmacy departments find new growth drivers in the context of the new healthcare reform? How to establish long-term and solid service relationships with patients? As an internal part of the healthcare organization, how should the pharmacy department readjust to its new role and positioning? These are questions that need to be discussed and resolved as they relate to the value proposition of pharmacy practitioners and the survival of pharmacy departments in the future.

1.2 Research content and research framework

Examining the reform of pharmaceutical care (PC) through the perspective of organizational management, the fundamental solution to these problems lies in a set of strategic values for the hospital pharmacy department that can be adapted to the new healthcare climate. To help organizations develop an effective tool for strategic analysis, Porter (1985) proposed the value chain in the early 1980s that states that the value chain of any organization consists of a series of independent and interlinked activities, including the generally accepted production processes such as supply, production, service, logistics, marketing and after-sales, as well as supporting value-added activities such as organization, personnel, information and

decision-making as shown in Figure 1.1. However, among the "value activities" of an organization, not every link can create value, i.e., "value addition". Only by maintaining the organization's management from the perspective of the entire value chain, and by identifying the value chain links with core competencies for optimization and upgrading, can we achieve optimal business performance, accomplish the virtuous cycle of the organization, and improve the overall business performance (Chi, 2000).

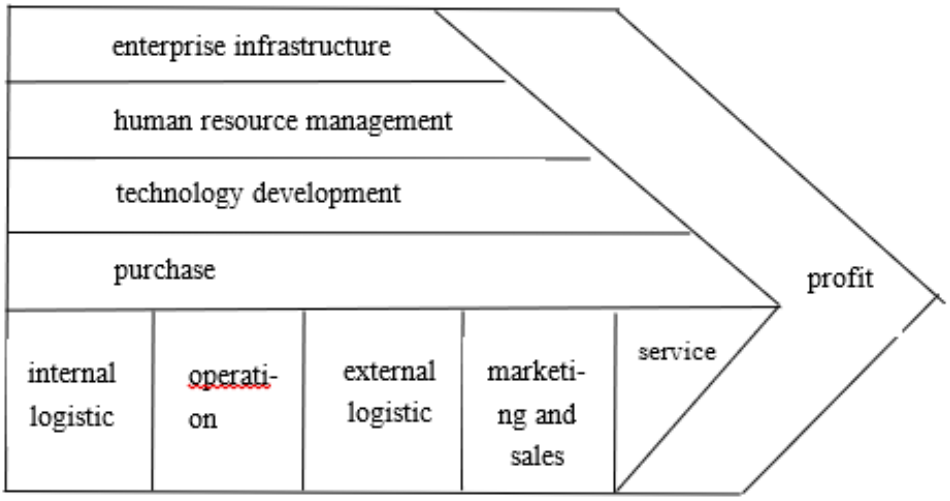

Figure 1.1 Components of a classic value-profit chain

Through the analysis of value chain theory, it is easy to deduce the new focus of the value-added transformation of the pharmacy sector in the context of the new healthcare reform: patient orientation.

In contrast to the strategic philosophy of the traditional pharmacy sector with a focus on medication guarantee, the process of dispensing medicines no longer occupies the main position in the hospital's value and profit chain due to the zero make-up policy of drug price. The policy restrictions and full competition in the market have predetermined that the pharmacy sector will transform from facing the upstream supply chain to facing the downstream service chain, which is also in line with the people and government's expectations that healthcare institutions deliver public good by treating patients and saving lives. At another level, from the perspective of PC, the pharmacy sector needs to move from "what kind of PC we can provide" to "what kind of PC patients need" as a guideline and basis for exploring business models (Li, 2019; Y. Liu et al., 2017)

Another well-established management theory is value exchange management, which assumes that the essence of the business process is the exchange of value and that the value added by firms is the surplus of value generated by this exchange. Although it was developed centuries ago, it is becoming an important marketing tenet for many emerging companies,

especially internet companies, along with customer lifetime value. The theory can be broken down into three parts: to the customer (i.e., the patient), to the employee (i.e., the pharmacist) and the investor (i.e., the rest of the hospital, government departments) (Yan et al., 2013).

For patients, the core of value exchange lies in the identification and differentiation of target customer groups. As mentioned before, different patients have very different needs and wish for clinical pharmacy service (CPS). Higher-level service needs are not properly perceived by the pharmacy staff whose primary responsibility is to dispense medication in today's environment. On the other hand, how to tap into the lifetime value of chronically disease patients, healthcare clients, and high-risk populations? How to effectively obtain feedback from clients on the services provided by the organization? How to build an information base of practical and actionable PC for frontline pharmacists? For staff, the "separation of medicine" has essentially led the pharmacy to return to its rightful role, and it should offer the frontline pharmacists a new arena. However, in practice, how can healthcare organizations efficiently acquire pharmacy talent that is adapted to the new business model of healthcare service? How can existing staff be trained in healthcare service skills? For investors, how can pharmacy departments, as a part of the healthcare organization, escape the role of a cost center? How can we help hospitals make as much profit as possible within the regulatory requirements of government departments? These questions can all be explored within the framework of value exchange management.

1.3 Research implication

In recent years, with the gradual implementation of policies and the gradual enrichment of patients' needs, the reform of pharmacy departments in healthcare institutions has become urgent. This issue is more relevant in the context of the new healthcare reform "zero make-up" policy, which has shifted the pharmacy department from a major profit center of hospitals to a cost center.

As many firms are attempting, pharmacy departments in healthcare institutions are also looking for new profit growth points and business models to maintain their operation and sustain profitability. Therefore, this study aims to explore the dilemma of hospital pharmacy departments in today's environment, combine the actual needs of hospital pharmacy departments with a series of management theories such as value-profit, value exchange and patient-centered approach, based on the exploration and practice of tertiary hospitals (the highest level of Chinese hospitals) in China. It is hoped that new and effective business

models can be drawn up to help pharmacy departments add their value, benefit patients, reduce the burden on hospitals, help pharmacists achieve their aspirations, and meet government expectations.

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Chapter 2: Literature Review

2.1 Theoretical bases

2.1.1 Value chain

The concept of "value chain" was first introduced by Porter (1985), and it aims to describe all the activities that a product or service undergoes at different stages of its life cycle, from conception, production, distribution, and to the consumer and final disposal after use. The theory assumes that a product gains value when it is passed from one participant in the chain to another (Hellin, 2006). Therefore, the concept of the value chain can be used as a tool to classify firms into major modules and identify the sources of their competitive advantage. For many years, this concept has been the focus of academic research in the field of economics and management (Moedas, 2006; Pereira et al., 2018).

Since the introduction of the concept, value chain and its analysis has been far from limited to the application of case study of a single company but have long been used to examine and evaluate entire industries and industry clusters as well as specific systems within companies. In addition, it is also used to examine the activities of an increasing number of economies covering multiple countries, the so-called "global value chain (GVC)". The related studies are also referred to as global commodity chains, global production networks or international supply chains. GVCs define economic upgrading as a shift to higher value-added products, services, and stages of production through increased specialization and effective domestic and international links. GVCs emphasises the importance of international links in establishing the front and back end of cross-border trade.

In the face of a volatile international economic situation, flexibility is a key winning factor. As shown in Table 2.1, the focus of each link in the supply chain has also changed. In recent years, research in this area has expanded to examine economic upgrading, in particular, whether economic upgrading of global firms necessarily improves workers' rights, the quality of their employment and, ultimately, the upgrading of society (Boffa, 2018; Barnes, 2003; Lee et al., 2011).

Table 2.1 Before and after changes in the economic upgrading of global value chains

Activity	Traditional Approach	Emerging Changes
Capacity planning	Deterministic •capacity, service levels and performance requirements are fixed at contract closure	Stochastic • proceeding by conjecture • reserve capacity that covers baseload • up-scaling if the product becomes a hit Rolling commitment • aggregate capacity is reserved for the contract period
Production planning	Precise commitment •product mix and linkages are determined at contract closure	• Original equipment manufacturer reserves right to decide how to use that capacity just before actual production starts • CMs must provide flexible production systems that allow alternative uses
Product design	Frozen •minimal changes in configuration	Flexible • allow for variations in availability of parts and components • ditto for capacity • faster turnover extends successful lines with derivates
Network governance	Strategy shapes structure •develop network organization in line with a given strategy •control every aspect of the value chain	Iterative learning • start outsourcing arrangement, without seeking perfect solution at the beginning • correct as you go along • speed of iterative adjustment is key to profitability
Performance expectations	Focused • unit cost reduction over a small range of production volumes • limited scalability • local, not global optimum	Systemic • combine unit cost reduction with extended scalability • flexible use of reserved capacity • focus on high-margin products and services • 90% of the global optimum — fast

Source: Ernst (2003)

In summary, value chain theory has evolved to encompass a number of areas that are too numerous to discuss in detail due to the space constraints of this thesis. Therefore, this literature review will a select group of literature from Porter (1985) original conceptualisation of the value chain model, with the aim of briefly illustrating the framework underlying value chain analysis (VCA), outlining the factors that influence how well value chains work, and attempting to point to future research directions in this area.

2.1.2 Framework analysis of value chain

The value margin chain is made up of a series of related phenomena that are organised according to the following assumptions.

Firstly, customer loyalty and commitment are the main drivers of organizational growth and live profitability.

Secondly, if customers are more satisfied with a business compared to its competitors, they will develop loyalty and commitment.

Thirdly, if a company can bring more value to its customers than its competitors, it will make them happy.

Fourthly, value is created by satisfied, loyal, committed, and prolific employees. This is felt by customers (internal and external to the organization), suppliers and other key stakeholders, and is reinforced by the satisfaction of those employees who have direct contact with the stakeholders.

Fifthly, employee satisfaction is brought about by a number of factors, the most important of which are "fairness" in management, the quality of coworkers in the workplace, the opportunities for personal growth at work, competence, the constraints received in communicating results to customers, the level of customer satisfaction in positions facing customers (the so-called mirror effect), and payroll. According to many studies on this phenomenon, these factors are often ranked in the above-mentioned order of importance. The core to high value and low cost is the development of organizational competencies.

Sixthly, the elements of the value-profit chain are self-reinforcing in relation to each other. They can either facilitate or hinder the progress of the organization's performance.

Table 2.2 Characteristics of the two global commodity chains

Commodity chain	Buyer-driven	Producer-driven
Typical example industry	Labour-intensive industries such as apparel, footwear, toys, consumer electronics, handcrafted items	Capital and technology-intensive industries such as automobiles, semiconductors, computers, and aircrafts
Who takes the pivotal role	Large retailers, brand-named merchandisers and trading companies	Transnational corporations or other large integrated industrial enterprises
Production system	Decentralized and horizontal	Centralized and vertically integrated
Source of profit	Design, value, services and marketing	Economies of scale, volume, and technological advances

Source: Abecassis-Moedas (2006)

As shown in Table 2.2, a common way of classifying value chains is according to the different roles that drive them: buyer-driven chains versus producer-driven chains. Buyer-driven chains are more common in labour-intensive consumer goods industries, where large retailers, distributors and trading companies often play a central role in establishing production networks (often in developing countries as exporters). Producer-driven chains are more commonly seen in capital-intensive and technology-oriented industries, where large multinational companies often play a leading role in managing production networks (Moedas, 2006). Buyer-driven chains are commonly found in the apparel, footwear, toys, household goods and consumer electronics industries, while producer-driven chains are concentrated in

the semiconductor, motor and automotive industries, Table 2.3 lists some of the major investment projects in the semiconductor industry in China in recent years.

Table 2.3 Major investment projects in China's semiconductor industry since January 2000 (global companies)

	Location	Activities	Investment (USD bn)	Capacity/Technology
SMIC (Semiconductor Manufacturing Corporation)	Shanghai	silicon foundry		480.000 8-inch wafers at 0.25 micron
Shanghai Grace Semiconductor Manufacturing Corporation	Shanghai	silicon foundry	1.6	
TSMC	considering the investment in a silicon foundry			
UMC	ditto			
ASE (Advanced Semiconductor Engineering Inc)	Hangzhou Zhejiang province	IC assembly and test	0.0028	
US1 Electronics (Universal Scientific Industrial Co Ltd.), a subsidiary of ASE	Shenzhen	PC motherboards (Pentium 4) for IBM. via USI Co Ltd. Taiwan	Operating revenues for 2001: USD 100 million	Capacity expansion from 6 to 10 lines • monthly production capacity increasing to 400.000 units
Siliconware Precision Ind Co	Shanghai	Integrated circuit assembly and test		

Source: Ernst (2003)

However, regardless of who drives the chain, value addition in the production of a product is represented by a natural sequence of operations from one stage to another, with value addition implying the creation and capture of value. It is not difficult to understand that every strategically important activity requires investment in resources, and therefore there is scope for adding value at each stage of the chain.

Similarly, the competition and success of a chain depend on its position in the chain and the value it can create and obtain. Invista is a textile and apparel company owned by DuPont and Danskin. A series of case studies were conducted along the chain from raw material extraction to primary manufacturing, mainly its fibers and fabrics. Then comes the manufacture of the goods, followed by the development, marketing and retailing of products with patented and proprietary features. A key finding of the study is that external knowledge management systems bring members of the value chain closer together and add value to the chain as a whole. Building organizational memory through knowledge management systems

is an important prerequisite for knowledge sharing between companies and their value chain partners. If an internal knowledge management system is not in place, organizational learning does not take place and new knowledge is not stored in organizational memory. As shown in Figure 2.1, the management system is divided into four separate components, namely acquisition, retention, maintenance, and retrieval.

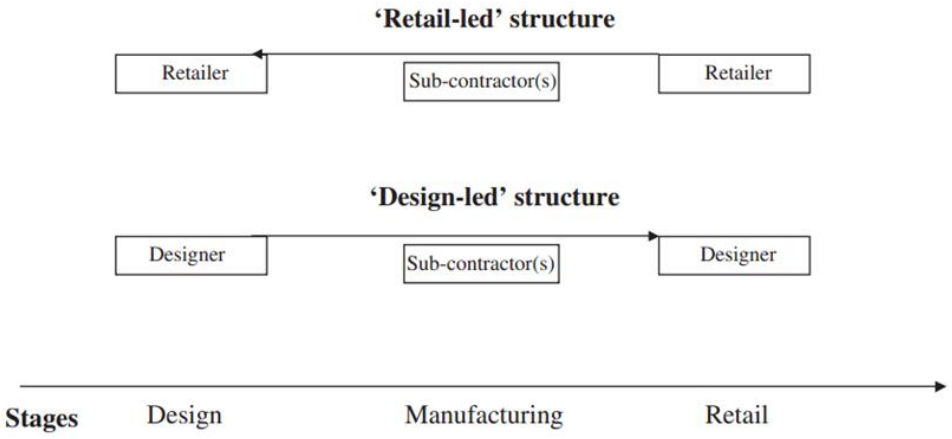

Figure 2.1 Schematic representation of the changing structure of the apparel industry
Source: Abecassis-Moedas (2006)

Furthermore, it was argued that value creation in value chains occurs at least at two levels: at the industry level (industry value chain) where the firm operates and at the firm level. Value creation depends on the ability to improve performance at the point of interest to the customer (Kothandaraman, 2001). Creating value for customers beyond cost is the ultimate goal of any overall strategy, and different processes of creating value for customers can be presented in Figure 2.2.

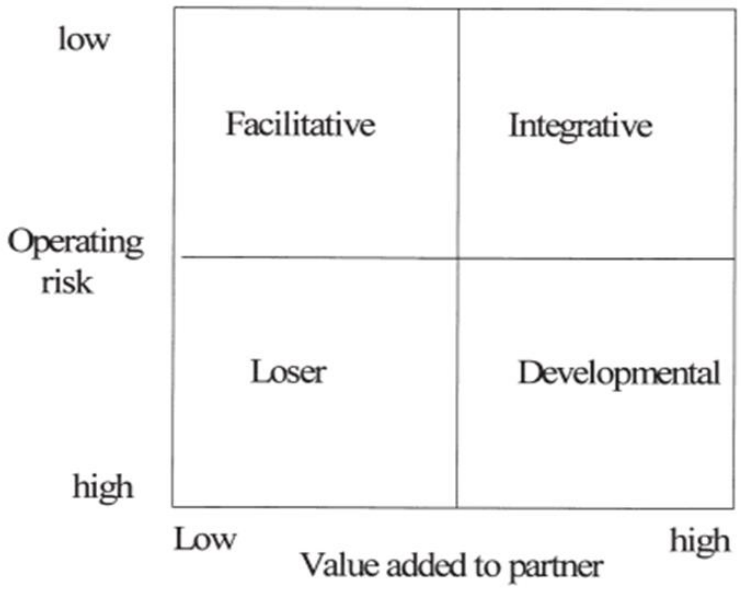

Figure 2.2 Assessment of potential collaborators
Source: Kothandaraman and Wilson (2001)

Thus, in this theory, it is value rather than a cost that determines the competitive position. In the other section of this thesis, a conceptual model was, constructed to describe the three core concepts of excellent customer value, core competencies, and relationships in value creation. As shown in Figure 2.3, a value creation network is used as a target to create excellent customer value. The degree of value creation in the network is influenced by the core competencies of the firm members. In other words, the core competencies of the firm members work together to create superior customer value. How firms join together in a network to create this value is influenced by the nature of the relationships between them. Therefore, the quality of the relationships contributes to value creation. If the relationships between firms are faulty, core competencies cannot be effectively integrated and then the value created by the network may not be significant. Relationships also keep networks in place and help firms to invest in maintaining and improving their core competencies.

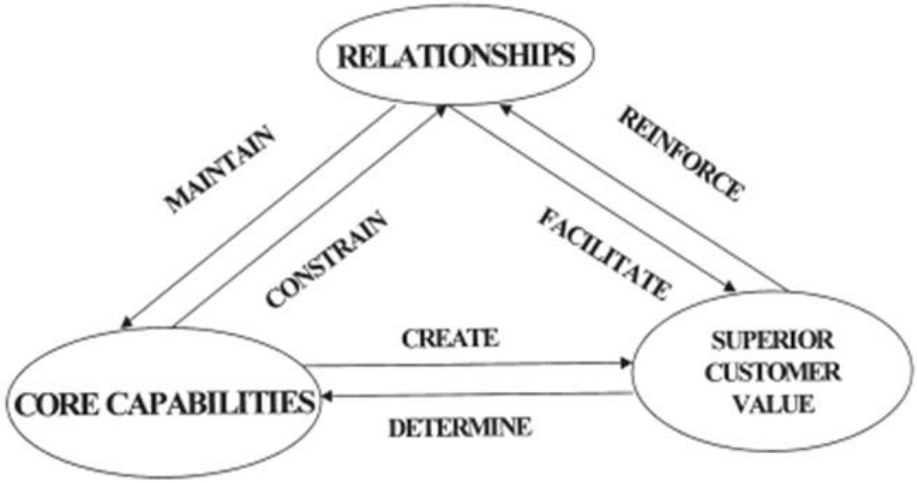

Figure 2.3 Model of a typical value creation network
Source: Kothandaraman and Wilson (2001)

The value of customers, suppliers, investors, and other important stakeholders can be expressed in terms of four elements and follows the following equation.

Value = (high quality results + process)/(cost to customer + price)

It is worth noting that while early management studies tended to focus on the firm as the primary unit of production, more recent studies have tended to use value chains that extend beyond the firm itself and even beyond industry boundaries. VCA overcomes the static and limited weakness of traditional analysis in identifying success factors (Kaplinsky, 2001). It highlights the analysis of complex and dynamic linkages within networks where value creation and the process of value acquisition take place within a value system where a complete business ecosystem is formed by suppliers, distributors, partners, and collaborators. This increases a firm's access to resources and opportunities (Zott et al., 2011). Table 2.4

presents the first- and second- order themes in the analysis network.

Table 2.4 Components of the business model

Components of business Models		
Author	First-Order Theme(s)	Second-Order Theme(s)
Rappa (2001)		Value: Benefts returned to sukeholders; Benefits returned to the firm; Market share and performance; Brand and reputation; Financial performance
	Sustainability	
	Revenue stream	
	Costmerure	
	Value chain positioning	
Oasterwaider (2004)	Value proposition	Relaiionship
	Customer segments	Value configuration
	Partner`s network	Capability
	Delivery channel	Cost structure
	Revenue stream	
Bonaccotsi et al. (2006)	Produce and services delivery	Network (structural aspects)
	Customers	Network externalities
	Cost structure	
	Income	
Brousseau and Peturd (2006)	Cost	Pricing strategies
	Revenue stream	Relationships (demand and supply)
	Sustainable income generation	Network externalities
	Goods and service production and exchanges	
Mahadevan (2000)	Value stream for partners and buyers network (identifies the value propostion for the buyer, sellers, and market makers and portals in an Internet context)	
	Revenue stream (a plan for assuring revenue generation for the business)	
	Logistcal stream (adds various issues related to the design of lhe supply chain for the business)	
Stewart and Zhao (2000)	Profit stream (includes the revenue stream and cost structure)	Customer selection Value capture Differentiation and strategic control Scope
Afuah and Tucci (2001)	A system made of components, linkages between components, and dynamics	Scope Price
	Customer value (the extent to which the firm's offer is distinct or has a lower cost than its competitors`)	Connected activities Implementation Capabilities Sustainability
	Revenue sources (Where do the dollars come from? Who pays what value and when? What are the margins in each	

Components of business Models		
	market and what drives them? What drives value in each source?)	
Alt and Zimmerman (2001)	Mission	Mission:
	Structure	Goals, Vision; Value proposition Structure
	Processes	
	Revenues	Actors and governance; Focus Processes
	Legal issues	Customer orientation; Coordination mechanism
	Technology	Revenues:
		Source of revenues; business logic
Applegate (2001)	Concept (describes an opportunity)	Concept.
	Capabilities (deline the resources needed to turn the concept into reality)	Market opportunity: product and service offered. competitive dynamic; strategy for capturing a dominant position; strategic options for evolving the business for evolving the business
	Value (measures the return to investors and other stakeholders)	Capabilities:
		People and partners, organization and culture; operating model; marketing sales model; management model; business development model; infrastructure model

Source: Zott et al. (2011)

In addition, VCA requires a "market map" to track and analyse the contributions of the different chain players and the relationships between them. Understanding the interactions within the value chain is a key determinant of how the value chain works, and the resulting "market map" defines the value chain actors, the operating environment and the service providers. The business environment includes many of the key factors that create the operating conditions for the functioning of a value chain, such as infrastructure, policies and regulations, as well as the institutions and processes that shape the market ecosystem.

While these factors are beyond the control of the value chain actors, it is important to examine them to identify trends affecting the chain and the drivers of these trends. These factors are key in business decisions to identify opportunities for lobbying and policy entrepreneurship (Stella et al., 2018; Hellin, 2006). Against this background, service providers include actors that provide support or facilitation services in the value chain, such as market information, financial services, transport services, research and development facilities and certification services.

Industry-level VCA is an effective way to examine the interactions between different players in a given industry. It helps to identify the resources needed for successful competition in a given industry and how each chain actor can maximise their returns and the returns of the

value chain. Collaborative innovation combines elements of product and process innovation management in a "network structure" to create a product service response that no other partners can create using their resources alone. Product service response extends to both directions of the value chain: upstream and downstream (Archer et al., 2007).

For example, in the example in Figure 2.4, customer value can be recreated in many parts of the value system. IKEA's value proposition is a combination of design, quality, and competitive pricing. To deliver this, IKEA has established upstream partnerships with its manufacturers and suppliers. Each manufacturer in the chain use manufacturing methods developed by them and IKEA to ensure the consistency of style and quality. Moreover, IKEA has established partnerships with downstream clients/consumers who generally "sell" the products to themselves. These clients and consumers take on the logistics function themselves and complete the manufacturing process by assembling the products themselves. This relationship is a model of collaborative innovation and co-production.

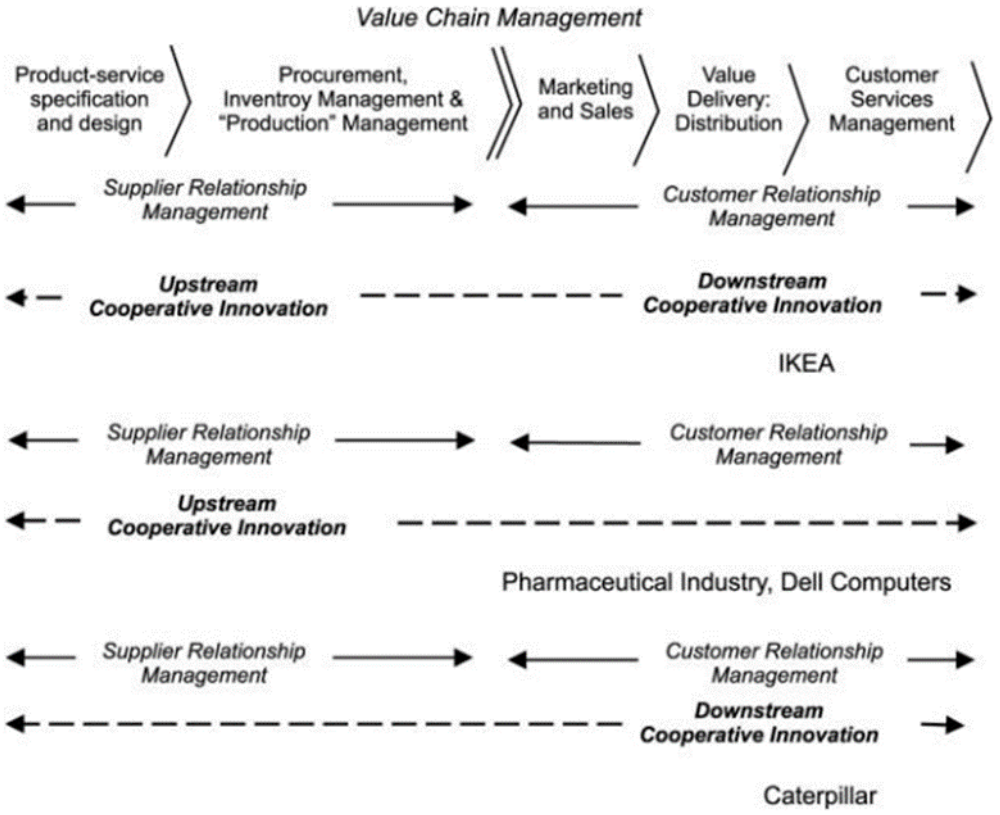

Figure 2.4 Exploring the scope of collaboration/partnership assessment in the value system
Source: Archer et al. (2007)

Figure 2.5 shows the structure of the value chain. The most step is the identification of target customers and their value drivers, followed by the identification of alternative methods of delivering and servicing customer value and how customer satisfaction can be improved through collaboration or collaborative innovation. The choice of upstream and downstream

targets has little impact on the decision making at the design process of product and service, but it is important to note that collaborative activities involving assets, processes and competencies have a greater impact on control and coordination.

From a value chain perspective, all firms can be summarised as part of a value creation network. However, some firms have more influence in shaping the network than others, while others play a secondary role and tend to be shaped by the network (Remneland-Wik H Amn et al., 2019; Kothandaraman, 2001).

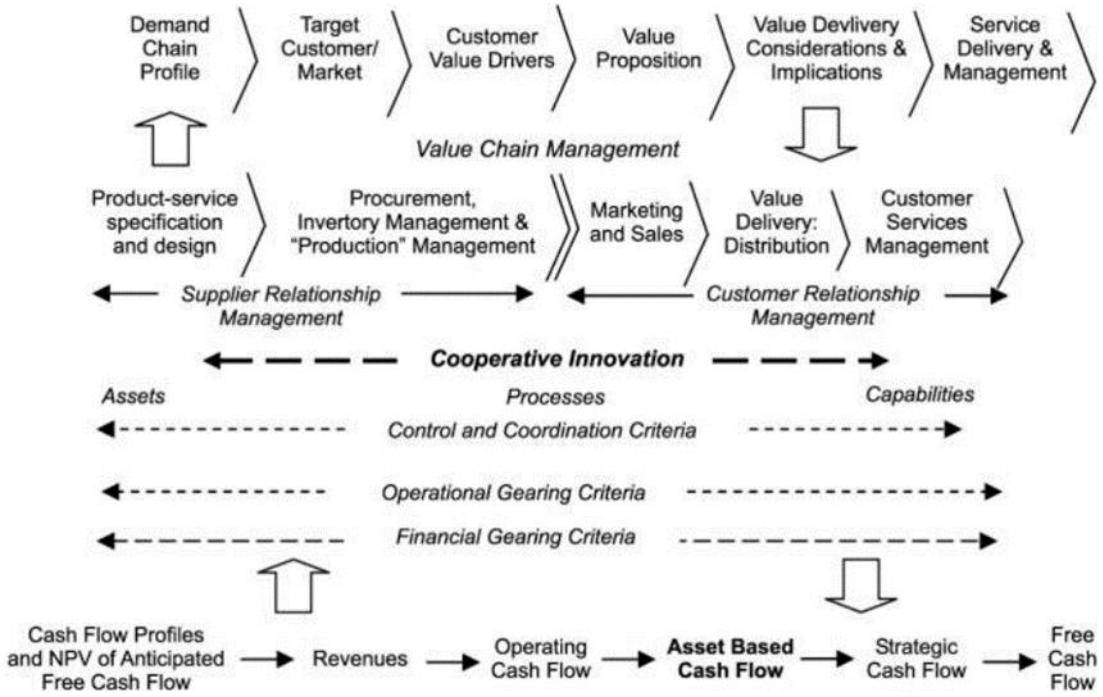

Figure 2.5 Assessing partner/collaborative innovation decisions
Source: Archer et al. (2007)

2.1.3 Dimensions of value chain analysis

Many previous researchers clarified the approach to VCA by prescribing tests of the key dimensions of the value chain. According to Fearne et al. (2012), the inclusion of environmental and social impacts into the value chain framework helps to adopt a broader view to ensure that value chains achieve sustainable competitive advantage. To this end, they provided three dimensions that can be used in VCA, namely the boundaries of the analysis, the range of values to be considered, and governance.

Concerning the boundaries of analysis, most value chain research has focused on an intra-firm perspective, which is consistent with Porter's original concept of value chains. However, value chains are now increasingly considered as systems of multiple companies, each recognising the need for a coherent strategy along the chain. This has led to stronger

partnerships between the participants in the chain and ultimately deliver greater benefits for customers. However, the boundaries of analysis may have to extend beyond the intra-firm context to end-of-life management.

Then there is the range of values to be considered. In VCA, it is important to examine the sources and beneficiaries of the value created by the value chain. While it is important to focus on customer value, VCA needs to be more dynamic and explore how activities and attributes influence consumer behaviour, as individual customers evaluate product attributes in different ways and consider many other factors, including their gender, culture and socio-economic status. All these factors influence their ability and willingness to buy and pay (Fearne et al., 2012). VCA is therefore suitable for identifying specific market segments, rather than treating customers as a single homogeneous group.

From a VCA perspective, Lee et al. (2011) defined governance as the authority and power relationships that determine how financial, material and human resources are allocated and moved within a chain. Fearne et al. (2012) observed that some early studies applying VCA limited their investigations to identifying material and information flows. These studies did not consider the potential impact of intra-chain relationships that can bring about productive collaboration. However, productive collaboration is essential for generating innovation and ensuring the competitiveness of the chain and its actors.

It is worth noting that, in contrast to Fearne et al.'s (2012) view, Boehlje (1999) proposed six dimensions of the value chain, namely: processes, product flows, financial flows, information flows, incentive systems, and governance.

Value chain processes include the activity of creating attributes or products that are needed or used by consumers/end users. The characteristics of the product flow include the transport and logistics necessary to move products between processes, the details of scheduling to ensure that products are available at all stages of the process without accumulating excessive inventory, the enhancement and maintenance of various quality attributes, and the use of plant and equipment at all stages of the value chain to reduce downtime time or bottlenecks. A key issue in managing product flows in the value chain is managing slack or flexibility and interdependence to accommodate unexpected disruptions or events.

Financial flows take place between chain participants and processes, including the technology of financial transfers and the sharing of financial performance information between participants. Information flows also occur throughout the whole chain. Important elements of this dimension are the accuracy of messages, the strength of these messages, the

cost of messages, the speed of transmitting and receiving messages, and the openness of sharing between participants.

The incentive system contains performance incentives and risk sharing, price premiums, profit sharing, cost-sharing, financial assistance, loan guarantees, long-term commitments, and market access.

Last, chain governance refers to systems of coordination within the value chain. Alternative forms of coordination encompass open market access, various forms of contracts, strategic alliances, joint ventures, franchising arrangements, networks and cooperatives, and vertical ownership. The choice of system imposes a significant impact on who has power and control in the value chain and how risks and rewards are shared.

2.1.4 Value chains and supply chains

According to Fearne et al. (2012), there are significant differences between the concepts of the value chain and supply chain. Supply chain thinking applies to commodities and commodity markets, while value chain thinking is more applicable to differentiated products and market segments. Supply chain management aims to reduce costs, increase profits and increase market share. Value chain management is about adding value and segmenting markets through differentiated products designed to improve profitability at all stages of the value chain. Furthermore, supply chain management focuses on efficiency, market access, and increased distribution, value chain management focuses on quality, service, and agility, with distribution determined by consumer demand rather than capacity utilisation.

While other researchers argued that supply and value chains do not need to be deliberately distinguished (Boehlje, 1999; Singh, 2006). In those study of the Indian organic cotton industry, supply and value chains are used interchangeably to refer to industrial networks. He explained the difference between the supply/value chain approach and traditional economic analysis and emphasised that the chain model focuses on performing functions rather than the agents that perform them. He suggested and encouraged this interdependence between the various stages of the supply/value chain.

2.1.5 Typical applications of value chain analysis

In order to predict the future of mobile commerce (m-commerce), Barnes (2003) examined the key players and technologies in the m-commerce value chain in relation to infrastructure, services, and content. His research focused on the business-to-consumer market, which is

considered to be the most embryonic part of m-commerce. Barnes (2003) identified six key components of the m-commerce value chain, namely: mobile transport, mobile services and delivery support, mobile interfaces and applications, content creation, content packages, and market-making.

Qualitative analysis of value chains is not easy, and even within the same sector, leading companies may organise their value chains in different ways. A simple example is that, unlike Apple which outsources its entire smartphone production to China, Nokia keeps a large part of its production in Finland. The different market segments (e.g., high-end and low-end) and geographical markets have different structures and patterns of value creation. Through a qualitative analysis of the value chain, Barnes (2003) was able to identify the emergence of globalised technologies as the most critical factor driving mobile commerce forward. These technologies support location-based applications.

Another example is Rogan et al. (2010) analysis of qualitative value chains to investigate the role of the market and regulatory structures in creating an enabling environment for the availability and diffusion of emergency contraception. Using in-depth and semi-structured interviews with contraceptive clients, suppliers, industry respondents and stakeholders from national and provincial governments, the authors mapped the emergency contraception value chain. The findings suggest possible reasons for the low use of emergency contraception. An important finding is that financial and structural barriers delay the provision of emergency contraception to public and private health facilities. VCA was found to be a useful tool for studying the industry, particularly supply-side constraints.

2.1.6 The case for innovation in applied value chains

Chiu et al. (2012) used data envelopment analysis (DEA) as an assessment framework to study the research and development (R&D) and production efficiency of 21 Chinese high-tech companies. The framework allowed the measurement of R&D and production efficiency within individual implementations and consisted of two phases. The first phase involved the calculation of the efficiency of the R&D process, the output of which was patents. Patents were in turn used as inputs in the second phase, which involved the calculation of production efficiency. The results of the study showed that R&D efficiency is independent of operational efficiency. The added value of innovative R&D in operational performance is not evident in most high-tech firms. Only a minority of firms focus on R&D and operational efficiency, even though allocating resources to both R&D and production efficiency is crucial for the success

of high-tech firms in a value chain framework. Another interesting finding is that improving R&D and operational efficiency requires a reduction in R&D resource consumption and an increase in the operational final output, as well as a reduction in patents that do not create value effectively.

Loebis and Schmitz studied the furniture industry in Central Java, Indonesia, to determine whether small and medium enterprises (SMEs) in the industry benefited from participation in global markets. They cited two opposing views on the sources of innovation. The local cluster theory claims that the knowledge needed to upgrade products and processes comes from within the cluster, while the GVC theory emphasises that this knowledge comes from outside the cluster, particularly from global buyers. They paid visits to Semarang, Jepara, and Klaten and had discussions with traders in these and other parts of Central Java. They found that while furniture chains are buyer-driven, upgrading prospects depend to a large extent on the producers and their buyers. In some cases, producers found themselves constrained with their large foreign buyers. However, this is not necessarily disadvantageous to small producers, as there is a mutual commitment between producers and buyers to work together to solve problems. Unfortunately, these buyers also source from other countries, such as Vietnam and China, which may offer a better deal. Therefore, although Loebis and Schmitz conclude that participation in the GVC of furniture manufacturers does benefit the industry, they question whether such gains are sustainable, since Vietnam and China may offer a better deal. Thus, while they concluded that participation in the GVCs of furniture manufacturing in Central Javanese does gain the benefit, they question whether such gains are sustainable. Vietnam and China, for example, may offer a better deal.

In addition, Zhu (2013) tested a value chain framework using a DEA network model to assess innovation efficiency in 13 cities in Jiangsu Province, China. The findings showed that there is no relationship between upstream R&D efficiency and downstream technology commercialisation efficiency. The latter contributes more to overall innovation efficiency than the former.

These examples fully illustrate the importance of value chain theory in examining the current situation of the industry and indicating the future direction of optimization, which is important for the innovative development of the industry.

2.1.7 Outlook of the value chain

It is easy to see from Figure 2.6 and Table 2.5 that a great deal of early work on value chains

and VCA has been published in recent years. Given the range of publications, it can be assumed that VCA is a useful and practical approach to help understand the relationships, components, and players within a sector or industry both from a local and global perspective. VCA and its variants and extensions presented in this literature review are only a small part of the rich and varied body of research in this area.

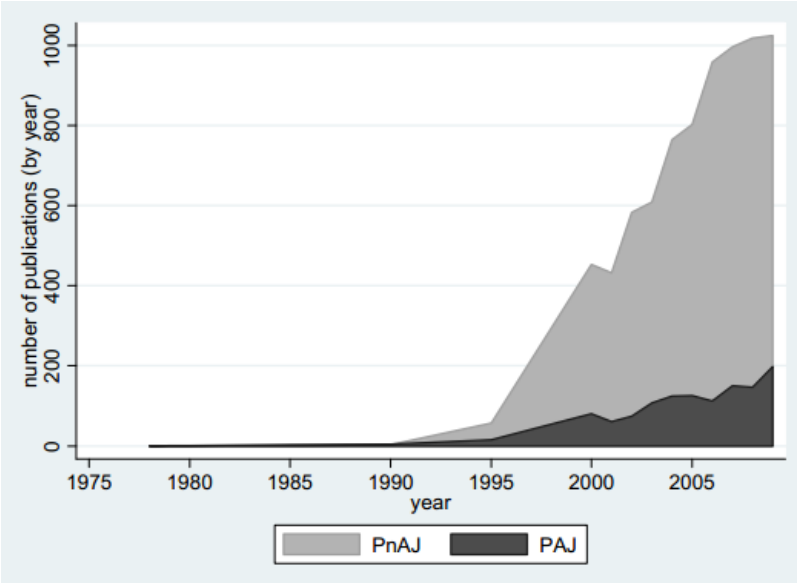

Figure 2.6 Publication of business model articles in the business/management field in recent years
Source: Zott et al. (2011)

Table 2.5 Review of published VCA studies

Author	Method or case study	Sector	Boundary of analysis	Dimensions Scope of value	Governance
Womack et al. (1990). Womack and Jones (1996)	Method	Multiple	Inter-firm	Customer	Not considered
Hines and Rich (1997)	Method and case	study Multiple	Inter-firm	Undefined	Not considered
Rother and Shook (1998)	Method	Multiple	Intra-firm	Internal cost/waste	Not considered
Rose and Stevels (2000); Rose et al. (2000)	Method and case	study Electronics	Inter-firm	Customer and consumer. Environmental impacts measured but no shared value creation	Not considered
Jones and Womack (2002)	Method	Multiple	Inter-firm	Customer	Not considered
Kaplinsky and Morris (2001)	Method	Multiple	Inter-firm	Customer and consumer	Collaboration
Dekker	Case study	Food	Inter-firm	Customer	Collaboration

Author	Method or case study	Sector	Boundary of analysis	Dimensions Scope of value	Governance
(2003)					
Simons et al. (2003)	Method and case study	Agrifood	Inter-firm	Consumer	Collaboration
Agriculture and Food Council of Alberta (2004)	Method	Agrifood	Inter-firm	Customer and consumer	Collaboration
Dolan and Humphrey (2004)	Case study	Agrifood/ development	Inter-firm	Customer	Considered without preference
Hines et al. (2004)	Method	Multiple	Inter-firm	Customer	Not considered
Taylor (2005)	Method	Agrifood	Inter-firm	Customer	Collaboration
Donaldson et al. (2006)	Method and case study	Healthcare and agrifood	Inter-firm	Customer and consumer	Not considered
Lummus et aL (2006)	Case study	Healthcare	Intra-firm	Internal cost/waste and customer	Not considered
Abdulmalek and Rajgopal (2007)	Case study	Manufacturing	Intrafirm	Internal cost/waste	Not considered
Bonney et aL (2007)	Method and case study	Agrifood	Inter-firm	Consumer	Collaboration
Da Silva and de Souza Filho (2007)	Agrifood	Inter-firm	Consumer	Collaboration	
Elloumi (2008)	Method Case study	Education	Inter-firm	Consumer	Not considered
Fearne et al. (2008)	Case study	Agrifood	Inter-firm	Consumer	Collaboration
Roztocki and Weistroffer (2008)	Method and case study	Services	Intra-firm	Internal (revenue minus costs)	Not considered
Seth et al. (2008)	Case study	Agrifood	Inter-firm	Customer	Not considered
Clark et al. (2009)	Case study	Agrifood	Inter-firm	Consumer	Collaboration
FaBe et aL (2009)	Method	Multiple	External stakeholders	Environmental impacts measured but no shared value creation	Considered with reference to Game Theory
Fearne et al. (2009); Dent et al. (2009)	Method and case study	Agrifood	Inter-firm	Consumer. Environmental impacts measured but	Collaboration

Author	Method or case study	Sector	Boundary of analysis	Dimensions Scope of value	Governance
Gooch et al. (2009)	Case study	Agrifood	Inter-firm	no shared value creation Consumer	

Source: Fearne et al. (2012)

The traditional or Porter (1985) view of VCA is a good starting point for any value chain study, but it still has its flaws. We can remedy it by examining activities in specific industries spread across multiple countries within the GVC framework. Future research may focus on GVCs in specific industries such as furniture, textiles and clothing and consumer electronics.

In addition, the results of studies using VCA need to be validated. There are also a number of issues related to the VCA model itself that need to be further investigated and addressed. This literature review is part of an ongoing study aimed at developing propositions and hypotheses for specific unresolved issues related to value chains and VCA. By expanding the literature review, a meta-analysis can be conducted to better understand the status of VCA as a research methodology and policy and decision-making tool for the global community at the firm, industry, and broader levels.

2.2 Transformation of pharmacy in the context of the new healthcare reform

2.2.1 Policy Interpretation

2.2.1.1 The main revenue models of the pharmacy sector before the era of healthcare reform

In China, public hospitals used to rely on three main sources of revenue: government subsidies, price make-up of drugs, and income from medical services. Data showed that in the 1970s, the main source of income for hospitals was the input of government departments, with subsidies from all levels of government accounting for more than 30% of the annual income of public hospitals (Ma, 2016).

The year 1985 is known as the first year of reform in China's healthcare system. The reform slogan of "devolution of power and decrease of profit to expand the autonomy of hospitals" marked the first transformation of the development model of public hospitals. Since the reform and opening up in 1987, China's healthcare institutions have established a transition from a single public ownership system to a model where multiple ownership

systems co-exist. The proportion of healthcare subsidies to financial expenditure has also fallen from 36.2% in the 1980s to around 7% (see Table 2.6). From these figures, it is seen that public hospitals can no longer rely on government subsidies (Ye, 2018).

Table 2.6 Healthcare expenditure as a proportion of fiscal expenditure since the 1980s

Year	1980	1990	1995	2000	2005	2010	2015
Proportion (%)	36.2	25.1	18.0	15.5	15.9	6.50	7.10

Moreover, the structural adjustment of financial subsidies dealt a huge blow to the revenue structure of public hospitals. Before the full implementation of the health insurance policy, financial subsidies were mainly "supply-side subsidies", i.e., financial expenditures on healthcare were mainly allocated to public healthcare institutions. However, after the implementation of the health insurance policy, the government's health and family planning were coordinated in a way that takes into account both supply and demand. Data showed that during the 12th Five-Year Plan period, expenditure on healthcare and family planning increased from RMB 325.1 billion in 2011 to RMB 565.7 billion in 2015, with an average annual growth rate of 13.4% (Y. J. Guo et al., 2013; Huang, 2009).

There is an increasing difficulty in obtaining policy subsidies for investment, so the second way out is income from medical services. China has been trying to promote the transformation of hospital PC from a "supply guarantee" to a "technical service" since around 1980. Unfortunately, for a long time, the price of medical skills and services in public hospitals has also been at a low level. The pricing of items such as registration fees, bed fees, nursing fees and surgical fees is even lower than the actual cost of the services provided by the hospital. As a result, the main profitability of hospitals has fallen on the price make-up of drugs.

Starting in 1985, according to the National Development and Reform Commission (NDRC), hospital pharmacies were allowed a certain margin of variation in pricing based on different drug attributes, with a 15% mark-up for western and proprietary Chinese medicines, and up to 25% for Chinese herbal tablets. This drug price mark-up policy has made the pharmacy an important profit center for public hospitals. According to a 2007 survey, the percentage of revenue generated by drug price mark-ups in large and medium-sized hospitals was generally between 40% and 70%, and the percentage of revenue generated by drug price mark-ups in small hospitals can even exceed 90%. Compared to developed countries where the revenue of drug price make-ups is around 15%, the phenomenon of "drug-based medical care" in Chinese public hospitals is prominent (Sun et al., 2017; Tian et al., 2012; Yu et al., 2010).

The original intention of the drug price make-up policy was to encourage medical

institutions at all levels to gradually move away from reliance on government subsidies and to couple medical staff income and drug sales. However, the drawbacks of this policy emerged from its implementation. Although the Chinese government has repeatedly lowered drug prices in the hope of reducing the proportion of hospital revenue from pharmaceuticals and the burden of medication on patients, the overall picture shows little success. From 2001 to 2004, the drug market prices in China decreased by 1.5%, 3.5%, 1.7% and 3.6% year-on-year, while outpatient medical costs increased by an annual average of 8.2% and inpatient medical costs increased by 8.6% over the same period.

Moreover, after the implementation of drug price make-up, all hospitals were testing the edge of this policy. Take the actual rate of drug mark-up of 15 hospitals directly under Liaoning Province in 2003 as an example. 23.6% of western drugs price were made up, exceeding the upper limit of the policy by 8.6 percentage points. 30.7% of traditional Chinese medicines prices were made up, exceeding the upper limit of the policy by 15.7% percentage points. It is fair to say that the drug mark-up policy is becoming an important factor limiting the sound development of hospital pharmacy departments in the long run (D. Y. Li et al., 2017).

2.2.1.2 The main entry point for the zero mark-up policy

In response to the above problems, on 1 July 2005, the then Minister of Health, Gao Qiang, delivered a report entitled Developing Medical and healthcare, contributing to the Construction of a Harmonious Socialist Society at a seminar on the situation jointly organised by the Publicity Deportment of the Central Committee of the Communist Party of China (CPC) and six other departments (Gao, 2005). The report analyzed the outstanding problems of the profit model of the current healthcare system from six aspects, pointing out that the medical service system does not meet the health needs of the masses, and the problem of difficult and expensive access to medical care is prominent. The report points the finger at the drug price make-up mechanism with the argumentation that this policy-induced hospitals to buy and sell expensive drugs and clinicians to over-prescribe.

In June 2006, Guidance on the Eleventh Five-Year Plan Development of the Pharmaceutical Industry (NDRC, 2006) clearly stated that it adheres to the principle of combining government-led and market mechanisms, actively and steadily promote the reform of the medical and healthcare system, increases government investment in healthcare, and solves the problem of income compensation for medical institutions. The document clearly demonstrated the determination at the government level to eradicate the “drug-based medical

care" model. An interview with Han Qide, Vice Chairman of the National People's Congress, on CCTV after the meeting also revealed that the Ministry of Health has basically decided to abolish the price increase for drugs (Wu, 2006a , 2006b).

The year 2009 was a crucial year for deepening the healthcare reform. The two documents (Opinions of the Central Committee of the CPC and the State Council on Deepening the Reform of the Medical and Health System and Recent Implementation Plan for the Reform of the Medical and Health System [2009-2011]) set out the direction and implementation plan for the new healthcare reform. The reform focused on the deepening of reform, including basic medical security, implementation of the basic drug system, construction of the primary medical and healthcare system, and equalisation of public health. The four goals of equalisation of public health have all achieved great results by 2020, except that the pilot reform of public hospitals was difficult to promote effectively.

The pilot reform of public hospitals was the tricky bit in the policy package of new healthcare reform. The policy is directly aimed at the drug price mark-up policy in public hospitals that has run for over 20 years. The implementation plans included subsidy mechanism reform in the public hospital, the gradual abolition of drug price mark-up, the separation of drugs and other medical services, and many other new indicators. Since then, the policy direction of "zero mark-up" in China's healthcare system has been gradually established.

In early 2012, provincial and municipal tertiary hospitals in some areas responded to the policy and began piloting the zero make-up policy. However, judging from the implementation status of the pilot hospitals, there were four arduous challenges. Firstly, the lack of revenue from drug price mark-up greatly affected the financial balance of hospitals, disrupting the overall development pace of public hospitals and even making it impossible to maintain daily medical expenditure. Secondly, public hospitals were facing the growing demand for drugs and procurement and stockpiling needs of patients. The subsequent funding gap is difficult to cover. If hospitals need to roll out new projects and buy the large instrument, they had to find another way out to solve the funding issue. Thirdly, in order to cooperate with the effective implementation of the zero make-up policy, hospitals had no choice but to raise the fees for registration, surgery, nursing and other services. On the one hand, the increase of these fees mobilized and motivated the front-line medical service providers. On the other hand, it hit patients' sense of access to some extent. Last, policy support was still inadequate. The government's policy compensation to the pilot hospitals was generally in the range of 60% to 65%, far from covering the losses incurred by the abolition of the drug make-up

mechanism.

For the hospital pharmacy sector, the blow of the zero make-up policy is even more devastating. According to D. Y. Li et al. (2017), the impact is felt in three main ways.

The abolition of the drug mark-up policy has turned the pharmacy department from a "profit center" to a "cost center". Subsequently, the status of the entire pharmacy department also plummeted, making it difficult for hospital administrators to effectively balance the treatment of pharmacists, the cost of pharmacy management, and the development of the pharmacy department.

For a long time, the training of hospital pharmacists has mainly focused on the accuracy of administering and dispensing drugs to patients, not enough attention has been paid to the professional skills of pharmacists and the improvement of clinical pharmacy competency. After the implementation of the zero mark-up policy, hospital administrators hoped that the hospital pharmacy department would transform from a drug dispenser to a service provider. However, they found that the talent pool of hospital pharmacy was insufficient, and the connotation of the pharmacy department was single and weak, which could not match the professionalism of the hospital clinical department and scientific research team, making the transition difficult.

The pharmacist assurance policy has not been implemented. Looking around the world, pharmacy service fees have been a common practice in several countries. The pharmacist law and clinical pharmacist system provide policy assurance for pharmacists to exercise their functions. However, these relevant policy cornerstones are still in the initial stage in China, and the transformation of the status of pharmacists still needs to wait for policy adjustments.

Faced with the huge impacts of the overall pharmacy department at the policy level, although pharmacy departments at all levels are interested in finding new profit models and outlets themselves, a large number of hospitals considered eliminating their pharmacy departments due to the limitations of their own management models and the cost of reform. Some hospitals even trusted their pharmacy department as a package to commercial companies for operation, which inevitably resulted in the loss of pharmacy talents and the overall depression of the industry.

However, challenges are always accompanied by opportunities. As mentioned in the previous section, the revenue triumvirate of China's public hospitals is government subsidies, drug price mark-ups and medical services revenue. As government subsidies have become a thing of the past, and drug mark-ups are facing serious policy restrictions, medical services are becoming an important direction of transformations of both pharmacy departments and

medical institutions. This thesis will also explore the new business model with PC as the main entry point in the context of the new healthcare reform.

2.2.1.3 The high-quality development trend of pharmacy

Since the new healthcare reform in 2009, the Chinese government has issued a series of policy documents to vigorously encourage innovation and exploration of pharmaceutical services. In July 2017, the Notice on Strengthening Pharmaceutical Affairs Management and Transforming the Pharmacy Service Model was issued. In November 2018, the Opinions on Accelerating the High-Quality Development of Pharmaceutical Services was issued. It is clearly stated that in order to further transform the PC model, improve the level of pharmaceutical services, and meet the growing medical and health needs of the people, the following opinions were put forward on accelerating the high-quality development of PC: further improving the awareness of the importance of PC, promoting the construction of hierarchical diagnosis and treatment system.

These policies have created an enabling environment for the exploration and practice of new PC and put forward new requirements for giving full play to the professional technical value of pharmacists and changing the PC model. In this context, guiding the pharmacy department of the hospital should take reform and innovation as the driving force, and take the needs of patients as the center. Guiding the pharmacy department should constantly innovate service concepts and service models and provide patients with more high-quality and humanized pharmacy services.

In October 2019, in order to further implement the Notice on Strengthening Pharmaceutical Affairs Management in Medical Institutions and Drug Cost Control to Promote the High-quality Development of Pharmaceutical Services (Guangdong Health Commission [2018] No. 108), Notice on Printing and Distributing “Guangdong Province to Further Improve Medical Services” Action Plan Implementation Plan (2018-2020) (Guangdong Health Document [2018] No. 1332) and other documents, to innovate the PC model, improve the efficiency of PC, and accelerate the transformation and development of PC, Guangdong Provincial Health Commission rolled out the Internet + PC that can deliver benefits to people in the medical institutions in Guangdong Province. The Guangdong Provincial Health and Health Commission has carried out a series of Internet + pharmacy benefit services in medical institutions in Guangdong Province. For example, the same WeChat ID code realizes the common use of hospital on-site and online services, and the same prescription realizes the transfer of prescription information from offline to online. , the

operation of a button enables hospital pharmacists to conveniently check the rationality of prescription information online, an interface enables online consultation and communication between patients and customer service, a monitoring information network system sponsored by a policy ensures medication safety, and a complete set of The information system realizes the service for the whole diagnosis and treatment and medication process of patients. The Office of the Guangdong Provincial Health and Health Commission issued the Notice on the Development of Internet + Pharmacy Benefiting the People, which set a series of deployment requirements to promote the development of "Internet + medical health" and implemented Internet + PC that can deliver benefits to people in medical institutions. This helped to achieve better and faster transformation from drug-centered to patient-centered, from guaranteeing drug supply to strengthening professional technical PC and participating in clinical medication on the basis of ensuring drug supply. These changes can improve the ability of PC, enhance the method of PC, and gradually promote PC to provide patients with all-day, full-process, and full-coverage comprehensive PC. Moreover, PC can be closer to patients, clinical, and society, meeting the growing medical and health needs of the people and helping the construction of a healthy Guangdong.

Entering 2020, strengthening the management of pharmaceutical affairs in medical institutions is an important part of establishing and improving the management system of modern hospitals and an important measure to strengthen the comprehensive regulation of medical and health services. In recent years, the pharmacy management in China has been continuously strengthened, and the level of rational drug use has been gradually improved. At the same time, the reform of centralized procurement and use of drugs was actively promoted, the drug pricing mechanism was gradually formatted, and the order of drug production and distribution was gradually standardized. In order to further strengthen the pharmaceutical management and PC of medical institutions, intensify the reform of drug use, promote the reform of the pharmaceutical field in the whole chain, improve the management level of medical institutions, promote rational drug use, and better protect people's health, the approval of the State Council approved and issued the Opinions on Strengthening the Administration of Pharmaceutical Affairs in Medical Institutions to Promote Rational Use of Drugs, further clarifying the requirements of the pharmacy department for rational drug use.

In March 2021, Guangdong Province issued the Notice of the General Office of the Guangdong Provincial People's Government on Printing and Distributing the Implementation Plan for Further Promoting the Construction and Development of High-Level Hospitals.

A series of overall designs at the national level and various policy guidelines and

corresponding requirements issued intensively at the provincial level reflect the China's emphasis on pharmacy construction and the transformation and development of pharmacy management and PC to high quality and high efficiency in the new era urgency.

2.2.2 Policy directions for pharmaceutical care

Mikeal et al. (1975) first introduced the concept of PC, which centerd on answering the question: how exactly can patients receive responsible pharmacological treatment? Later, Brodie et al. (1980) continued to reinforce this concept by arguing that PC consists of three components:

First, medication decision-making component (providing decisions).

Second, providing patients with the medicines they need (providing products)

Third, providing a range of services necessary for patients before, during and after treatment (providing services).

The concept of PC was further interpreted by Hepler et al. (1989). They argued that PC should focus more on quality of service, and while providing patients with responsible medication services, a medication expectation that improves the quality of life to patients should be conveyed Charles and Linda (1990).

In addition to deepening the definition of PC, the methodology of PC is also being updated with the times. Regarding what is "responsible medication service", Pane pointed out that good PC should start from evidence-based medicine and evidence-based pharmacy and choose the best drug for the patient according to the patient's clinical situation and treatment plan under the guidance of theories. Apoteket underlined the practical aspects of clinical medication activities, stating that PC should focus more on direct interaction with patients, including identification, problem-solving, patient follow-up and documentation, in order to help doctors and patients find more effective treatment options together (Björkman et al., 2008).

It is fair to say that although the specific definitions and focus of PC vary from theory to theory, there is no deviation from the essence of improving the quality of patients' medication and meeting their quest for a higher quality of life through responsible and effective care.

As argued in the previous section, the government promised a series of compensation mechanisms after the zero make-up policy was implemented. Among these measurements, direct compensation from governments, i.e., government funding, can have an immediate effect, but for some large and medium-sized tertiary hospitals, the effect of direct

compensation is a drop in the bucket compared to the loss caused by the abolition of the drug price make-up. Medical institutions at all levels focused on the so-called "indirect compensation" in the form of increasing the quality and quantity of PC's charging items to indirectly compensate for the deficit in the hospital's financial income and expenditure caused by the drug price differential (Wu, 2014). According to H. Y. Liu et al. (2007), this model gave hospital PC a variety of new growth models in order to regain the economic value of the pharmacy department.

2.2.2.1 Drug dispensing fees

An important part of the PC concept is the medication guidance service, which improves patients' medication adherence through in-depth communication between pharmacists and patients, thus better enhancing the effectiveness of medication treatment.

For a long time, this type of necessary service has not been taken seriously by hospital pharmacy departments because this service did not charge extra fees. According to Su et al. (2012), 44% of patients were unable to take their medication on time after administration. 34% of patients were not clear about the indications, adverse effects, and reasons for medication. 32% of patients were dissatisfied with the overall effectiveness of their medication after administration. These issues can be effectively addressed through patient education by pharmacists before and after administering medication.

The practice in developed countries is to set up drug dispensing fees as a specific charging item for medication dispensing and guidance. This fee ensures fuller communication between patients and pharmacists on the rational use of medicines and effectively controls the rapid increase in drug prices. Table 2.7 shows the five items of drug dispensing fees in Japan, which illustrates that the developed countries have set strict standards for charging for PC in the process of issuing and collecting medication (Jiang et al., 2017).

Table 2.7 Breakdown of drug dispensing fees in Japan

	Basic dispensing fee	Uses
Basic dispensing fee	310 yen per visit	Basic medication dispensing
Dispensing Fee	50 yen/day	
	30 yen per dose	Drugs took at a draught
	100 yen/species	Injectable drugs
	100 yen/species	Topical medication
Addendum fee	Variable, additional charge	Poisonous and anaesthetic drugs, home-made drugs, expedited collection of drugs
Pharmacy record management guidance fee		Internal medicine prescriptions over 7 days

Special instruction fee for dosing	Inpatients

In terms of charges for pediatric drug dispensing services, the charging methods of drug dispensing services in the United States, the United Kingdom, Japan and Taiwan, China, the United States, the United Kingdom, Japan, and Taiwan all charge dispensing fees. The United States, the United Kingdom and Taiwan have some legal provisions that support the collection of dispensing fees. The charging methods are different in different countries and regions. There are charging methods related to drug dispensing pf pediatrics in the United Kingdom and the United States, and there are special regulations for the collection of drug dispensing fees of pediatrics in Taiwan, China.

Pharmacy intravenous admixture service (PIVAS) is a clean operating environment where trained pharmacy technicians or nursing staff operate the admixture of ordinary intravenous drugs, parenteral intravenous nutrition, anti-tumor drugs, antibiotics, and the centralized distribution site of intravenous drugs according to standard operating procedures. According to the regulations of the Health Pharmaceutical Management Regulations for Medical Institutions and Quality Management Practice for Centralized Dispensing of Intravenous Drugs by the former Chinese Ministry, medical institutions should establish PIVAS according to clinical needs, implement centralized distribution and supply. The corresponding charging standards shall be formulated by different provinces in China.

According to the current price standards for medical services in China, a total of 8 provinces, autonomous regions, and municipalities directly under the Central Government have promulgated the charging standard for the admixture of common drugs and antibacterial drugs. These provinces or autonomous regions are Chongqing, Yunnan, Sichuan, Guangdong, Shandong, Henan, Heilongjiang, and Tianjin.

However, there are large differences in different regions in terms of the charging standards for drug allocation. The charging standards for drug allocation in various places are not related to their economic development levels. The implementation standards of medical service prices in some provinces (cities) still use the standards promulgated many years ago. The charging standard for the admixture of common drugs and antimicrobial drugs is RMB 2 to 8 per group. The median of the charging standard for the admixture of common drugs is RB 3.0 yuan per group, and the average was RMB (3.64 ± 2.02) per group. The median of the charging standard for the admixture of antibiotics is RMB 3.0 per group, and the average was RMB (4.07 ± 2.09) per group.

Twenty-two provinces, autonomous regions, and municipalities directly under the Central Government have issued charging standards for the admixture of total parenteral nutrition and

cytotoxic drug, with an average of RMB (38.05 ± 26.50) per group. The minimum charging standard for the admixture of cytotoxic drug is RMB 5 to 40 per group, the median is RMB 15 per group, and the average is RMB (15.27 ± 7.49) per group. It can be seen that the charging standards vary widely across China. The charging standard for the admixture of total parenteral nutrition drugs in Chongqing (at RMB 40 per group) is comparable to the national average, while the charging standard for the admixture of cytotoxic drug (at RMB 5 per group) is much lower than the national average (at RMB 15 per group).

Canadian PIVAS pharmacists charge USD 18.45 for general drug dispensing, and Japan's general drug dispensing fee is CNY 400 per day (equivalent to RMB 24.75 per day), which is much higher than China's charging standard. There are big differences abroad in terms of the charging fee of PC in China and in other countries (Haisha et al., 2012).

2.2.2.2 Pharmacist outpatient system

In 2008, the American College of Clinical Pharmacy (ACCP), American Pharmacists Association (APhA) and American Health System Pharmacists Association jointly applied to the Professional Committee of Pharmacy to clarify the definition of pharmacy outpatient clinic. Pharmacy outpatient clinics are comprehensive and accessible PC provided by pharmacists to patients. By practicing in the community or hospital, pharmacists establish long-term and harmonious drug-patient relationship with patients. They are responsible for solving problems related to drug use raised by patients, and conducting drug management, education, triage and referral of patients to ensure patient health and safety. They also help to strengthen patient self-management.

In China, as a new medical model, pharmacy outpatient mainly conducts a series of activities, such as drug evaluations, responses to drug consultation, and individualized drug regimen formulations for different types of outpatients (including patients with special populations, patients with chronic diseases, and patients with multi-disease combination drugs), and medication guidance. Pharmacy outpatient is in line with strengthening pharmaceutical management and safeguarding people's health rights and interests under the new situation of China's healthcare reform, and it is also an important direction for the transformation of PC model.

Most patients with chronic diseases require long-term pharmacological treatment, but each visit can only be prescribed by a physician of choice, which takes up a lot of clinician resources. With the establishment of a pharmacist clinic system, pharmacists with the appropriate expertise and clinical qualifications can provide personalised PC to patients with

chronic diseases (Y. N. Li et al., 2020). In addition, a system of pharmacist check-ups and pharmacist consultations can be established to put PC first, better avoid medication risks and assist in the formulation of medication plans. As a win-win-win model, physicians can receive advice from pharmacists on medication decisions, pharmacists can improve their status and receive financial remuneration for their professional services, and patients can receive more comprehensive medication guidance and more beneficial medication outcomes.

The online registration platform and the hospital's official website were used to obtain information on the availability of pharmacy clinics in tertiary hospitals in China, including specialties, fees and the qualifications of pharmacists attending the clinics. Among the1326 tertiary hospitals in China, a total172 of 12.97% of the total number of hospitals surveyed had pharmacy outpatient clinics, and the top5 provinces in terms of the number of pharmacy outpatient clinics were Guangdong, Beijing, Zhejiang, Jiangsu, and Shanghai. The main specialties of pharmacy clinics include pregnancy/lactation medication management, anticoagulation/antithrombosis, chronic disease management, pain management and paediatric medication management.

Especially during the outbreak of COVID-19 in early 2020, many patients were unable to go to the hospital for face-to-face consultation due to the epidemic control measures. As an information channel, online pharmacy clinics played an important role. Xu summarized the pharmacy outpatient service services in the context of "Internet +" and provided a reference for the majority of pharmacists to further develop online pharmacy outpatient. According to all valid consultations received by the Third Affiliated Hospital of Sun Yat-sen University from March 27 to December 31, 2020, the demographics such as patient age, gender, consultation times, and consultation content were classified and counted. Results showed that among the 368 patients, the majority were young and middle-aged women. There were 423 effective consultations, and the most questions were about drug use, accounting for 56.2%; the second was consultation about adverse reactions, accounting for 23.6%, and 16.78% was about drug consultation during pregnancy and lactation. Therefore, online pharmacy outpatient service has its unique advantages. As a supplement to offline pharmacy outpatient service, it can better enable pharmacists to provide pharmacy services and promote rational drug use by patients.

To further explore the prospect of online consultation in pharmacy clinics during pregnancy and lactation. The data of 154 cases of drug consultation for pregnant and lactating women on the WeChat public account of Suzhou Municipal Hospital from February 8 to March 31, 2020 were collected. The data of patients' demographics, consultation questions,

drug types for consultation were classified and counted. Compared with the mode of offline consultation, the benefits and limitations of online PC and the prospects of the mobile PC mode were analyzed. The results showed that among the 154 online consultations, 83 (53.90%) were breastfeeding women, 71 (46.10%) were pregnant women; 104 (67.53%) were consulted about drugs, and 50 (32.47%) were consulted about medical issues; The most involved drugs are external medicines (36/168, 21.43%), followed by Chinese patent medicines (26/168, 15.48%), vitamins and trace elements (24/168, 14.29%), endocrine system medicines (22/168, 15.48%) 13.10%), antibacterial drugs (22/168, 13.10%). The most frequently consulted issue is the safety of drug use during lactation (53/104, 50.96%), followed by the safety of drug use during pregnancy (23/104, 22.12 %). The problems involving the first trimester of pregnancy were the most (32/171, 45.07%), and the problems involving infants aged 2 to 6 months were the most in all stages of lactation (28/146, 60.87%). The diagnosis and treatment problems mainly included narrative symptoms, questions about what medicine to use (30/150, 60.00%) and how to adjust the medicine according to the test report (20/150, 40.00%). It can be seen that the online model provides a new channel for patients to seek medical consultation in the context of CIVOD-19 control and prevention. Pharmacists can provide patients with more comprehensive drug consultation services, but at the same time, pharmacists need to actively improve their professional ability, sense of responsibility, communication skills in order to promote the standardized and healthy development of the mobile model of PC.

TCM is a valuable treasure trove in China, especially in Guangdong Province where there is a profound culture and history for TCM. In addition to general hospitals opening pharmacy outpatient, some public tertiary hospitals specialized in TCM also set up TCM pharmacy outpatient focusing on TCM. TCM clinical pharmacists participating in pharmacy clinics can promote the development of TCM clinical pharmacy to a certain extent, reduce the risk of TCM drug-induced diseases, and provide significance for the current development of pharmacy coutpatient. Taking Shunde TCM Hospital of Guangzhou University as an example, the hospital counted 122 patients admitted to its TCM pharmacy outpatient from January 2018 to April 2020 as the research object, and retrospectively analyzed the medication consultation situation of 122 patients. A questionnaire was issued to investigate patients' knowledge of TCM, awareness of safe use of TCM and evaluation of the service of TCM pharmacy outpatient.

The results showed that patients' awareness of the safety of Chinese medicine use was weak, with 16.39% considering Chinese medicine very safe and 72.95% mostly safe; 77.87%

had taken Chinese medicine or health care products on their own and only 36.89% had taken Chinese medicine after diagnosis by a physician. 94.28% of the patients said that the Chinese medicine pharmacy clinic service was helpful in improving the awareness of Chinese medicine safety, and 90.98% of the patients were satisfied with the development of Chinese medicine pharmacy clinic. 90.98% of patients had a positive attitude towards the development of the Chinese medicine pharmacy clinic (Chen et al., 2020).

Despite this, pharmacy clinics, as a new phenomenon, have been explored in China in recent years at all levels and in all types of hospitals, but there is still room for improvement in terms of standardization, informatisation, fees, and prescribing rights. The international experience of pharmacy outpatient shows that national-level policies and guidelines, a sound electronic medical record system, an efficient appointment follow-up mechanism, clear prescribing rights for pharmacists and a mature charging system for PC are the main factors driving the development of pharmacy outpatient. These experiences are worth learning from.

2.2.2.3 Clinical pharmacy laboratory test

In contrast to the tests carried out by general medical technology departments, clinical pharmacy laboratories are becoming a new testing model for medium and large tertiary hospitals. It is also a new business model for pharmacy departments in large hospitals with enabling conditions. Some patients with infections, tumours, and other special medication requirements have to frequently change their medication regimen due to differences in the expression of certain genes or enzymes with different sensitivities to different therapies. This is a major burden on these patients in terms of time and money.

Due to the increase in adverse drug reactions, the issue of drug safety has become a major concern and an increasing number of patients want to achieve 100% safety and efficacy of drug use. Mutations in patient genotypes and genetic polymorphisms in drugs are important causes of differences in efficacy and adverse effects between patients taking the same drug. Therefore, the clinical pharmacist team in the hospital pharmacy department can provide scientific and accurate drug-related genetic test results for clinical purposes, which can provide experimental data and theoretical basis for the formulation of individualised drug regimens in a scientific and rational manner.

If the clinical pharmacy department can bring personalised testing before the medication regimen and combine the analysis of various pharmacological indicators such as therapeutic drug concentration and target efficiency, and make a comprehensive study and judgment, the clinical pharmacy department can predict the best medication and treatment for the patient

and give rationalised medication recommendations. This practice will reduce the chance of delaying disease due to frequent changes of the medication regimen, and greatly improve the professional skills and income of the clinical pharmacist.

In the context of precision medicine, genetic testing based on individualized drug delivery by clinical pharmacists in oncology specialties is a new model for clinical pharmacy services (CPS). The clinical pharmacists in oncology specialise in providing PC in pharmacy clinics for antitumour treatment, accepting enquiries from oncology patients, using the results of genetic testing to guide the process of targeted therapy as an entry point. They can also provide guidance on the selection of oncology treatment regimens. When combined with pharmacological monitoring in the ward and follow-up visits in pharmacy clinics, the guidance on the selection of oncology treatment regimens can provide clinical pharmacists with correct advice on drug use in pharmacy clinics, and then participate in the formulation and optimization of patients' drug regimens, pharmacological monitoring and mitigation of treatment-related adverse effects. This study provides an important theoretical support for clinical pharmacists in the formulation and optimization of patients' medication regimens, pharmacological monitoring and mitigation of treatment-related adverse effects. Therefore, it plays an irreplaceable role in clinical pharmacists' service to oncology patients.

As a special group of people, children have always been concerned about the safety of their medication. Tumor is a malignant disease that seriously threatens the life of children, and leukemia is the most common malignant tumor in children in my country. Although the corresponding chemotherapy regimens are selected according to different types and grades, there are still large individual differences in drug response and toxicity. Species differences depend on genetic diversity. Pharmacogenomics studies the relationship between drug gene polymorphisms and pharmacodynamics, pharmacokinetics, and drug safety, so as to clarify the genetic nature of drug response differences and provide genetic basis for the implementation of individualized therapy (Li, 2015).

Despite the remarkable progress in the treatment of childhood acute lymphoblastic leukemia, there are still 20% of children with unsuccessful treatment. With the help of comprehensive pharmacodynamics and pharmacogenomics studies of individualized treatment of childhood acute lymphoblastic leukemia, despite significant progress in the treatment of childhood acute lymphoblastic leukemia, there are still 20% of children with inadequate treatment. successful. With the help of comprehensive pharmacodynamics and pharmacogenomics studies of individualized treatment of childhood acute lymphoblastic leukemia, more insight into the role of host genetic polymorphisms will help to better

improve chemotherapy efficacy (Liu, 2013).

In practical applications, the dosage for children is usually based on body weight and body surface area. However, children themselves are in dynamic changes of growth and development, which affect the pharmacokinetics and pharmacodynamics of drugs, and may change the safety and efficacy of drug therapy. In clinical practice, in order to achieve the drug treatment of individual children, in addition to the disease state and the pharmacokinetics of the drug itself, growth and development characteristics, gene polymorphisms and other factors should also be combined. In order to achieve the best drug treatment for children, the technical means that can be used include drug treatment monitoring, pharmacogenomics and attention should be paid to the selection of preparations suitable for children of all ages (Li, 2019).

A statistical study on the current status of CPS in major hospitals in Jiangsu Province showed that clinical pharmacy laboratory testing played a major role in promoting the construction of the clinical pharmacist system and the role of clinical pharmacists in rational drug use and pharmacy services. A survey was conducted on the current status of CPS by emailing a questionnaire survey to members of 28 the clinical pharmacy branches (from 28 each hospital) of the Jiangsu Provincial Medical Association. The data and results were statistically analyzed.

A total 28 questionnaires were distributed, and 28one valid samples were collected, with a valid return rate of 100%. Among the 28 hospitals surveyed, there were 25 general hospital and 26 tertiary hospitals. There were 312 full-time and part-time clinical pharmacists, with an average of 7.32 full-time clinical pharmacists and 3.82 part-time clinical pharmacists in each hospital. The proportion of full-time clinical pharmacists with master's degrees and intermediate titles was significantly higher than that of part-time clinical pharmacists ($P<0.05$). Among the 144 full-time clinical pharmacists, 70.24% were trained and qualified as clinical pharmacists. Among the 13 surveyed hospitals qualified as clinical pharmacist training bases by the NHC, the average number of teachers was 3.77; among the 5 surveyed hospitals qualified as provincial clinical pharmacist training bases, the average number of teachers was 5.80; in the one surveyed hospital with the qualification of the NHC clinical pharmacist teacher training base, the average number of teachers was 5. Clinical pharmacy-related work carried out in the surveyed hospitals was the highest for participation in daily physician visits, participation in medical advice and prescription reviews, special reviews of antibacterial drugs, writing pharmacy charts, pharmacy information services, outpatient drug consultation and monitoring of adverse drug reactions, all at 100%. The lowest proportion was for

specialist consultation clinics (10.71%). The proportion of CPS carried out in training base hospitals was generally higher than that in non-training base hospitals, with special reviews of antineoplastic drugs, hormonal drugs and blood products and expert consultations at the provincial clinical pharmacist training base hospitals surveyed. There were statistically significant differences ($p<0.05$) in the proportions of CPS carried out in the consultation clinics, the establishment of hand and anesthesia pharmacies, community PC, pharmacogenomic testing, and participation in the management of drug clinical trials, compared with those in the surveyed hospitals; the average number of specialist consultations, the number of case analyses, the number of reviews of inpatient injection orders, and the number of reviews of intravenous configuration orders per provincial clinical pharmacist training base hospital compared with those in the surveyed hospitals. The differences were statistically significant ($P<0.05$) in the number of specialist consultations, number of case analyses, number of inpatient injectable orders, number of intravenous orders, number of outpatient prescriptions, number of therapeutic drug monitoring cases and pharmacogenomic testing cases (Y. Y. Zhou et al., 2017).

2.2.2.4 Personalised pharmaceutical preparations

In the context of centralised national procurement, some preparations and specifications no longer meet the needs of the market and are gradually being eliminated by hospitals. However, there are always some patients who have special requirements for medication dosage and form, and this is where the professional value of the preparation room comes into play. Through the preparation room under the pharmacy department, it is possible to provide patients with personalised preparation, especially for dermatological applications and TCM ointments. Statistical analysis was carried out on the use of hospital preparations prepared by Sichuan Provincial People's Hospital from 2017 to 2019. The number of preparations of hospital preparations was stable at 50, and their usage and sales amount showed an upward trend; Western medicine preparations are mainly dermatological external preparations; Among the traditional Chinese medicine preparations, Huzhang Jiedu granules ranked first in terms of sales amount, and Mammary gland Tongluo Sanjie granules and Jinsha Tonglin Paishi granules were also used more. Generally speaking, hospital preparations have a good development trend, and western medicine preparations and traditional Chinese medicine preparations have their own characteristics. On the basis of ensuring the stable supply of raw materials and maintaining the stable production of existing preparations, we can actively develop dermatological special preparations and traditional Chinese medicine special

preparations to meet clinical needs (Shuai et al., 2021).

In terms of quality control, the quality control and monitoring of hospital preparations is one of the key tasks of the pharmacy department. The Affiliated Hospital of Guangdong Medical College has conducted systematic monitoring of the stability of the quality of the hospital's preparations. The stability of the formulations was monitored in terms of their properties, content and microbiological limits for 6~112 month. The results showed that all the preparations met the requirements in terms of properties, contents and microbiological limits during the observation period9. The bacterial count, mould and yeast count of the sulphur cream did not comply with the regulations when examined on the first 4day of preparation, which was due to bacterial contamination of the purchased cream base. It was concluded that the commonly used internal preparations, nasal drops and ear drops of the hospital were valid for less than 6one month, and the lotions and applications were valid for less than one 1year, and their quality was guaranteed (Yang et al., 2006).

Through analysis, it was found that the problems encountered in the development of Chinese medicine preparations in hospitals in Guangdong Province include high policy threshold, difficulty in approval, restricted scope of use, and lagging pricing mechanism; the management mode of hospitals in terms of preparation rooms is backward; and hospitals are weak in new drug development capability (Lin, 2018).

At the same time, to understand and grasp the development status and problems of hospital preparations in Guangdong Province, for the reference of governments at all levels, drug supervision departments and hospitals in formulating relevant policies, implementing supervision and formulating development plans, scholars conducted in-depth research on the development status of hospital Chinese medicine preparations in Guangdong Province, through the use of questionnaires, interviews, symposiums, field research, data collection, review of relevant information, extensive listening to Medical institutions, drug supervision and management departments and pharmacy experts and scholars' opinions and suggestions, and collated and analyzed the data. 116 questionnaires were distributed, 98 valid questionnaires were collected, with an effective recovery rate of 84.48%; 11 cities and 31 hospital preparation rooms were visited; 3 seminars were held; and relevant information was obtained from the Guangdong Food and Drug Administration. The results showed that the number of preparation rooms that have obtained the "medical institution preparation license" has decreased from 321 in 2000 to 98 in 2010. The preparation rooms were mainly concentrated in the Pearl River Delta region, with a total of 62, accounting for 63.27%. A total of 3,466 preparation varieties passed re-registration. The largest preparation room area was

over 18,740 square meters, while the smallest is only 60 square meters. The highest fixed assets are over RMB 30 million, while the lowest is only RMB 80,000. Although the development of Chinese medicine preparation in hospitals has unique advantages, there are more problems in management, production, and development, which hinder the healthy development of Chinese medicine preparation in hospitals (W. M. Wang et al., 2013).

Therefore, in order to develop Chinese medicine preparations in hospitals, various government departments should formulate policies suitable for the development of Chinese medicine preparations in hospitals, and hospitals must solve the problems in development, improve the management level, develop special preparations, and make joint efforts to promote the healthy development of Chinese medicine preparations in medical institutions. It is suggested that the competent authorities in Guangdong Province should set up a trading platform, formulate encouraging policies, invest more in the research and development of Chinese medicine preparations in hospitals, and hospitals should cooperate closely with enterprises to form a situation where enterprises are the main players and hospitals are supplementary in the development of Chinese medicine preparations (W. M. Wang et al., 2013).

2.2.2.5 Pharmacist involvement in good clinical practice pharmacy management

With the gradual globalization of clinical trials in China, the good clinical practice (GCP) has been increasingly emphasized and followed.

In June 2017, China's State Drug Administration officially joined the international council for harmonization (ICH) of technical requirements for registration of drugs for human use. The ICH has accelerated the pace of internationalization of China's drug clinical trials, gradually participating in and guiding the development of international rules for drug registration and promoting safe and effective innovative drugs to meet the clinical needs of patients at home and abroad as soon as possible. However, it also brings many challenges to institutions undertaking clinical trial projects (W. Guo et al., 2019).

The State Drug Administration's idea of accrediting medical institutions for drug clinical trials is to create a platform for healthy competition and development of research, and to enable medical institutions to assume good social responsibility for the pharmaceutical industry's R&D chain. Hospitals around the world are actively involved in the construction of drug clinical trial institutions in order to enhance their overall competitiveness (Tang et al., 2018).

In the current situation, it is imperative to establish a drug clinical trial organization with

hospital pharmacy staff as the main body, and to change the understanding of pharmacy workers and hospital managers about drug clinical trial work. The establishment of a drug clinical trial organization by pharmacists will not only improve the technical level of the hospital, but also enhance the academic status of the pharmacy department in the hospital, in line with the development trend of hospital pharmacy from “drug-centerd” to “patient-centered”. The main ways in which pharmacists can contribute to the development of drug clinical trial facilities are as follow. As managers of the facility office, as members of the ethics committee, as full-time pharmacists managing trial drugs in clinical trials, and as participants in the preparation of drugs for oncology trials (Y. Zhou et al., 2020).

Duan study provides a reference for clinical trial institutions to standardize the management of trial drugs. They established a clinical trial pharmacy management system in accordance with the requirements of the GCP. In this system, pharmacists summarize the various problems that arise in the management of trial drugs and actively solve them. The current management model of the hospital trial pharmacy is in line with the actual situation of the institution, and the pharmacist plays an important role in the management of trial drugs. By analyzing and solving the existing problems, various errors in the work are reduced, which guarantees scientific and reliable clinical trial results and ensures the safety of drug administration for the subjects.

The standardised management of trial drugs in accordance with GCP requirements provides a strong guarantee for the implementation of GCP to ensure the scientific, reliability and authenticity of clinical trial results, and the use of risk management strategies by pharmacists in the management of clinical trial drugs can better promote the smooth conduct of drug clinical trials, protect the safety and rights of subjects, ensure the scientific, valid and reliable trial results, and avoid the occurrence of drug The use of risk management strategies in the management of drug trials can better facilitate the smooth implementation of drug clinical trials, protect the safety and rights of subjects, ensure scientific, valid and reliable trial results, avoid major protocol violations and drug loss events caused by poor management, avoid major protocol violations and avoid risky operation of the project (Ma et al., 2021).

2.2.2.6 Other extended services

In addition to medication, many of the customer-oriented management ideas of modern firms can also be used by hospital pharmacy departments. There are many ways to improve PC. For example, introducing an information-based medication management programme to the traditional dispensing model, indicating on the packaging the medication regimen plan

according to the patient's past cases, and for patients with chronic diseases indicating when the next medication will be collected. The centralised preparation of intravenous medication, home delivery of dialysis solutions, and herbal decoction services can also be considered. At a fraction of the cost, this example can exchange for patients' loyalty and reliance on the hospital pharmacy department.

In summary, under the new pharmacy norm, after the zero mark-up policy has been implemented, reliance on drug mark-ups for profits has become a thing of the past, while policy-level guidance in the direction of PC is a major trend. How to obtain economic profit, hospital status and patient trust through PC more precisely has become an important issue for every hospital pharmacy department.

2.3 Current development of clinical pharmacy abroad

CPS is the practice of pharmacy as part of a multidisciplinary healthcare team designed to achieve high quality use of medicine. Clinical pharmacists are practitioners who provide comprehensive medication management and related care to patients in all health care settings. They are practicing pharmacists with advanced technical expertise, education and training that provide the necessary clinical competencies to structure a team-based, direct patient care environment (Cai, 2004). Clinical pharmacists work directly with physicians, nurses, other health care professionals, and patients to ensure that the medications prescribed for patients are prescribed medications that are most likely to provide the best health outcomes.

Clinical pharmacists are trained to manage adverse drug reactions, counsel on drug-drug and drug-disease interactions and provide evidence-based drug information and pharmacoeconomic evaluations. The CPS process involves four main components: patient assessment, medication therapy assessment, care plan development and implementation, follow-up assessment and medication monitoring.

As the origin of the concept of clinical pharmacy in the world, the United States is a leader in the development of PC. Clinical pharmacists in the United States not only play an irreplaceable role in the safety and efficacy of patients' medications but create economic benefits that are widely recognized by their peers worldwide (L. L. Zhang et al., 2016).

The practice of clinical pharmacy in the United States began in the early 1920s, when pharmacists were able to begin participating in patient visits as clinical staff. Later, the Guidelines for Pharmacotherapy Specialists (ACCP, 1990) was issued as a landmark since it stated for the first time that pharmacists should not only perform the role of dispensing

medications but should also aim to be experts of drug use. According to a Gallup survey, pharmacists are the second most trusted group of people in the United States and are considered the most trusted source of pharmacy information (Alexandra et al., 2008).

Not only do pharmacists in the United States have a high social status, but pharmacist-centerd healthcare services have also been a successful business model that brings significant economic benefits to the healthcare industry across the United States. Gallagher et al. (2014) systematically reviewed the clinical pharmacy services (CPS) from 2011 to 2017 and the economic benefits CPS brought about. They summarised the value added to healthcare organizations by CPS through the Quality of Health Economic Studies Instrument (QHES) and Incremental Cost-Effectiveness Ratio (ICER) by aggregating data from 115 CPS-related publications in three major databases, PubMed, Ovid, and Embase. The report showed that the main types of services provided by CPS in the United States include general pharmacotherapy (41%), disease management (30%), and targeted drug programmes (17%). Unlike China, where PC is mainly concentrated in tertiary hospitals, PC in the United States is set up in large hospitals (34%), outpatient clinics (28%) and community pharmacies (17%). The median score of quality of health economics evaluation was 74 in the nine full categories of economic benefit evaluation, and four reports demonstrated that CPS services could achieve better outcomes at lower cost, as shown in Table 2.8.

From the summary in Table 2.8, it is easy to see that the presence or absence of PC process interventions can have a significant impact on the rational use of medication for some diseases, especially chronic diseases. Typical examples are telephone pharmacy consultations and pharmacy clinics and patient education for hypertension. Although the additional pharmacy intervention charges increase the financial burden on the patient, the more professional and refined medication guidance from PC can significantly stabilise the patient's blood pressure levels, compared to home medication or medication guidance from internal medicine. Patients are willing to pay the pharmacist between USD 20 to 60 per mmHg for patient education and medication decision. The benefits of pharmacist interventions may not be significant for some conditions, but the cost of interventions through pharmacists is lower than conventional treatment. Community pharmacist clinics for pharyngitis and erythropoiesis-stimulating agent pharmacist clinics are typical cases where PC intervention channels can help patients save 20% to 50% of their medication costs compared to traditional clinical channels. Another example is the diabetes PC, which is a win-win-win situation. Clinicians save energy and time, pharmacists gain financially, and patients not only save money but also gain better outcomes.

Table 2.8 Description, summary, QHES and ICER scores for the economic evaluation of PC

PC	Intervention costs (USD)	Comparative costs (USD)	Benefits of intervention	ICER	QHES
A comparative study of osteoporosis treatment and care management	619736	726887	0.2% reduction in hip fracture incidence	Significant	59
Medication therapy management for electrical enquiries	7110	5471	Average treatment success rate: 0.247, 0.056	Patients pay USD 4,684 per successful treatment	89
Erythropoiesis-stimulating agent pharmacist outpatient versus conventional treatment	13412	16173	Quality adjusted life years (QALYs) intervention group 2.096, control group 2.093	Significant	95
Community pharmacist clinics for pharyngitis versus conventional treatment	53.62	79.12	QALYs decreased, 0.2707 in the intervention group and 0.2707 in the control group	Significant	74
Diabetes PC and routine care	35740	44528	Quality Adjusted Life Years intervention group 5.518, control group 5.020	Significant	87
Comprehensive medication review with or without a pharmacist	192.60	157.02	Mean probability of avoiding adverse events: intervention group: 0.93 control: 0.94	Significant	74
PC for the management of hypertension and routine internal medicine programmes	1462.87	1259.94	Intervention group: 131.6 mmHg, control group 138.2 mmHg	Patients pay USD 33.27 per 1 mmHg reduction in blood pressure	82
PC and home monitoring programme for the management of hypertension	400.36	67.36	Intervention group: 137.7 mmHg, control group 146.8 mmHg. Mean increase in life expectancy: 0.53 (men), 0.44 (women)	Patients pay USD65.29 for every 1 mmHg reduction in blood pressure and USD 1850 (male) and USD 2220 (female) for each year of life expectancy improvement	69
Hypertension care patient education	104.80	No data available	Mean blood pressure reduction: intervention group: 11.8 mmHg, control group: 6.2 mmHg	Patients pay USD 22.2 per 1 mmHg reduction in blood pressure	67

Based on the development of clinical pharmacy in the United States, it is not difficult to find that this is a practically proven and feasible business model. The uneven distribution of clinician resources and the uneven classification of resources in hospitals at all levels have given hospital pharmacy departments a good opportunity to divert patients. Under the tide of the new healthcare reform, quality PC is bound to influence the overall effectiveness of medical institutions. We need to learn from the experience of CPS in developed countries, combined with our policy direction, to expand new PC business models. In this way, we can promote the economic benefits and raise the professional status of pharmacists and generate sound development of this industry.

In developing countries, such as India, clinical pharmacy is a relatively new area of practice and health care professionals have little knowledge of the role and activities of clinical pharmacists in the hospital setting. As a result, they are less willing to work with clinical pharmacists in various health management, therapeutic processes and other areas. There is a need to improve health care professionals' attitudes towards clinical pharmacists, recognising the need for clinical pharmacists to work as part of the medical therapy and health management team and to improve patient care. Increased inter-professional collaboration between doctors, nurses and pharmacists can reduce the high levels of drug-related morbidity and mortality.

An interventional study conducted in an inpatient setting in a tertiary care hospital in the Malabar district of Kerala, India, explored the perceptions and attitudes of other health care professionals towards CPS from the perspective of general practitioners (GPs) and the frequency of collaboration between GPs (general practitioners) and pharmacists. The study included physicians, nurses, dietitians, physiotherapists, quality control department professionals and other medical and paramedical trainees working in hospital clinical departments throughout the study period investigating health care providers' perceptions and experiences of the clinical role of pharmacists, measuring the frequency of collaboration between physicians and pharmacists through the use of the Interprofessional Collaboration Instrument for General Practitioners in Tertiary Care Hospitals (FICI-GP) The degree of collaboration also included coordinating the activities of various health care providers to improve patient care through interprofessional practice and collaborative working relationships, and persuading physicians and other health care providers to make full use of pharmacists' skills to help manage patients' medication therapy.

GPs in India are aware that the current professional training of clinical pharmacists is patient oriented. Doctors are willing to work with clinical pharmacists to monitor medication

therapy and they recognise the importance of pharmacists' involvement in clinical visits and their role as educators and advisors on the safe use of medication for patients. However, GPs strongly disagree that clinical pharmacists have the authority to make treatment decisions or maintain a patient's full medication regimen. However, doctors who obtained their credentials from the United States and United Kingdom had a better understanding of the role of the clinical pharmacist compared to other doctors in India, and they agreed with the role of the clinical pharmacist as an integral part of the medical ward team.

With the further development of clinical pharmacy practice in the United States, the professional services of pharmacists have been extended to medication therapy management services and have become part of the Medicare program. Medication therapy management (MTM) emerged in the United States in the 1950s and has evolved over the decades to become part of Medicare Part D reimbursement in 2006, with payment rates related to the duration of MTM services, severity of illness and resources required to provide the services. Data show that 99.9% of Medicare Part D enrollees choose a pharmacist to provide MTM services (Centers for Medicare and Medicaid Services, 2010). The core elements of MTM are applicable to the optimization of complex prescriptions, including chronic disease management. MTM training in the USA is primarily provided by the APhA.

The inappropriate use of medications costs the American health care and to the MTM service process or other health care systems over USD 200 billion annually. These costs include approximately USD 10 million in avoidable hospitalization costs, USD 78 million in outpatient care, USD 246 in prescription, and USD 400 million in emergency care, representing 8% of total annual health care expenditures.

Improving drug use in the United States is an important public health goal and an initiative of the national public health programme, Healthy People 2020 (healthypeople.gov). According to American's Department of Health and Human Services, several of the goals in the plan focus on improving drug use. Examples (and final target figures) include:

First, increase the proportion of hypertensive patients treated with antihypertensive drugs; second, reduce the number of emergency room visits due to common, preventable adverse drug events; and third, reduce the proportion of elderly patients with disabilities who are not taking their medications appropriately.

MTM is designed to empower providers to identify and address medication-related issues that have been shown to reduce health care costs and improve clinical outcomes. Many pharmacists have a desire to expand their services for monitoring patients and assisting patients with medication-related problems. However, they need to refine their various skills in

guardianship of patients, increase their expertise in pharmacotherapy, or develop the infrastructure needed to support these services.

Pharmacists have been providing personalised patient monitoring services in different workplaces for decades, and these services are known as pharmacy monitoring, a term that has been coined since 1990s (Gums, 2003). The term TMT came into widespread use early in the century when the 2003 Medicare Prescription Drug, Development and Modernization Act incorporated the concept of MTM as part of the Medicare Part D prescription drug benefit program.

MTM became part of Medicare Part D and facilitated the development of national standards for MTM services in the United States by expanding patient services for pharmacists and the pharmacist reimbursement mechanism. there are provisions in the MMA that allow pharmacists and other medical personnel to provide MTM services to Medicare beneficiaries with high-risk drug-related problems. It is worth noting that the law does not authorise pharmacists to be legal providers under Medicare Part B, and the lack of such an authorisation continues to discourage pharmacists from billing for certain services. Currently, in addition to providing services to beneficiaries of prescription drug benefit plans, pharmacists provide MTM services to a wide variety of patient populations.

MTM encompasses a wide range of health care services provided by pharmacists. As defined by the consensus of the 2004annual pharmacy profession, MTM is a unique service or group of services that optimises the outcome of medication treatment for individual patients. The definition supports services that optimise medication outcomes for the individual, facilitate collaboration between pharmacists and other health professionals, and promote continuity of care. It includes a range of professional services within the scope of pharmacy practice, is broadly applicable to a wide range of pharmacy practice settings, and is applicable to any patient requiring MTM services. However, there may be some limitations due to differences in the scope of services provided under the rules of practice in each state in the USA.

The MTM service differs markedly from the routine consultations provided by pharmacists when prescriptions are dispensed and patients pick up their medication, which are brief consultations that usually consist of a description of the medication being dispensed and answers to patient questions, particularly those related to the medication. In contrast, MTM is a patient-centered service process that includes the analysis and assessment of the patient and their entire medication regimen, rather than just focusing on the medicines used by the individual patient.

Disease management programs and MTM services are also distinct, with MTM services addressing a patient's potential or actual medication-related problems in a comprehensive manner and disease management programs focusing on patient education and management of specific diseases. More advanced MTM services may include aspects of disease management programs, such as blood pressure monitoring and lipid management. Similarly, MTM services, such as comprehensive and targeted medication therapy assessments, may also be an integral part of a comprehensive disease management program.

The MTM service can be provided either face-to-face or by telephone. The face-to-face interaction helps to build a relationship between the pharmacist and the patient by observing and assessing signs and symptoms (e.g., drowsiness, confusion, bruising, extrapyramidal symptoms) that are associated with the patient's potential medication-related problems, and the face-to-face contact with the patient allows the pharmacist to observe in greater depth whether the patient understands and accepts the pharmacist's recommendations. The pharmacist can also perform physical examinations, vital signs measurements and immediate laboratory tests on site as required during the face-to-face visit.

Face-to-face services can take place in a variety of settings, such as community pharmacies, hospitals, clinics, patients' homes and other locations such as community centers. Telephone based MTM services can provide counselling for patients who are not comfortable arranging face-to-face services, for example, if the patient is returning home or living in a remote rural area. In addition, telephone MTM services allow patients to receive services in a comfortable, private setting and also facilitate access to some medication or medical records kept at home. Both types of MTM services require the pharmacist to have good communication and patient assessment skills.

Finally, although the terms MTM services and MTM programs are often confused, there is a difference between them. According to the designation currently in use, MTM programs are developed by health insurance or other healthcare providers and focus on optimising patient outcomes. MTM services are part of an MTM program and are provided through medical staff such as pharmacists.

The five core components of MTM service model are: medication therapy assessment, personal medication record, medication therapy action plan, intervention and/or referral, documentation and follow up (X. Q. Liu et al., 2018).

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Chapter 3: Research Methods

3.1 Research design

As presented in the policy context and industry context in the first two chapters of this thesis, the transformation and reform of clinical pharmacy services (CPS) has both broad prospects for policy guidance and great potential for commercial success. After incorporating the basic ideas of value chain theory, patient-centered management theory and value exchange theory, and combining them with the new situation and policy directions for the development of the pharmacy department in Chinese healthcare institutions, this study intends to conduct a specific analysis of several cases and demonstrate the feasibility of a new business model for CPS through a series of qualitative data collection, analysis and processing.

It is worth noting that the healthcare industry has its uniqueness compared to traditional manufacturing and service industries. Firstly, the industry is subject to strong policy guidance and regulation, and the overall level of openness is low, making it even more important to control policy compliance when researching industrial innovation. Secondly, the medical and health system in China not only acts as a physical bearer of value relations but is also endowed with certain public welfare and security attributes.

These two points are of great significance to the study of China's healthcare system, which is undergoing rapid development. In developed countries, the industrialisation of healthcare is relatively mature, with well-established industry standards. Service recipients (i.e., patients) and investors (i.e., the management teams of commercialised healthcare institutions or government organizations) have a higher degree of acceptance of the commercialised PC. In contrast, China has maintained a paternalistic approach to setting and controlling standards for the development of the healthcare industry for a long time. Service recipients and investors view PC as more of a public good than a commercial one. This context leads to both challenges and opportunities for the development of PC in China, which also implies significant practical relevance of this study.

Several large tertiary hospitals in China's Guangdong Province (mainly in Guangzhou City) were selected as the subjects of our study. Guangdong Province, with its backdrop of five mountains and facing the South China Sea, has been a place of openness and innovation

since ancient times. It was here that China's first western medical hospital in the modern sense (now Sun Yat-sen Memorial Hospital of Sun Yat-sen University) was born. As a bridgehead and pioneer of China's reform and opening up, Guangdong Province's healthcare reform has also been at the forefront of China. Since the 1980s, four parallel efforts in hospital infrastructure projects, equipment introduction, human resources and discipline construction have driven the rapid integration and accumulation of medical resources in Guangdong Province, enabling its medical system to take off rapidly in terms of human resources, materials, and technology.

As the leader of the reform, Guangdong Province introduced a series of policies to deepen the reform of public hospitals in 2018, including the "two-invoice system" and zero make-up policy, which are among the fastest implementation in China. Against this background, the pharmacy departments of medical institutions in Guangdong Province have felt the pressure of transformation brought about by policy changes. A number of pharmacy departments in public tertiary hospitals have come up with model transformation plans that can serve as research samples. It is also instructive to explore PC business models in practice.

3.2 Selection of research methods

When analysing the specific pharmacy service innovation initiatives in the pharmacy departments of healthcare institutions, it is easy to find that although the specific reform practices are different in different geographies and at different hospital levels, their ultimate purpose and theoretical core remain the same. All roads lead to Rome (i.e., the equivalence of results). The key to selecting a research method for such issues is to find an operational configuration research strategy.

Typically, there are two types of configuration research strategies: theoretical taxonomy and experience classification (Miles, 1978). Theoretical taxonomy established theoretical findings as to the basis for research, from which key factors and variables influencing the pathway are summarised and a weighted model for solving specific problems evolves. In the first two chapters of this thesis, three candidate theories of CPS management and innovation have been framed by investigating the relevant studies at home and abroad. Combining these theories with the cases below, management optimization thinking will be explained.

The theoretical taxonomy may be incomplete in the face of such an emerging industry as PC management because it is driven by concepts and theories. The second strategy for configuration research, namely empirical classification, can assist us in solving such problems

by summarising the operational laws of development in concrete practice and imposing a series of empirical data statistical analysis methods to conceptualise them (Meyer et al., 1993). The flexible application of the above two configuration research strategies, namely the interpretive cross-case inductive comparative approach Eisenhardt (1989) can answer the interpretive and exploratory questions in the context of emerging industries.

In order to shed more light on the "why" and "how" of the case development, we will also adopt a longitudinal multi-case approach to study a number of specific cases, based on the following two main considerations.

The focus of this thesis is to explore the new model of PC reform and to refine a set of a complete methods for the theoretical research in this field that is not yet sufficient. A longitudinal cross-case comparison can help us to further optimise and improve the existing theoretical foundation.

The cross-case analysis approach designed in this thesis incorporates a comprehensive consideration of pharmacy innovation models across different geographies and levels of hospitals, making it easier to summarise replicable business logic and to draw robust and generalised conclusions than individual case studies (Eisenhardt, 2007).

The theoretical underpinnings of PC value-added cases in different hospitals may have different focuses. If only a single case is analysed, the key to the core issue may be missed. A problem that can be effectively circumvented by combining different cases for cross-comparison, and a more comprehensive picture of business model development can be obtained.

3.3 Data collection

The main issue addressed in this thesis is to examine the potential value-added of PC and to draw out some business models that can effectively leverage such value-added to turn the pharmacy department into a profitable one. For the collection of primary data, we, therefore, underline in-depth interviews with middle and senior management personnel in hospital pharmacy departments.

In addition to the frontline pharmacy departments in healthcare institutions, we have collated three other sources to ensure access and review of raw data as summarised in Table 3.1.

Table 3.1 Descriptive statistics for data collection

Data type	Data sources	Statistics of data information				
		Formal interview			Informal interview	
		Time	Content	Number of respondents	Time	Number of respondents
First hand information	interview	About 250 minutes	Explanation of the relevant results of the questionnaire on the exploration of new mode of pharmaceutical care	15 first-line patients 12 clinicpharmacists 4 senior managers of Pharmaceutical Department 2 senior managers of circulation enterprises 2 principal leaders of the Institute	About 300 minutes	30 clinical harmacists 9 senior managers of Pharmaceutical epartment 6 senior managers of circulation enterprises 2 principal leaders of the Institute
	Field visit	Pharmacy Department of 5 top three hospitals in Guangdong Province Clinical pharmacy departments of 5 top three hospitals in Guangdong Province Self funded pharmacies of 5 major top three hospitals in Guangdong Province Three drug distribution enterprises in Guangzhou Guangdong Pharmaceutical Association				
Second hand information	Second hand information content	laws and regulations	Academic literature	News report	Institutional Yearbook	Corporate disclosure
		308 items	More than 30	More than 20	6	4

Pathway one is the interview and questionnaire survey with patients. This data is used to confirm the client's satisfaction with CPS. Some quantifiable efficacy data were included in the QHES and ICER for semi-quantitative assessment of PC outcomes. Data obtained from the questionnaires were standardised and analysed using OriginLab 2018. The results of the descriptive statistical analyses set out in the text were reported as exported through the software function, with confidence intervals calculated by the two-tailed t-analysis module that is built-in OriginLab.

Pathway two is data collection of drug distribution companies. Due to the special nature of drug guarantees in Chinese public hospitals, drugs used in the pharmacy sector in principle need to be guaranteed and distributed through drug distribution companies. Therefore, we conducted interviews with the main person in charge of the largest drug distribution company in Guangzhou, which focused on the economic benefits generated by the reform of PC compared with the benefits of pharmacy reform in the hospital pharmacy sector. The data were compared using relatively simple calculations with Mircosoft Office Excel 2016.

Pathway three is an interview and questionnaire survey for middle and senior officials of the Guangdong Pharmaceutical Society. As a bridge between frontline service providers in the pharmacy departments of medical institutions, the pharmaceutical industry and commerce, and pharmacy science and technology practitioners, the society has a higher dimension and more forward-looking industry data and insights on PC reform. This interview highlighted the kicking-off and operation of pharmacist clinics in Guangzhou's tertiary hospitals.

In addition to the above primary data, we also collected some secondary data to supplement the missing parts of the primary data, which mainly include:

3.3.1 National and international academic journals

These journals are primarily used to summarise the impact of industrial policy and incorporate advanced experiences of PC in developed countries, and obtain semi-quantitative data from other clinical pharmacy studies as supporting evidence.

3.3.2 Yearbooks and journals of the pharmaceutical societies

They are mainly to identify the organizational and institutional innovations that accompany the PC reform, focusing on the structural optimization of the pharmacy sector and the development of a talented workforce.

3.3.3 Web resources

The section mainly collects reports on reform and innovation and national healthcare policy documents from the official websites of healthcare institutions.

3.3.4 Interviews

As suggested by Locke (1980) interviews are the most direct, common, and powerful way of obtaining first-hand information for research. In the study, both formal and informal

interviews were designed as forms of research.

The interviews as a whole were conducted on a semi-structured basis and focused on the following question: how effective is the delivery of PC in achieving sustainable profitability? It is important to note that the interviews were not set in a specific sequence. The recording of the interviews was based primarily on the following principles.

Firstly, all interviews were transcribed in detail within 24 hours to ensure the reliability and authenticity of the interview content.

Secondly, in order to avoid as much interference as possible from the recording of the interviews, the recording of the interview process was done by a recording device or an assistant.

Thirdly, each interview was limited to two hours.

Fourthly, all interviewees had a direct working relationship with the case and understood the methodology and purpose of this research.

In addition to face-to-face formal interviews, we also set up informal interviews, which were conducted mainly by telephone, email, or IM (a communication tool) in a semi-structured way. The interviewees mainly cover leaders involved in the development of pharmacy regulations and patients with serious illnesses who are not easily interviewed in person.

3.3.5 Field visit

With a close relationship with the head of a medical distribution company in Guangdong Province, we visited five local tertiary hospital pharmacy departments in Guangzhou and conducted site visits to three of them (including their main branch hospitals).

In addition, we have attended six relevant business operations and development meetings organised by hospital pharmacy departments and pharmacy societies, some of which were recorded in video form.

3.4 Data processing

The information obtained through interviews, secondary data collection, and other channels can only guide us to carry out qualitative discussions on the value presentation of PC. In order to further explore the value of PC from multiple dimensions and perspectives, we use content analysis to carry out semi-quantitative analysis and processing of the obtained data.

Content analysis is a research tool that allows information extracted from qualitative data

to be summarized in a scientific way. Content analysis is used to determine the presence of certain words or concepts within some given qualitative data (i.e., transcripts of interviews). Using content analysis, researchers can quantify and analyze the presence, meanings and relationships of such certain words or concepts. Through objective, systematic, and quantitative research on the content of communication display, the obtained information can be efficiently summarized and sorted out and compiled into a statistical descriptive corpus for judgment.

In essence, content analysis mainly includes encoding text and transforming original materials into standardized materials. In the following paragraphs, this thesis will explain the whole process of the study and describe how we iterate, analyze, and theoretically collect the data.

The core issue is that the primary objective of this study is to understand what aspects of value chain optimization PC can bring to medical institutions under the background of new healthcare reform and observe the value-added brought by this optimization from the perspective of different interviewees.

With regard to the interview, in order to further develop the exploratory research problem, we started with the interview, mainly interviewing the head of the pharmacy department of Guangdong Provincial People's Hospital, the head of front-line clinical pharmacy, the back-office service support department of the pharmacy department (procurement, drug accounting, warehouse management), pharmacy outpatient visiting experts, and patients with chronic diseases. Guangzhou Pharmaceutical Co., Ltd. (a commercial distribution company) is in charge of the hospital's business department, and we interviewed its head person, the competent leader of Guangzhou Pharmaceutical Co., Ltd. Interviewees was inquired about their views on the value-added of pharmaceutical reform in Guangdong Provincial People's Hospital from various angles.

After obtaining enough primary interview data, the research problem was divided into several groups of core concepts: the links and forms of the value-added chain. This is the research framework of this study.

For example, in an interview with front line practitioners of clinical pharmacy in Guangdong Provincial People's Hospital, the interviewer learned that "For some drug monitoring projects that are not on the list of conventional pharmacogenomic tests, it is often necessary to unite the relevant forces of hospital research and academic departments at the forefront of the academic circle of front-line patients. On the one hand, the intervention of advanced research teams can effectively bring the most forward-looking guidance to frontline

clinical pharmacy departments, and on the other hand, the collection and acquisition of clinical information on rare cases is an important part of accelerating the output of research results. This win-win process effectively enhances the technical strengths of our pharmacy and achieves excellence in the midst of hardship and pain."

From this interview, three important information concepts were extracted to guide the follow-up research.

First is the integration process of the value chain. This study found that the front-line PC departments of clinical pharmacy and pharmaceutical research institutions in colleges and universities should be the first two niches in the value chain of PC. Through in-depth integration of the value chain, the efficient transformation of clinical research achievements has been realized and the quality of CPS has been improved.

Second is the manifestation of the "functional value" of CPS, which is the expression of value-added. Patients are willing to pay more for differentiated and real-time pharmaceutical guidance.

Third is the patient-centered service concept. This concept comes from the thinking tradition of "customer first" in the traditional commercial field. In the interview, whether it is the front-line pharmaceutical department or the back-office scientific research support, the final service target is patients with new drug demand, which also reflects the role change of the pharmacist team from "dispensing jobs" to "professional and technical jobs".

In a word, the exploratory research using interviews showed that the key point of realizing the value-added of CPS is to clarify the manifestation of its value-added, and to find the innovation and optimization of relevant links in the value chain.

In the process of preliminary analysis, the data were collated and analysed each week to discover the relationships between the various data and to discover their similarities and differences. During the initial data collection, the research questions gradually became clear. We noticed that although policy makers, healthcare managers, frontline staff in the pharmaceutical sector and patients had different needs and positions, the goal and expectation to optimise the overall value chain was consistent and urgent. All forces are happy to see the "occupation" of the entire value chain and to reduce the appropriation link between national policy and patient benefits. We can summarise and analyse a large number of similarities between the different innovative initiatives of different healthcare entities. Further analysis and detail will be provided later.

In contrast, however, respondents' expectations of the form of "value added" that resulted from value chain optimization vary considerably depending on their positions. We, therefore,

divided the value added by optimization into two benefits and three costs: functional benefits, emotional benefits, time costs, energy costs, and money costs. From the interview data we obtained, there was a wide variation in the importance attached to the five value-added models by different groups of respondents (even among patients and different consultation types).

Similarly, although interviewees from different positions said that "patient-centered" is the key to value and profit reform in pharmaceutical departments of medical institutions, different interviewees had different understandings of how to implement this slogan concept. Specifically, it mainly focuses on the subjectivity, enthusiasm, visibility, and professionalism of pharmaceutical practitioners.

In summary, these three concepts were coded and grouped into typical keywords to observe the reform issues faced by different interest groups in the process of value integration in the pharmaceutical industry.

3.4.1 Data encoding process

The following Table 3.2 presents data coding.

Table 3.2 Basic principles of data coding

Category	Coding Label	Coded symbol
Interview subject code	Large medical institutions	Main data: S1-S4, such as Guangdong Provincial People's Hospital S1 and Guangdong Provincial Hospital of Traditional Chinese Medicine S2
	Small and medium-sized medical institutions and community hospitals	Main data: Z1-Z5, such as Z1 of Guangdong First Rongjun Hospital
	Drug distribution enterprise	Main data P1-P2, for example, Guangzhou Pharmaceutical Co., Ltd. P1
	Principal person in charge of Guangdong Pharmaceutical Association	Main data: X1-X4
	Pharmaceutical manufacturer	Main data: C1-C4, for example, a peritoneal dialysis solution supplier C1
Interview station code	Policy makers	-zc
	Senior management of pharmaceutical department	-yg
	Senior Managers of Circulation Enterprises	-lg
	Head of Society	-xh
	Pharmaceutical researchers	-ky
	Drug procurement	-cg
	Drug accounting	-kj
	Self-funded pharmacy manager	-dz
	Factory Business Manager	-sh
Optimizat-ion of	Cooperative chain optimization	-01

Category	Coding Label	Coded symbol
value chain structure	Value-added chain optimization	-02
	Information chain optimization	-03
	Supply chain optimization	-04
Value-added embodiment	Functional benefits	-A
	Emotional interest	-B
	Money cost	-C
	Time cost	-D
	Energy cost	-E
Role Identity (Patient-centered)	Subjectivity	-zt
	Enthusiasm	-jj
	Visibility	-kj
	Professional	-zy

Based on the above, the sources of interview content were first identified: e.g., S1-S4 for large 3A medical institution subjects, Z1-Z5 for community hospital (outpatient hospital) subjects, X1-X4 for social subjects, and C1-C4 for medical supplier subjects.

In addition, due to the different roles of the interviewees, we also compiled their corresponding roles for different interviewees, e.g., the interview clip of the deputy director of the pharmacy department of Guangdong Provincial People's Hospital, whose corresponding code prefix is S1yg. During the interview design process, we guided the interviewees to focus on three key aspects of the embodied value of clinical pharmacy services, thus summarising the three most important coding markers.

We then began the coding process. For example, we read in the interview transcript. "In fact, the top leadership of the hospital did not force the hospital pharmacy to make financial profits in the short term. On the contrary, the human and resource investment in clinical pharmacy care should be increased compared to the pre-policy reform of zero drug mark-up. Although the capital cost increases in the short term, hospital management believes that such investment can significantly increase the linkages between the clinical pharmacy department and other departments, further improving the overall service level of the healthcare facility and bringing macro benefits. For patients, the expertise required for clinical pharmacy services cannot be achieved in one step. It takes time to train a competent team that can deliver advanced pharmacy service concepts to patients, all of which require an upfront cost investment. Therefore, we don't go for quick success and immediate benefit in terms of the price we charge for clinical pharmacy but focus more on team building and patient needs" (Deputy Director, Department of Pharmacy, Guangdong Hospital of TCM).

Reading the interview texts, it is not difficult to find the form and content of value added preferred by hospital pharmacy managers, i.e., a core understanding of collaborative

ecosystem integration as the main means of adding value, a focus on the emotional and functional benefits for patients, and a focus on professional development. The coding flag can therefore be set to (S2yg01Abzy). Coding structures are demonstrated in Figure 3.1.

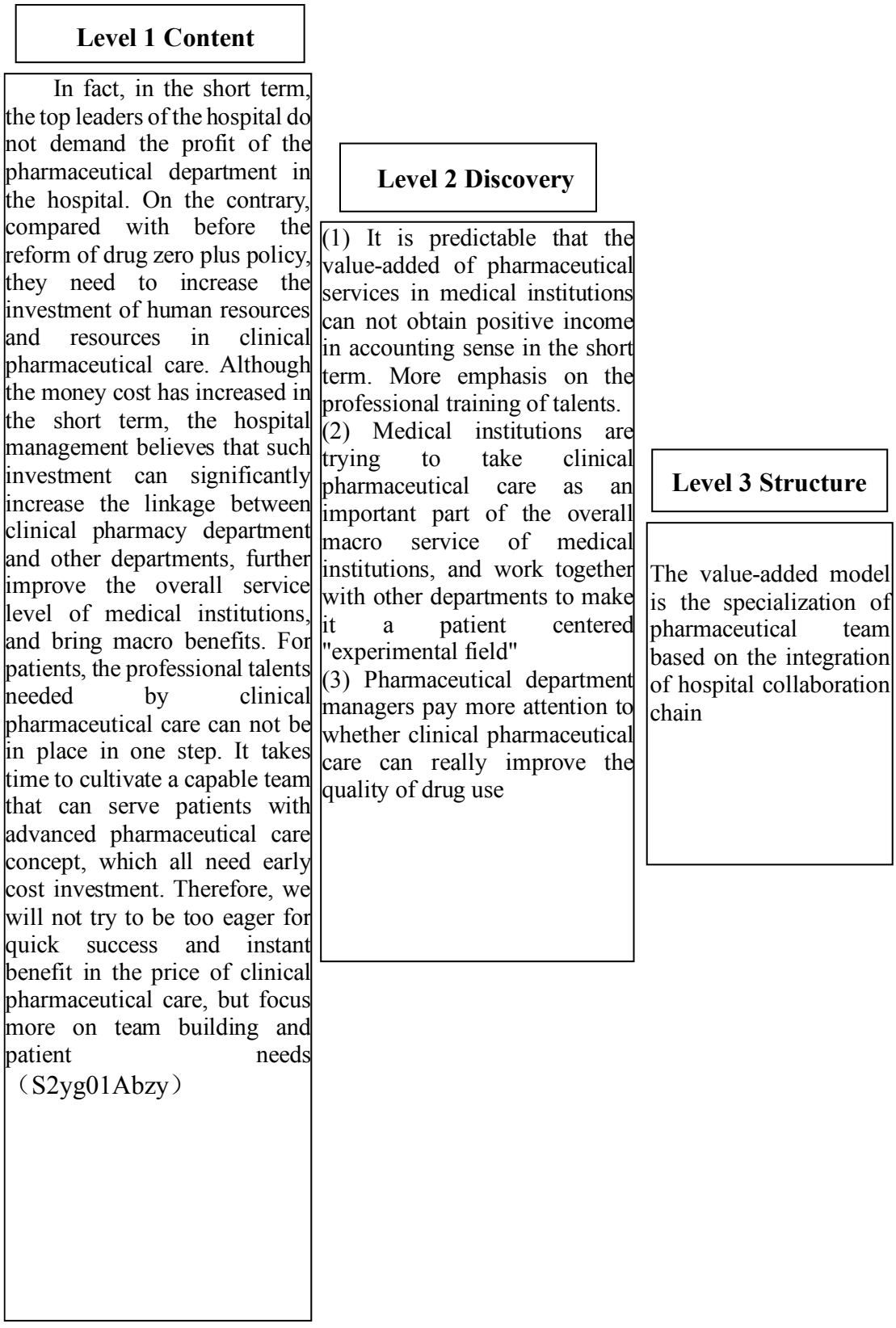

Figure 3.1 Some coding structures

3.4.2 Collection and coding of secondary data

Secondary data were collected and coded in a similar way to the first-hand data. It was mainly used to examine the latest national policy documents on medicine, health insurance and healthcare policy since January 2020, especially since the outbreak of novel coronavirus pneumonia has been raging since 2020 and poses new and daunting challenges for clinical pharmacy. We have coded national documents specifically related to the control of novel coronavirus pneumonia, and the coding method is shown in the following Table 3.3.

Table 3.3 Summary of coding methods of secondary data in national policy documents (n=308)

Category	Coding Label	Coded symbol
Policy Release Department Code	State Department	-A
	State Food and Drug Administration	-B
	National Health and Health Commission	-C
	National Healthcare Security Administration	-D
	Ministry of Finance	-E
	National Administration of Traditional Chinese Medicine	-F
	National Pharmacopoeia Committee	-G
	State Intellectual Property Office	-H
	State Administration of Market Supervision	-I
	Chinese Society of Health Economics	-J
Policy Entity Content Code	Medical insurance related	-01
	Medicine-related	-02
	Medically related	-03
	Comprehensive policy document	-04
Value-added embodiment	Functional benefits	-a (efficacy evaluation, quality control)
	Emotional interest	-B (Patient satisfaction, ethos building in pharmaceutical departments)
	Money cost	-C (medical insurance fee control, centralized procurement)
	Time cost/energy cost	-D (Internet medical efficiency, implementation of graded diagnosis and treatment)
Prevention and control of new coronary pneumonia		-COV

3.4.3 Reliability and validity

To ensure the reliability and validity of this study, a small number of researchers were invited to evaluate the research process and discuss the coding results. Firstly, the research methodology was discussed for two months to ensure mastery of the qualitative research and case studies, and then two years of data were collected.

Group discussions were held on issues of ambiguity or inconsistency to reach a final consensus to ensure the confidence and validity of all data in the collation and analysis process.

A two-tier mechanism was used to ensure the accuracy of the coding results. Firstly, we discussed the coding and iterated on the inconsistencies until we reached an agreement.

Secondly, if the results were inconsistent, this was discussed in the form of multiple analyses to ensure correctness and heterogeneity in the coding, and finally the coding results.

For the purposes of this study, the data referred to in this section include first-hand interview data, field interviews, secondary data and the data coding process.

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Chapter 4: Value Chain of Pharmaceutical Care

4.1 The pharmacy value chain before the new healthcare reform

As mentioned in the previous chapters, before the implementation of the new healthcare reform, the profit and revenue model of the hospital pharmacy sector mainly consisted of three major segments: drug mark-ups, PC and government subsidies. In the course of continuous development and evolution, a series of dilemmas were gradually formed, including the reduction of government subsidies, the difficulty of carrying out PC, and the barbaric growth of drug mark-ups and drug prices. Therefore, in order to truly understand the development of the business model reform of the new pharmacy sector, it is necessary to clarify how the process of the new healthcare reform has disrupted the value chain of the pharmacy sector. Why did the traditional "drug-based medical care" model not really add value to the hospital pharmacy sector?

In fact, at the policy level, the government's efforts and determination to control drug prices have been strong. By the end of 2021, the NDRC has issued nearly 30 price reductions and controls on pharmaceuticals, which are unprecedented in other countries in terms of the magnitude, intensity, and impact of price reductions (see Annex C).

However, as a special category of goods, medicines are very different from general fast moving consumer goods (FMCG). The value-profit chain approach can be used to analyse the value-profit chain of pharmacy before the healthcare reform. Patients, as the final consumers and users of medicines, are not equipped with the ability to choose medicines according to their own needs. At this time, hospitals are required to intervene in the role of knowledge division of labour in the patients' "purchase" of medicines and PC (Hu, 2004). As the upstream actors to the hospital, the pharmaceutical company undertakes the task of producing the instruments, equipment and solutions for medicines and PC. The distributor and logistics company undertake the task of distributing the medicines. What is described above is the most natural process of drug price formation in the 1.0 era when the consumer surplus obtained by the healthcare provider comes mainly from the difference between the evaluated value of the medicine and the cost of paying for it. This difference is partly reflected in the profit margin resulting from the drug mark-up policy and partly in the fees charged by the hospital for

medical and PC (Li, 2013).

Looking at this chain, it is easy to see the monopoly of the hospital pharmacy department in the entire value chain of drug purchase and sale before the new healthcare reform policy.

Firstly, medical services, as necessary social security, are irreplaceable and public hospitals. Medical services have a monopoly on the use and direction of medicines to some extent. Because of their public nature, public hospitals of the same grade are directly and easily able to form stable strategic partnerships, working together to maintain their monopoly in the drug purchase and sale chain.

Secondly, most of the drug manufacturers in China produce mainly generic drugs, so the homogenisation of their products is serious. As of 2008, there were nearly 5,000 manufacturers of raw material and formulation in China, and 97% of chemical drug production is generic (State Food and Drug Administration [SFDA], 2018), so it is not easy for pharmaceutical companies to form effective synergies and obtain bargaining power in negotiations with hospitals. Before the implementation of policies such as centralised procurement and national negotiations, there was even vicious competition and price wars. Higher value-added space is given to hospitals.

Before the implementation of the new healthcare reform, the drug distribution chain was too long. From the drug manufacturer to the hospital pharmacy may go through three or even more distributors and agents, which also led to too many interest subjects and information asymmetry.

Thirdly, it is thus clear that although drug supply and PC are fully competitive (or even viciously competitive) upstream, hospitals were in a typical bilateral monopoly position in the entire drug purchasing and marketing process before the implementation of the healthcare reform. The national policy that drugs price can be made up by 15% maximally allowed gave hospitals the possibility to add value through their bargaining power in the purchase and sale chain. According to the statistics released by the State Economic and Trade Commission in 2001, the total profit of the national pharmaceutical industrial producers in that year was RMB 17.6, and the total profit of the pharmaceutical commercial enterprises was RMB 940 million. In comparison, the income from hospital drug price differential in that year was reported at RMB 50.4 billion. In other words, medical institutions took 73.1% of the drug revenue, a very significant proportion even the price make-up is not counted in (J. C. Zheng, 2018).

According to profit chain analysis, it can be found that this “value adding” is not a sound and virtuous circle. According to Porter (1985), not the entire chain of business activities

creates value. It is clear that the upstream and intermediate chains (e.g., pharmaceutical companies, distribution, and rebates) can offer hospitals space for higher added value. However, it is more costly for the chain facing the downstream (patient services) to create value. Therefore, this is why hospitals tended to look upstream in the supply chain to find value added regardless of attempts to regulate drug prices prior to the new healthcare reform.

4.2 The pharmacy value chain in the post-healthcare reform era

With several packages of measurement of the healthcare reform, the value-profit chain of medical institutions has undergone a marked reversal.

Firstly, the policy of the zero mark-up resulted in hospital drug use no longer be linked to a percentage of the pharmacy department's revenue. Restrictions on ancillary drug use and the introduction of pharmacist review authority and automated prescription review systems have also further standardised the process of medication guidance for clinicians.

Secondly, the implementation of the "two-invoice system" policy has led to the transparency and flattening of intermediate channels. Large public hospitals can trace the source of drugs directly back to the manufacturer. The clarity of the channel has broken down the barriers of information asymmetry and compressed the value-added space of the drug distribution chain. The policy has also rapidly promoted the consolidation of the drug distribution and distribution industry, with only a few commercial companies remaining in a region that often has the capacity to complete supply and distribution. The bargaining space of the pharmacy sector in the chain has been significantly reduced.

Thirdly, the cost for hospital drug procurement has been significantly limited through a number of policies at different levels, such as centralised drug procurement policies, maximum retail price regulations for drugs, national essential drug catalogues and nationally negotiated drug catalogues. Entering centralised procurement almost means that drugs are sold at the cost of raw materials in exchange for a stable market share. The bidding process for centralised procurement is entirely government-led and market-based, in which the value-added space for hospitals is reduced to a minimum.

Fourthly, the spread of health insurance policies and the expansion of the health insurance catalogue has further split the entire process of purchasing and selling PC. While patients are still users of PC due to the reimbursement of China's health insurance, it is the health insurance account that pays for them. This means that the so-called downstream of the hospital is no longer the individual patient, but the entire health insurance system.

From the above four points, it is fair to say that although the impacts of the overall healthcare reform policy on the hospital pharmacy department are complex and multi-faceted, the analysis through the value-profit chain is clear. In the past, the hospital pharmacy department made profits mainly through gaining bargaining power in the face of the pharmaceutical industry and commerce as a two-way monopoly party and gaining value-added in the three upstream links.

After the implementation of the healthcare reform, due to the full competition of upstream actors under strong government control, the gradual convergence of upstream channels and the abolition of its own mark-up policy, the value-added capacity of the pharmacy department in the upstream of the supply chain has been gradually weakened. The downstream model of payment by the health insurance and the increasing demand of patients for healthcare has further pushed the pharmacy departments of healthcare institutions to focus on the downstream. It is easy to conclude that the reform of patient-oriented PC should be a new way to add value to the pharmacy sector in the post-healthcare reform era.

4.3 The role and analysis of the value chain of pharmaceutical care

4.3.1 Supply chain

According to the above, the so-called “supply chain side” of the value chain of PC is intuitively understood to be two types of business actors: pharmaceutical suppliers as manufacturers of medicines and commercial companies that perform distribution and dispensing functions. However, there is a more hidden PC providers, namely the pharmacists themselves (or the employees). For this reason, this section will analyse the incubation role of these two types of subjects in the development of the PC model in two parts.

Firstly, this study conducted interviews with Guangzhou Pharmaceutical Company Limited (GPHL), the largest public hospital drug distribution company in the Guangzhou area. The analysis is based on interviews with senior operational staff of GPHL, combined with essential, non-confidential data on the pharmacy department’s intake and inventory in medical institutions. The focus was on the shift in the structure of the pharmacy department’s drug intake after the implementation of the zero make-up policy. It also covered the impacts of national-level drug price regulation policies such as national centralised procurement on the upstream supply chain of the PC value chain.

4.3.1.1 Group purchasing organizations (GPOs) and centralised procurement have a huge impact on the upstream supply chain

Based on the summary of interviews, GPOs is the most mentioned change on the supply side. The model was first piloted in a total of 11 cities including four municipalities directly under the central government (Beijing, Tianjin, Shanghai, and Chongqing) and seven pilot cities (Shenyang, Dalian, Xiamen, Guangzhou, Shenzhen, Chengdu, and Xi'an) since November 2018. Thereby, the model is known as the 4+7 model (Zhang, 2020). The impacts of GPOs and centralized procurement can be seen in Table 4.1.

Table 4.1 Summary of three national centralised procurements

Time	Centralised procurement batches	Number of drug selected varieties	Average price reduction %	Maximum % reduction for a single product
November 2018	First batch	25	52	96
December 2019	Second batch	32	53	93
August 2020	Third batch	55	53	95
Time	Centralised procurement batches	Number of drug selected varieties	Average price reduction %	Maximum % reduction for a single product

Take the Guangzhou GPO platform currently used as an example, it is a government-led, non-commercial operating group. Its social costs for tender procurement are the total of government procurement platform and procurement agency costs (government funding), drug costs saved from tender procurement, corporate tender procurement costs, hospital tender procurement costs, and other participant costs.

According to the relevant data provided by the distribution companies, this thesis focuses on the third batch of centralized procurement just completed in August 2020. Among the 55 product gauges selected in the third batch of centralized procurement, the average price reduction reached 53%, and the highest reduction of a single product reached 95%. A large number of imported original drugs dropped out of the bidding or directly did not participate in the bidding of centralized procurement. This phenomenon reflects the continued squeeze of government policy on the value-added capacity of the upstream supply chain of hospitals (Shi, 2020; Y. J. Zhang, 2020).

4.3.1.2 Exploration of the self-funded pharmacy model

According to interviews with managers of GPHL, the self-pay pharmacy model was the key profit model developed by many public hospital pharmacies from 2015 to 2018. It is one of the first solutions by hospital pharmacy departments after the new healthcare reform was

implemented, mainly to solve the following problems.

Firstly, after the gradual implementation of centralised procurement, a large number of the original drugs that won the bidding were forced to be excluded from the hospital. At the same time, many expensive imported drugs were also excluded from the hospital due to the price per prescription, average prescription price, and drug share.

Secondly, with the standardization and refinement of the drug access process in public hospitals, Rules for the Implementation of the Accreditation Standards for Tertiary General Hospitals required hospitals to set up a well-established limit on the number of pharmacy product specifications, especially for complementary medicines and antibiotics, which are more strictly limited. A more common and widespread practice is that original drugs cannot have repeated the generic name and generic drugs can have one repeated trade name maximally.

Thirdly, patients' differentiated medication needs are objective, and some patients are willing to pay more for higher-priced medical services.

Fourthly, the frequency of discussion of new drugs at hospital pharmacy meetings is generally low. Most public hospitals hold this meeting once a year, and a small number of new drugs may not be presented for discussion at meetings for three to five years, yet there is clinical demand for the drugs. For this kind of drug, there should be available selling channels.

It is against this background that self-financed hospital pharmacies have emerged. It is important to note that these pharmacies are by nature pharmacies opened in hospitals outside the local commercial companies, with all the formalities in place. They also share the profits with the pharmacy department in the name of rent (Dang, 1997; Pan, 2003; T. L. Wang, 2011).

However, such a business model seems to be at risk of abuse and is suspected of bypassing the zero mark-up policy on drugs.

Although the life and death of the self-pay pharmacy model seem uncertain at present, it was noted from interviews that its success has given hospital pharmacy departments important theoretical ideas. Although drug supply and PC are becoming increasingly homogeneous in major hospitals, the diversity of patients' own needs for medication still exist. There are patients who are willing to pay a higher premium for higher-end care. Such thinking is also used in the subsequent personalised medicine practice, which is developed in Chapter Six.

4.3.1.3 Patient-centric from the provider's perspective

In an interview with a Novartis sales representative, this study keenly observed the feedback on the supply chain side of the patient-centric thinking from healthcare providers.

Dacina (nilotinib capsules) is an antineoplastic product in the Novartis speciality line, primarily for the treatment of adult patients with chronic myeloid leukaemia in the chronic or accelerated phase. It is primarily intended for patients who are imatinib-resistant or intolerant. Its use requires monitoring by a clinical pharmacist for electrocardiogram and haematological toxicity has been adjusted for dose, and treatment regimens may vary between patients. Treatment with this product should be continued as long as the patient continues to benefit.

Due to the above attributes, the clinical representatives of the hospital modified its clinical promotion programme. Thanks to the complete patient medication profile of the hospital's clinical pharmacy department, the manufacturer changed the traditional sales model of building contacts with the clinical department and the pharmacy department, and instead focused on the patient. Some patients needed to be referred and transferred due to changes in their condition, and the sales team followed the patients wherever they went.

Two important conclusions can be drawn from the case.

On the one hand, the clinical use of high value-added drugs, mainly oncology drugs, is increasingly calling for the involvement of clinical pharmacy departments. As the development of drugs for oncology continues to progress, targeted drugs based on genetic phenotypes have a premise that patients need to test their genes before using this drug. The pharmacological and pharmacological performance of many oncology drugs needs to be applied according to patients' characteristics. This is an important point for the clinical pharmacy to provide personalized guidance to create value-added. Moreover, lifetime documentation for patients can effectively avoid patients' duplication of medication due to transferring hospitals and other objective factors, reducing the cost for patients. All these reflect a change in the patient-centered clinical pharmacy model

On the other hand, this model can be effectively radiated to the supply side upstream. The reasonable filing of the hospital clinical pharmacy department further changes the supplier' ways of promotion, from the original clinical orientation that encourages the pharmacy to prescribe more drugs and the drug warehouse to limit drugs, to reaching out for more patients to offer them service. This change reverses the social image of traditional pharmaceutical representatives, while manufacturers and This change have reversed the social image of traditional pharmaceutical representatives. More importantly, the direct interface between

manufacturers and patients can effectively help manufacturers to obtain first-hand clinical data and further update their products. From this point of view, this patient-centered optimization effectively integrates the first and the last links of the entire value chain, helping the whole chain to achieve positive economic and social benefits.

4.3.2 Collaborative chain

In contrast to the upstream-oriented supply chain, as for the collaborative chain end, the value chain we wish to analyse how the collaborative relationships between the pharmacy department and other key departments within the healthcare organization have changed before and after the new healthcare reform.

As mentioned earlier, due to the complete abolition of the drug mark-up policy, the pharmacy department is changing from a profit center to a cost center in healthcare institutions. This also means that the relationship between the pharmacy department and other departments in the healthcare institution (especially the clinical department) is changing fundamentally. How the pharmacy department interacts with other departments within the institution to create collaborative value-added is becoming a new issue for hospital pharmacy departments. Table 4.2 shows how the relationship is examined. Statistical results of the questionnaire are shown in Table 4.3.

For this purpose, a stratified random whole-group sample of 50 pharmacists and 50 physicians was selected to distribute the questionnaire. The general information of the two groups was not significantly different and was comparable.

Table 4.2 PC collaboration chain questionnaire

Statement	To examine
I am happy to work with each other for patients.	Collaborative interest
The other person can help me serve my patients better.	Output expectations
I trust the other person's clinical diagnosis/review decisions.	Trusted relationships
I respect each other's professionalism and professional attitude.	Professional respect
Clinical pharmacist clinics will blur the boundaries between the responsibilities of the two departments.	Positioning of functions
The other side takes up too much of the hospital's resources and funding.	Fairness
I have the ability to influence each other.	Impact

Table 4.3 PC collaboration chain survey results

	Pharmacist's formula	Physician's side	P-value
Collaborative interest	4.4	4.2	**
Output expectations	4.5	3.1	*
Trusted relationships	4.8	4.6	**
Professional respect	4.7	4.4	*
Positioning of functions	2.0	4.5	n.s.
Fairness	3.2	1.1	n.s.
Impact	1.7	4.0	n.s.

It is easy to see from the model of the questionnaire that the pharmacist shows a stronger willingness to collaborate in four directions: interest in collaboration, output expectations, trust, and professional respect. Although the present model is based on the collaboration efficacy model proposed by Mcdonough and Doucette (2000), it is currently evident that clinical pharmacists are still in the stage of gradually gaining recognition for collaboration.

However, from the interviews with some of the pharmacist clinics, this study obtained more promising results. Their main feedback pointed in several important directions.

Firstly, the establishment of the Clinical Pharmacist Outpatient attracted a large number of patients for consultation. Due to the small amount of time allocated to individual patients by the clinicians, consultations are fast. Patients are not sufficiently knowledgeable about lesser-known drugs and new drugs, resulting in the problem that patients still have doubts about their medication. This is a hidden danger to medication safety and rational use of drugs. The Clinical Pharmacist Outpatient gives pharmacists the opportunity to educate patients directly and reduces the number of medication accidents caused by factors such as over-prescription of medication.

Secondly, in the year or so since the opening of the Clinical Pharmacist Outpatient, the content of patient consultations changed considerably, such as adverse drug reactions, drug interactions, and comparisons of similar drugs. Some patients also took the initiative to report their medical history and allergy or take the genetic testing and blood concentration monitoring after poor medication results, which is more helpful in improving patients' medication adherence and precision.

Thirdly, the Clinical Pharmacist Outpatient helps to relieve the pressure of excessive outpatients. Before the establishment of the Clinical Pharmacist Outpatient, when patients were not sure about the details of their medication, they could only return to the department to consult the outpatient doctor, which interfered with the normal consultation of the outpatient doctor. With the Clinical Pharmacist Outpatient, patients who need medication consultation can be divided into outpatient pharmacists, which increases the working efficiency of the outpatient department.

What is even more noteworthy is that it was the close interaction and collaboration between clinicians and pharmacists during the outbreak of coronavirus (COVID-19) in early 2020 that saved valuable time and built up experience for the pandemic control. In particular, a pilot version of the COVID-19 Treatment Protocol, based on the practical experience of frontline pharmacists, was released on 16 January 2020 during the early stages of the pandemic. By 22 January, with the full cooperation of physicians and pharmacists in the most

critical areas, the COVID-19 Treatment Protocol [Trial Version 3] (General Office of the NHC and the Office of the State Administration of Traditional Chinese Medicine, 2020) was issued by the. Subsequently, at an average rate of one edition per week, the trial protocol was continuously adjusted and iterated. By March 4, 2020, the treatment protocol had been updated to the seventh edition. It can be said that it was the sincere cooperation of frontline physicians and pharmacists that enabled the rapid compilation of a set of practicable and operational clinical guidelines, which can be said to have made an indelible contribution to the effective and stable control of the epidemic situation in China.

In addition to opening outpatient pharmacies, pharmacy departments in major public hospitals are looking for more ways to further improve their work and performance. As Fu et al. (2009) mentioned that the pharmacy department of Huashan Hospital Affiliated to Fudan University introduced the concept of Quality Control Circle (QCC) in its management, organising key technical staff responsible for preparation to form a QCC with the aim of solving problems related to the preparation process in the hospital and improving the product The aim is to solve problems in the preparation process and improve the one-time inspection pass rate. QCC is composed of 10 people, including a circle leader, a circle tutor and eight circle members.

In the early stage of the trial implementation, the team members visited the preparation room on the spot, understood the workflow and communicated with the relevant supervisors and technicians. The preparation inspection records during the period of June to August, summed up and analyzed the factors that caused the inspection to fail, and drew a Platogram to analyze the current number of defectsor failures, and calculated the number of failures. The proportion of each category item was then sorted.

With the support of Plato's data analysis, the team found that the main reason for failing the inspection was the failure of the picking, so in subsequent work, the team further explored the theme of "why the picking failed" and eventually increased the one-off inspection pass rate for the preparation from 90.84% per month before the improvement to 98%. 90.84% per month before the improvement to 98%.

It is worth mentioning that in this QCC activity, the team not only standardised and optimised the process of preparation, but also explored the management of personnel. In addition to organising standard operation process (SOP) training, establishing a quality supervisor inspection system and encouraging members to propose rationalisation proposals, a comprehensive data checking, standardization and evaluation system was also proposed for the confirmation of improvement results. It is also clear that this activity has improved the

quality of preparations, reduced costs and increased efficiency in the relevant departments, and, more profoundly, has enhanced the problem-solving skills of managers and technicians and stimulated the potential of the grassroots staff. This is undoubtedly another example of how the pharmacy departments of public hospitals are seeking breakthroughs through change and exploration in the wake of the healthcare reform.

4.3.3 Value chain

Pharmacogenomics, a new field of pharmacological research at the beginning of the 21st century, has been rapidly moving from the laboratory to the marketplace in the last five years. On 28 June 1997, Kinseltkolbert's laboratory was the first to discover that genetic differences could lead to individual differences in drug effects and that the design of studies of drugs and medication regimens should be tailored to these differences. Based on this concept, Kinseltkolbert created the world's first modern genetic pharmaceutical company, and the concept became known as pharmacogenomics (X. Zhang et al., 2001).

Pharmacogenomics, as an interdisciplinary of gene function and molecular pharmacology, is a necessary theoretical guide for the advancement of individualised drug use in the pharmacy sector. Pharmacogenomics does not focus on the human genome, but rather uses genetic theory as an improvement variable to study drug effects and drug safety from the results of drug use. Pharmacogenomics can help individualise drug use more rapidly and efficiently than genomics in the traditional sense, thereby having deep theoretical underpinnings and broad commercial prospects.

Individualised medication is one of the core elements of rational medication use, the opposite of "a standardised prescription for a disease". The first generation of individualised medication still focused on traditional biochemical indicators such as the concentration of drugs in body fluids, which has some guiding significance but did not touch the real thinking of individualised medication: individual differences are brought about by the abundance of genetic mutations. The introduction of pharmacogenomics provides more systematic theories for the development of clinical individualisation and the design of effective treatment regimens for specific populations, not only shortening the course of the disease, improving efficacy, reducing toxic side effects and lowering treatment costs.

From the perspective of pharmacoeconomics, the introduction of pharmacogenomics can help patients access more attractive PC at a reasonable price. For example, the same hypertensive condition can have over 100 clinically reported genes, and different hypertensive

pathways may require different drug interventions to achieve better results. The wrong medication may not only fail to achieve the therapeutic goal but may also cause serious adverse effects and bring new suffering to the patient. The introduction of pharmacogenomics can effectively reduce the duplication of medication, which can reduce the expenditure of national health insurance, the number of patient visits and adverse effects for patients, and the possibility of ineffective prescriptions for clinicians. In March 2017, the WHO launched its third global patient safety challenge, the Medication Without Harm strategy, which aims to reduce serious avoidable drug-related harm by 50% globally within five years, and this can only be achieved by relying on advanced pharmacogenomic technologies (WHO, 2017).

At present, 187 hospitals in China have launched pharmacogenetic testing. In June 2015, the first precision medication clinic was set up in Beijing Chaoyang Hospital. In 2017, the Guangdong Society for the Application of Precision Medicine was established, and the 7th Annual Conference of the National Society for Therapeutic Drug Testing was carried. In 2018, the monitoring for pediatric individualized medication under NHC was kicked off (Y. Liu et al., 2017).

Although pharmacogenomics has the above-mentioned advantages, the process of moving from the laboratory to the clinic requires incubation provided by hospitals. More importantly, as patients increasingly inform themselves of pharmacogenomics, part of the capable patients hope to obtain their “gene ID card”. For medical institutions, genomics-based medication guidance can also be an excellent way to create value in three main areas.

4.3.3.1 Lifetime value for customers

As the innate nature of the individual client, the genome has the potential to further unlock lifelong value. Once a hospital’s clinical department has access to a patient’s genomic information, it can tailor-make a set of value-added services that integrate diagnosis, treatment, and rational drug use for the customer. The hospital’s clinical pharmacy department can target its value-added services to understand its customers better than they do.

4.3.3.2 A digital portrait of customers

It is clear that healthcare in China is currently suffering from a lack of medical resources and inefficient allocation. This dilemma is also reflected in the high pressure and intensity of the daily work of frontline health care workers. In this context, it is difficult for healthcare professionals to provide personalised, detailed and quality care to patients, and as a result, the difficulty of accessing healthcare has long been criticised by patients. With the advancement

of healthcare reform, the focus on patient experience has become a hot topic of innovative reform research in the pharmacy department in recent years, and the concept of patient experience is gradually gaining popularity.

However, given the lack of medical resources, how can the patient experience be enhanced without unduly increasing the workload of medical staff? From the perspective of multidisciplinary cross-fertilisation, the concept of "Internet+" may provide a satisfactory answer to this challenge (Y. N. Li et al., 2020).

In the era of Internet of Everything, Internet companies are moving into the medical field to optimise the consultation process and provide personalised and targeted services to enhance the patient's consultation experience. In the era of big data, along with the development of comprehensive processing technology for massive amounts of data, user profiling based on big data has started to emerge in the medical industry after the fields of internet finance and personalised recommendations for e-commerce marketing. The use of patient profiling to explore patient needs, provide accurate medical care, save medical resources and improve patient experience has opened up new ideas.

From the successful cases of Internet media, precise individualized notification has become an important means to obtain value-added, while in the face of the complex etiology of patients' conditions, hospital pharmacy departments often find it difficult to find quantitative indicators and replicable operational models to provide precise guidance on medication, dosage form, dose, and other directions. Hospital pharmacy departments are normally provided with a range. The introduction of pharmacogenomics has revolutionised the rational use of medicines. Through the scientific description of genomics, hospital pharmacy departments can effectively quantify patient medication criteria, form a data-based "digital portrait of the patient" and better classify and describe their customers.

It can be said that the concept of "digital portrait" in the context of domestic public medical institutions is still a relatively new concept, in which medical big data is seen as a medical resource, based on the technical theory of "user portrait" and "user tagging". In this concept, medical big data is considered as a medical resource, based on the technical theory of "user profile" and "user tagging", and a digital portrait of the patient is constructed through its research and mining. By constructing a patient portrait tagging system, refining, selecting, and correlating tags, subdividing indicators, forming a portrait tag library, and on this basis depicting a digital portrait of patients presenting multi-dimensional, multi-view and three-dimensional, providing more reasonable medication guidance, can also further the difficulties of data access and analysis mining in the medical industry (Yao et al., 2019).

How far are novel concepts such as “Internet+” and “medical artificial intelligence” from us? L. Liu et al. (2020) from Central South University of China tried to offer an answer: data mining, artificial intelligence, cloud computing and other technologies in the medical field are still gradually spreading, but even now they are already contributing to human health care. This study focused on patients with chronic obstructive pulmonary disease (COPD) and combines personalised health profile modelling technology with health management system design and development technology to design and develop a COPD health management system based on personalised health profiles of patients, providing a rational and effective health management platform for COPD patients and exploring personalised health management models for patients with other chronic diseases.

In addition to the use of big data under the Internet, the patient’s own basic data and history of disease and medication use can also help to create a fine-grained portrait of the patient. Han et al. (2013) discussed that how the Union Hospital of Tongji Medical College of Huazhong University of Science and Technology explore technical support for clinical pharmacists to use the clinical pharmacy laboratory as a tool to provide PC for individualised clinical drug therapy.

As a deployed teaching hospital, the pharmacy department of the hospital is keenly aware that in addition to the regular pharmacy services such as clinical consultations, pharmacy visits, body discussions, adverse reaction monitoring and patient education, there is scope for further experimentation and exploration of specialised pharmacy services in the context of existing working conditions. This study provided a detailed description of the Therapeutic Drug Monitoring (TDM) Handbook for immunosuppressed patients, which includes basic information about the patient and the patient’s signs, such as drug concentrations, and a list of medication information, including drug doses, dosing times and other medications being used, and the professionalism of the pharmacy service is reflected in the fact that the pharmacist monitors the results of the patient’s individual medication dosage changes and drug concentrations in months, which are expressed in the form of a coordinate chart. In this coordinate, the horizontal coordinate is the time (month) and the vertical coordinate is the dose of medication (mg-d-1), and in this coordinate axis the change curve of the patient’s medication is plotted, making the change in medication dose and test results more visual, and this innovative presentation is quite enlightening.

4.3.3.3 Market prospects for value-added pharmacogenomics-based services

A predictive assessment by Marketletter previously stated that in 1998 the market for pharmacogenomics-based products and services was estimated at USD 47 million and by 2005 it had reached USD 795 million (see Table 4.4). The compound annual growth rate has exceeded 5%. The AbbotGenseb consortium, established in July 1997, has further globalised and scaled up the market prospects for pharmacogenomics. With over 30 pharmacogenomic-based collaborations already underway, the organization is committed to disrupting and challenging existing drug marketing models through the personalisation principles of pharmacogenomics (March, 2000; Marshall, 1997).

Table 4.4 Market status of products and services in pharmacogenomics, 1998 to 2008 (in USD million)

Indications	1998	2008
Cardiovascular disease	8.0	139.1
Infectious diseases	7.3	123.3
Central nervous system disorders	4.3	72.3
Cancer	2.4	41.3
Other	24.8	419.0
Total	47.0	795.0

As of May 2020, the Food and Drug Administration, United Stated has approved the addition of pharmacogenomic information to the drug labels of 275 drugs, involving 142 pharmacogenomic biomarkers (FDA, 2020). The Outline of Technical Guidelines for the Detection of Drug Metabolizing Enzymes and Drug Target Genes (for Trial Implementation) (NHC, 2015) was issued which for the first time promoted the detection of drug-metabolizing enzymes and drug target genes as a specific guideline for precision drug use in individualized medicine.

The Union Hospital of Tongji Medical College of Huazhong University of Science and Technology is a pioneer in the practice of PC for individualized drug therapy in clinical pharmacy laboratories, pioneering the value-added service of blood concentration monitoring of immunosuppressive drugs, digoxin, methotrexate and other drugs. More importantly, compared to the past when the test data was merely reported to the clinic and the physicians themselves completed the analysis of the rationality of drug administration and made drug dose adjustments. This medical institution focuses more on the integration effect of resources at the collaborative chain end, and reflects the value-added effect of the clinical pharmacist's own services through professional data analysis of the reports by the clinical pharmacist. The value-added model of patient-centered, personalised drug treatment and clinical pharmacists as the main body of work has been truly realised.

In the case of immunosuppressive drugs, for example, as mentioned in the section 4.3.3.2, the clinical pharmacist creates an exclusive profile for each patient participating in the pharmacogenomic service, namely the TDM Transplant Patient Handbook. The handbook contains basic information about the patient, clinical prescription diagnosis, transplant procedure status, transplant timeline, follow-up physician and follow-up pharmacist. In addition, it records the patient's body mass, blood pressure, heart rate, 24h urine output, temperature, blood and urine routine, liver and kidney function, lipids, blood glucose and drug concentration from the date of hospitalisation. The relationship between genetic factors (genetic variants) and drug effects is given at the genetic level through pharmacogenomic continuous follow-up analysis. The relationship between patient responsiveness to many drugs (both potent and adverse drug reactions) and their genetic subtypes has now been revealed, and this relationship can assist clinicians in selecting the most effective and best-dosed drugs for their patients by pre-testing their genotypes, i.e., prescribing "genetically appropriate" drugs by testing the patient's drug-related genes. The most appropriate prescription will enable the patient to achieve the best possible outcome, thus achieving true "individualization" of the medication.

Of course, it is foreseeable that with the further promotion and development of pharmacogenomics, the process of adding value to pharmacy services through pharmacogenomics will no longer be limited to the field of anti-tumour and immunosuppression in the future. During our visits, we found that some large tertiary hospitals have already started to monitor pharmacogenomics for chronic disease and anaesthetic drugs.

For example, the Institute of Clinical Pharmacology, School of Pharmacy, Sun Yat-sen University is attempting to include four classes of anesthetic drugs - inhalation anesthetics, opioid analgesics, muscle relaxants and intravenous anesthetics - in the monitoring of clinical pharmacology by combing through research on key targets such as CYP2B6, CYP3A4 OPRM1 opioid receptors and ABCB1 drug transport proteins (Z. L. Zheng et al., 2018). Zhao Shujin from the Department of Pharmacy of Guangzhou General Hospital of Guangzhou Military Region also studied and explored the pharmacogenomic level for the differences in efficacy and myopathic adverse effects of a class of drugs, statins, which are widely used in clinical practice for the primary and secondary prevention of dyslipidemia and coronary heart disease, locating CYP3A4, CYP3A5 OATPs, P-gp, HMGCR, APOE, CYP7A1, CETP and other possible pharmacogenomic targets, providing pharmacogenomics-based dosing guidance for future atorvastatin metabolizing enzymes, transporters and lipid

metabolism-related gene polymorphisms (He et al., 2011).

4.3.4 Information chain

As described in the previous chapters, the change in the supply chain has provided the pharmacy sector with the need and opportunity to explore effective business models. The improvement of the collaboration chain can offer a reasonable positioning for the pharmacy sector to change its role and achieve a win-win situation with the clinical sector. The enhancement of the collaboration chain can also clarify the status and boundary of the pharmacy sector. In the value-added chain, pharmacogenomics and personalised medicine are used as a guide to introduce the hardware that pharmacy departments can rely on. According to the value-profit chain, the final breakthrough still needs to be made, namely the opening up of the information chain.

This thesis underlines the exploration of the information chain end of the 24-hour online pharmacy clinic in the clinical pharmacy department of the First Affiliated Hospital, Sun Yat-sen University as an example for analysis of the information chain.

The Hospital's online pharmacy clinic was officially launched in October 2019 and is a new exploration of "Internet + PC" at the Hospital, mainly based on the mobile application, "Mobile Sun Yat-sen Hospital". As an exploration of new online services, the online paid pharmacy outpatient service allows patients to consult a group of qualified pharmacists without leaving home. The PC covers a wide range of areas such as maternity and paediatrics, cardiovascular, infectious diseases, anti-tumour targeting and diabetes. Especially during the outbreak of COVID-19 in early 2020, the online pharmacy outpatient service played an important role as an informational channel. During the opening hours, the People's Daily and Guangzhou TV stations published news about the pharmacy clinic respectively. The reliability and visibility of the hospital's pharmacy department were also established.

In particular, during the COVID-19 outbreak, the Third Affiliated Hospital of Sun Yat-sen University, as the designated admission hospital in Guangzhou, also launched an Internet hospital PC, actively exploring a new model of Internet hospital pharmacy service, which covers prescription audit, drug delivery, Internet hospital pharmacy clinic, WeChat public pharmacy service, pharmacist follow-up, patient management and many other contents, especially for hypertensive, diabetic insured patients, pregnant and lactating patients, patients with hepatic and renal insufficiency, to provide protection for the needs of medication during the special period of the Newcastle Pneumonia epidemic. In particular, it provided protection

for the medication needs of insured patients with hypertension, diabetes mellitus, patients during pregnancy and lactation, and patients with liver and kidney insufficiency during the special period of the New Coronary Pneumonia epidemic.

The use of electronic medical record systems has already reduced the risk of cross-infection by reducing direct contact between paper medical records and patients with infectious diseases to a certain extent.

A more extensive and widespread reform of the information chain is taking place in the field of "Internet hospitals". Internet hospitals are a new business model derived from "Internet + medical", an extension of telemedicine and traditional physical hospitals, based on the medical resources of physical hospitals. It provides patients with a series of closed-loop medical services from online to offline and from front-end to back-end, allowing patients to obtain medical services from physical hospitals more conveniently, while optimising the matching of existing medical and health resources. In the past two years, Internet hospitals have been developing rapidly in China as a new industry format.

As a unique product of the new healcare reform in China, the Internet hospital has distinctive Chinese characteristics. In developed countries, where Internet technology and Internet healthcare started earlier, such models have not been developed. As of November 2016, 59 Internet hospital platforms calling themselves "Internet hospitals", "network hospitals" and "cloud hospitals" had been established in China, most of which are already operating on the ground. Most of them are concentrated in East China and South China.

It can be said that the Internet hospital was originally set up to provide a new solution to the imperfect primary healthcare system, to reconstruct the healthcare value chain and to achieve win-win benefits for all parties. It relies on new technologies and means in order to promote the improvement and implementation of the graded medical treatment system. However, at present, those with the ability, willingness and motivation to build Internet hospitals are still mainly large tertiary hospitals in core regions. The idea of using the Internet platform to break the traditional medical interest pattern and thus contribute to the establishment of a general practitioner system is still in the architecture stage.

But another benefit of the implementation of Internet hospitals is obvious. As Internet hospitals have put forward new requirements for the construction of online consultation functions in medical institutions, their promotion has further improved the integration and optimization of the internal information chain in hospitals. In particular, the construction of electronic prescriptions, drug distribution and patient health management has objectively contributed to the automation, intelligence, and cloud-based management of pharmacy

departments. At the same time, based on the rapid development of mobile Internet in China, telemedicine and mobile health care are also gradually promoting the efficiency of information processing in pharmacy departments before and during consultations (Gu et al., 2017).

In an interview with the Guangdong Pharmaceutical Society, a prescription flow platform based on Internet hospitals is attempting to change the framework of the entire pharmacy service information chain: the Internet hospital prescription flow platform (hereinafter referred to as the platform). The platform refers to the data connection between Internet hospitals, pharmacies (social pharmacies or physical hospital pharmacies) and patients, realising prescription and drug information between doctors, pharmacists, and patients. It is a technical support platform that provides a full chain of pharmacy services on the Internet for patients by interconnecting prescriptions and drug information between doctors, pharmacists and patients, completing the steps of electronic prescription issuance by physicians, online review by pharmacists, pharmacy dispensing verification and drug delivery, pharmacy consultation and follow-up visits.

On the platform, the Internet hospital, the platform operator, the social pharmacy and the hospital pharmacy each have their own responsibilities. In this system, the medical institution is responsible for the construction and maintenance of the entire information chain, the qualification authority review of the platform prescribers and prescription review pharmacists, the adjustment and confirmation of the operating drug catalogue, and the integrated online and offline management of the flowing prescriptions. The platform is responsible for drug supply and quality assurance, prescription allocation, The prescription flow platform is responsible for drug supply and quality assurance, prescription allocation, verification, distribution and medication guidance, drug distribution and provision of consultation. The fundamental aim of the Internet prescription flow platform is to maximise the use of information technology to develop hospital pharmacy services in the direction of regional, multi-center services. That is, through the information linkage of multiple medical institutions, the sharing of Internet prescription information is realised, and regional centers for prescription audit are established, where Internet hospital network prescriptions from different medical institutions are centralised and audited for prescription flow. With the help of Internet hospitals, a PC platform for patients with chronic diseases was established to provide extended services for the management of chronic diseases after the prescriptions have been transferred. Through the establishment of a platform for chronic disease patient medication files, patients' chronic disease medication use is tracked and managed to enhance the

experience and effectiveness of pharmacy services for chronic disease patients.

With the deepening of China's medical system reform and the development of Internet technology, "Internet + medical care" models such as "Internet telemedicine", "Internet diagnosis and treatment", and "Internet hospital" have emerged as the times require, which greatly facilitates patients' medical treatment and further improves medical care. accessibility. The state attaches great importance to Internet medical work. In order to standardize the management and operation of "Internet + medical care", in September 2018, the National Health Commission and the State Administration of Traditional Chinese Medicine issued 3 documents including the Administrative Measures for Printing and Distributing Internet Diagnosis and Treatment (for Trial Implementation), which puts forward specific requirements for the management content of Internet hospitals such as access, rules, and systems (J. Y. Wu, 2020).

4.4 Enhancing the value chain of pharmaceutical care

4.4.1 Functional benefits

In order to explore how to enhance the value chain of PC, this study designed a set of scales and surveyed clinical pharmacists, outpatient pharmacists, research pharmacists, frontline pharmacy pharmacists and pharmacy department managers in a number of large public hospitals, including Guangdong Provincial Hospital of Traditional Chinese Medicine, Guangdong Provincial People's Hospital and Guangzhou Red Cross Hospital. The details of the questionnaire are shown in Appendix A. 170 questionnaires were distributed. Among them, 140 questionnaires were collected. 75 valid questionnaires were subsequently returned, representing a valid return rate of 44.1%.

The questionnaire distinguishes the attributes of the respondents, which are divided into five main positions: clinical pharmacist, clinician, research expert, policy maker, and hospital administrator. The weighting of each position in the 75 questionnaires returned is shown in Table 4.5.

Table 4.5 Percentage of sample role orientation for the "Exploring New Models of PC" survey scale

Characterisation	Sample size	Sample share
Hospital administrator	6	8.0%
Policy makers	7	9.3%
Clinical pharmacist	30	46.6%
Clinicians	17	22.6%
Scientific research specialist	15	20.0%

The questionnaire was designed with five main elements, each with four to seven items,

covering five areas: organizational definition and positioning, patient emotional relationships, effectiveness and efficiency, patient-centeredness, consolidation and change. Each item examines two sections: importance level and agreement level.

Firstly, degree of importance. The importance rating examines respondents' perceptions of the importance of the stated items to the development of clinical pharmacy. A score of five was given as the highest score, indicating very important, and one as the lowest score, indicating unimportant.

Secondly, the degree of agreement. It represents the respondents' perception of whether their organization (the five organizations correspond to the five respondent's positions are hospital pharmacy departments, hospital clinical departments, hospital research and development departments, policy-making departments and hospital decision-making levels) is effectively fulfilling and practising the descriptions involved in the statement. Five indicates that the statement is very much in line with the respondent's idea and one implies the least.

By examining the discrepancy between the degree of importance and the degree of agreement, this study understands the discrepancy between the ideal content of excellent PC and the reality of the implementation of CPS (He, 2020).

An important indicator on the scale is "effectiveness and efficiency", which is a six-item scale focusing on how well the five roles surveyed enhance the functional benefits of CPS.

With the results of the questionnaire survey (see Table 4.6), the following findings were found.

Table 4.6 Functional benefit results of the "Exploring New Models of PC" survey scale

Statement	The average level of importance	The average level of agreement
Adequate PC is a guarantee of rational drug use.	5.0	4.8
The current fees charged for PC provided by the department cover its costs.	1.9	1.2
Pharmacist clinics, pharmacogenomics can effectively reduce the cost of medication for patients.	2.2	3.0
Some patients are willing to pay more for value-added items (or self-pay items) and the department is always able to accommodate their requests.	3.2	1.2
Pharmacy service interventions generally improve drug intervention outcomes.	4.6	4.3
PC is a key future business growth area for our division.	4.5	2.0

Firstly, the vast majority of respondents agreed that proper PC is a guarantee for the rational use of drugs to be achieved. In the follow-up interviews, some clinical pharmacists added that PC should be in a broad sense, including not only the part that direct face patients, but also testing, research, and interdepartmental cooperation.

Secondly, the item of PC fees was the lowest-rated in the survey, and all respondents agreed that the fees currently charged for PC provided by healthcare institutions are unlikely to cover their costs and that PC fees are not a key point in the development of PC. In an interview with Luo, the director of the pharmacy department at Guangdong Hospital of TCM, we learned that the hospital leadership at this stage does not focus on the actual economic value created by the pharmacy department, but more on the invisible value-added processes, such as word of mouth, patient emotion, overall operational efficiency, satisfaction. The current range of the PC fees from RMB 10 to 30 is decided based on a comprehensive examination of the actual costs, patient acceptance, and social value, rather than the actual indicator of financial profitability. Therefore, respondents thought that this item was neither important (1.9 points) nor needed to be implemented (1.2 points).

The third item (can pharmacist clinics and the development of pharmacogenomics reduce the cost of medication for patients?) examined the reduction in patient care costs from precision medication. The majority of respondents rated this as less important (2.2 points), and this issue was explored in the follow-up field interviews, where the research pharmacist at the Guangdong Provincial People's Hospital offered a relatively objective answer.

From this point of view, the majority of precision drug use is still focused on the need for less than 30 drugs and in many cases to avoid possible adverse reactions. From this point of view, the adverse reactions due to the absence of pharmacogenomics cannot be measured in monetary terms for both patients and hospitals. If understood in that light, pharmacogenomics and pharmacist clinics can indeed reduce the cost of medication to patients. However, in practice, most patients do not necessarily need pharmacogenomics and pharmacist clinics. If they need, pharmacogenomics and pharmacist clinics only help to achieve a better outcome rather than a lower cost of care. From this regard, its importance is even lower. Therefore, it is difficult to evaluate specific points for this item.

The fourth item examined the potential for adding value to clinical pharmacy service (CPS), i.e., whether any patients are willing to pay more for value-added items (or self-paid items) and whether the pharmacy department is able to meet their requirements effectively. The importance of this item has the largest mean variance (2.15) in this study. The disagreement on this item centerd on the fact that clinical pharmacists, clinicians, hospital administrators, and research pharmacists each had their own evaluation.

From the follow-up interviews, this study found that clinical pharmacists generally consider this item to be relatively important for the development of overall CPS (4.0 points), based mainly on the fact that patients' knowledge base of medication use is now enriching,

and there are higher requirements for the richness and professionalism of PC. Although many large public hospitals are already equipped with professional equipment and hardware such as sequencers and bioinformatics databases, there is still a need to explore more application scenarios that rely not only on top-down communication and popularisation but also on listening to the actual needs of patients.

For hospital administrators, however, the importance of this item was somewhat reduced (2.1 points). The main feedback was that hospitals still had limited resources. Rather than constantly exploring the latest research findings of clinical pharmacy to meet all the needs of patients, it would be better to outsource the relevant solutions to specialist technology teams such as BGI (a Chinese genomics company), freeing up the hardware and software of the pharmacy department in healthcare institutions.

For research pharmacists, the importance of this item was generally rated extremely high (4.4 out of 5). During the interviews, it was found that research pharmacists themselves had some tasks and needs for clinical pharmacy exploration, so they wished to conduct more in-depth and professional research and analysis of the medication process of some patients. They generally believed that their level of research skills and the hardware and technical capacity of their hospitals could meet most of the needs of patients.

The fifth item concerns the relationship between the intervention of PC and the outcome of the pharmacy intervention. It is reassuring to note that the vast majority of respondents gave high ratings to the importance and recognition of this item (4.6 points and 4.3 points respectively).

The sixth item asked respondents whether PC was the main direction of development in their department. Most respondents agreed that focusing on PC was an important part of the exploration of value-added PC (4.5 points for importance). Unfortunately, all of them (from policy makers down to clinical pharmacists) gave the item low points for recognition (2.0 points). In an interview with the director of the pharmacy department at the Guangdong Hospital of TCM, this study learned that in its current conditions, the pharmacy department is still in an intermediate stage of moving from the backstage to the frontstage. The current development of the pharmacy department is not sufficient to support it as a reliable value center for the hospital. Hospitals still expect the pharmacy department to rely on its professional services to support the coordinated and sustainable development of the whole hospital.

By synthesising the above six findings, this study summarised three features of the current functional benefits of the PC value chain. First is the improvement in the level of

medication use brought about by the rational use of medication. Second is the contradiction and complexity brought about by the increasing demand for PC from patients and the pressure on the hardware and software of medical institutions. Thirdly, the functional benefits of the pharmacy sector are not reflected in actual economic profits, but in hidden benefits.

4.4.2 Emotional benefits

Compared to the traditional value-added model of pharmacy departments that focus on dispensing drugs, the introduction of a PC value chain is based on the possibility of establishing a long-term emotional connection between pharmacy departments and their clients (patients). In the past, hospital pharmacies generally adopted a window-type dispensing model, in which patients could only reach in with one arm to hand in their prescriptions for medication and could not easily consult and communicate with the pharmacy staff. In order to improve the outpatient pharmacy, Fujian Provincial Hospital has transformed it from a window type to a counter type. After more than a 6year of continuous improvement, the dispensing mode of the outpatient pharmacy has been completely transformed, with the dispensing room divided into a front and back counter through a turntable. The pharmacist at the front desk is responsible for receiving, reviewing, checking, dispensing, and explaining prescriptions. With this small change to the outpatient window, the back-office pharmacist has a relatively clean and quiet working environment, free from outside distractions, to concentrate on the prescriptions. The pharmacist at the front desk can also focus more on listening to patients' needs. The pharmacist's information and advisory services have been changed from passive to active services, further leveraging the pharmacist's role in adverse drug reaction monitoring. This improves both the overall efficiency of the pharmacist community and the overall satisfaction of patients. This shows that emotional value is also an important part of the consideration of pharmacy service benefits (Gao, 2007).

From the interviews, this study learned that large hospitals with the clinical pharmacist outpatient have invariably included patient follow-up and patient education in the systematic management of their chronic disease pharmacist outpatient. For example, in the Guangdong Provincial People's Hospital, for patients on warfarin anticoagulation, the clinical pharmacist has set up a one-to-one patient follow-up file. They tracked and optimised patient satisfaction through a self-designed questionnaire, which covered multiple dimensions such as test return results, waiting time, guidance on medication consultation, professionalism, adverse reaction anticipation, and service attitude and quality. There is a regular joint outpatient of clinical

pharmacists and physicians every Tuesday to provide comprehensive medication consultation to patients.

In the course of our fieldwork, a very interesting phenomenon was discovered. A significant number of patients come to the pharmacist outpatient for consultation with a very similar scenario. Patients paid an initial visit to a large public hospital at the provincial level and obtained a prescription but conducted their follow-up treatment at a community hospital at the county or district level. When patients changed to lower-level hospitals, normally their disease conditions changed or patients are inability to accurately describe the diagnosis made by the doctor at the large public hospital, leading to a change in the medication regimen by the lower-level hospital, which may aggravate their disease conditions. This can lead to changes in the community hospital's medication regimen, which can lead to recurrence or even worsening of the condition. The pharmacist outpatient system is mainly set up in large public hospitals, and pharmacists in grass-root hospitals do not have enough authority to audit prescriptions. Outpatient pharmacists at the Guangdong Provincial People's Hospital also agreed on the need and effectiveness of the pharmacist outpatient system to be available at lower-level hospitals.

It is important to note that the "patient-centered" and "patient emotional relationship" are the focus of this questionnaire survey and serve as an important representation of the study's exploration of the emotional value of CPS to patients.

The statistics for the emotional relationship section of the questionnaire for patients are shown in Table 4.7 and the following very interesting facts were noted.

Table 4.7 Results of the Patient Emotional Relationships section of the PC Exploring New Models survey scale

Statement	The average level of importance	The average level of agreement
Patients and pharmacists can develop a more emotional relationship than physicians through PC.	1.6	2.0
Emotional empathy and dependence are one of the most important considerations for patients choosing a clinical pharmacist consultation service.	3.5	1.3
Pharmacist involvement in the clinical process can effectively reduce the likelihood of doctor-patient disputes.	4.8	4.1
The delivery of PC deepens the emotional connection with patients, and this emotional connection always has positive benefits.	4.5	4.2
Pharmacists are happy to provide long-term stable pharmacy consulting services to some patients with chronic diseases.	5	4.3
Patients are happy to receive a long-term stable pharmacy consultation service at one facility.	2	4.7

Statement	The average level of importance	The average level of agreement
Patients are happy to recommend or refer other patients to our CPS.	3.2	4.0

Firstly, although policies and literature suggest that pharmacists and physicians should be on an equal footing and relationship when dealing with patients, the majority of respondents felt that although patients and pharmacists have some emotional relationship through PC, it is difficult to achieve a level of "more rapport level than physicians". Although clinical pharmacists and policy makers thought that this item was relatively important (mean 2.8 points), most clinicians and policy makers did not believe that a higher level of pharmacist-patient emotional connection would contribute to enhancing the overall value of CPS (mean 1.2 points).

In the follow-up interviews with some of the pharmacists, an interesting and reasonable explanation was found for this phenomenon. It is still the clinic physicians who cure patients. Patients tend to consider physician's prescriptions as an "order" service from the point of view of professionals, and most patients are unaware of the importance of the dosage behind the prescription. Even if there are pharmacist clinics, they are more likely to come in after the initial visit to solve the problem and provide "advice" services. From this point of view, even with the subsequent development of CPS into a new phase, the emotional connection between pharmacists and patients is still hardly better than that of front-line clinicians, nor is it better than that of front-line nursing and medical technicians.

Secondly, another statement that emerged as more clearly divergent in the survey was statement two: emotional empathy and dependence are one of the most important considerations for patients in choosing a clinical pharmacist consultation service. All 75 samples rated the importance of this statement from 3 points to 4 points. However, a low score of 1.3 points was rated on the level of agreement. In-depth interviews were conducted on the reasons for this phenomenon and the following was found.

For policy makers and hospital administrators, there is a consensus that patient-pharmacist emotions have a positive contribution to the overall hospital satisfaction and other indicators of effectiveness. However, the focus of current efforts still needs to be on increasing the accessibility and professionalism of CPS consultation. This is not the best time to enhance the emotional value of PC.

For frontline pharmacists and physicians, most of them believed that this statement should describe the state of CPS after it has been fully promoted, popularised, or even saturated. The

majority of patients receive PC at the suggestion of their physicians or hospitals, and this model does not give patients much choice.

Thirdly, the majority of respondents valued and recognised that the involvement of pharmacists in the clinical process can effectively reduce the probability of doctor-patient disputes. We listened to a lecture course on patient relations and doctor-patient conflict resolution by Xia Ping, Director of the Patient Service center of Guangdong Hospital of TCM.

According to the core principles of the course, the most fundamental source of doctor-patient disputes often comes from the fact that patients are not given sufficient attention before the consultation, that there are no channels for effective communication during the consultation and that patients do not receive timely feedback after the consultation so seek profound reasons.

The core opinion of this course is that the rooted course of doctor-patient disputes lies in insufficient concern for patients before the visit and the lack of effective channels for communication during the visit. As part of the overall medical service, PC can take on the role of the patient education, guidance and prevention before the consultation by offering part of the assistance in medication consultation during the visit (such as the joint clinic model in Guangdong Provincial People's Hospital). then, PC can provide return visits and feedback on medication consultation after the visit, technical and emotional support and protection to patients in the three main links. From this regard, the intervention of pharmacists in the clinical process has a positive benefit in terms of reducing doctor-patient disputes. This is also reflected in items five and six where the majority of respondents thought that the delivery of PV has deepened the emotional connection with patients (mean 4.5 and 4.2 for importance and agreement degree respectively). The majority of respondents also felt that pharmacists were happy to provide long-term stable PC consultation to some patients with chronic diseases (5 and 4.3 for importance and agreement degree respectively).

Fourthly, the results collected in statements six and seven reflect the biggest difference between healthcare and traditional business. According to value exchange theory, emotional value, as an implicit value gain, often needs to be captured through customer lifetime value in order to be truly valuable, in terms of customer loyalty, satisfaction and hospital recommendations. However, in this survey, the items designed concerning the exchange of emotional value for patients are contrary to traditional business thinking.

The first aspect this study explored was to ask respondents whether patients would be willing to receive long-term, stable PC consultation at a healthcare provider after the previous questions examined the emotional value to patients. In general, as clients of healthcare

services, patients develop loyalty after receiving quality PC, especially for patients with chronic conditions such as cardiovascular disease.

However, in the actual survey, we found that most respondents did not consider it important whether patients were loyal to their own healthcare provider or not. In follow-up interviews, this study learned that a significant proportion of patients stabilise their disease conditions or recover quickly after receiving pharmacy outpatient consultations, and a small proportion with recurrent conditions choose to re-visit the clinical department of a higher-level healthcare provider. Most patients do not need to see the same clinical pharmacist multiple times for advice. The return visit rate is also not a necessary indicator for the development of a clinical pharmacy department.

However, the 75 samples gave a high average score (4.7 points) in terms of the agreement, meaning that patients with a need for a return consultation would still choose the same pharmacist for consultation. In the follow-up interviews, it was learned that the reasons for this phenomenon may also not be brought about by an increase in the emotional value of patients as expected, but rather by the fact that most patients prefer to consult a hospital with a record of their visit due to the traceability of their case and course of illness. The number of hospitals with a developed CPS is not very large at present, leaving fewer options to choose from.

Fifthly, the last item examined whether patients were willing to recommend the CPS of the respondent's healthcare institution to other patients. Most respondents believed that patients had the willingness and tendency to recommend them (4.0 points), but they were not sure about the importance degree of this statement (3.2 points). In the follow-up interviews, it was learned that it is naturally good for healthcare institutions that patients are willing to spread word of mouth, but whether they need to choose CPS consultation and what kind of CPS they need to choose are more a matter of judgment in relation to the patients' own medical conditions and objective conditions. This judgment is individual and professional, so this word of mouth brings more potential brand value in terms of reputation to the hospital pharmacy department than actual economic value.

The results of the above questionnaire and interview transcripts make it easy to summarise the significance of the emotional value of patients in CPS. For healthcare institutions, word-of-mouth is a very important assessment indicator. The acquisition of word-of-mouth not only depends on the clinical department's medical skills but also requires the pharmacy department to provide attentive and professional services. Although PC does not directly bring loyalty and repurchase rates, as in the traditional commercial sector, PC is

the most important part of brand building for the hospital's clinical pharmacy department.

As far as the current situation of clinical pharmacy development is concerned, it may not be time for emotional gain for patients, but in the near future, when CPS is popularised, systematised and standardised, the brand value of CPS to the pharmacy department and the brand value of the pharmacy department to the whole healthcare organization will need to be measured and assessed by the emotional gain of PC.

4.4.3 Cost of money

The most significant improvement in the value chain of PC for hospitals is the reduction in monetary costs, most notably in pharmacy outpatient. Before the healthcare reform, charges of "medication guidance" were implicitly included in the patient's registration fee. However, many patients with chronic illnesses or precise medication needs who wished to access the value-added services provided by clinical pharmacists did not have a channel to purchase them. As mentioned earlier, the opening of pharmacy outpatient allows pharmacy departments to charge an additional fee for pharmacy outpatient visits. To this end, this study has learned through the survey that all major hospitals in Guangdong Province are basically equipped with a pharmacy outpatient mechanism (see Table 4.8), with a focus on their main service areas. As shown in the table, the hospitals in Guangdong Province with pharmacy outpatient are listed, and this study has also surveyed them to find out their main service areas, types of clinics, and consultation fees.

Table 4.8 List of hospitals with pharmacist clinics in pharmacy departments in Guangdong Province

Hospital name	Type	Service Direction	Consultation fee
The First Affiliated Hospital of Sun Yat-Sen University	Specialist outpatient	Chronic disease management, anticoagulation, medication use in pregnancy	RMB 10
Guangdong People's Hospital	Joint Outpatient	Precision medication	Chief Pharmacist: RMB 30
The Second Affiliated Hospital of Sun Yat-Sen University	Joint Outpatient	Joint Nephrology Clinic	RMB 17, and RMB 10 reimbursed by medical insurance
The First Hospital of Guangzhou Medical University	Joint Outpatient Clinic	chronic obstructive pulmonary disease (COPD)	Registration fee for chief physician 30 RMB
He Xian Memorial Hospital of Southern Medical University	Specialist outpatient	Chronic disease management pharmacy outpatient	RMB 10
Nanhai People's Hospital	Specialist outpatient	Anticoagulation, chronic disease management, pregnancy medication	RMB 13

Hospital name	Type	Service Direction	Consultation fee
Zhujiang Hospital of Southern Medical University	Specialist outpatient	Individualized Medication Clinic	Director: RMB 10, Deputy Director: RMB 20
Guangdong Hospital of Integrative Medicine	Specialist outpatient	Chronic Disease Medication Management Clinic	Deputy Director: RMB 20, Director: RMB 30
Nanfang Hospital of Southern Medical University	Specialist outpatient	Chronic Disease Medication Management Clinic	RMB 10
The Third Affiliated Hospital of Southern Medical University	Specialist outpatient	Chronic disease management, medication use in pregnancy	Director: RMB 10
Dongguan Third People's Hospital	Specialist outpatient	Chronic Disease Medication Management Clinic	Deputy Director: RMB 20, Director: RMB 30
The First Affiliated Hospital of Jinan University	Specialist outpatient	Chronic disease management, anticoagulation, medication use in pregnancy	RMB 11
Shenzhen TCM Hospital	Specialist outpatient	Medication therapy management (MTM), anticoagulation, analgesia, anti-infective medication	RMB 10
Foshan First People's Hospital	Specialist outpatient	MTM, anticoagulation, analgesia, anti-infective medication	RMB 10
Shunde TCM Hospital	Specialist outpatient	MTM, anticoagulation, analgesia, anti-infective medication	13
Yuebei People's Hospital	Specialist outpatient	MTM, anticoagulation, analgesia, anti-infective medication	10
The First Affiliated Hospital of Shantou University	Specialist outpatient	MTM, anticoagulation, analgesia, anti-infective medication	9

At present, although pharmacy outpatient is seen as a major solution to the revenue problem in hospital pharmacy departments, they still face three issues.

Firstly, on the whole, pharmacists' outpatient income is mainly based on consultation fees, but the current pharmacy consultation fees in major hospitals are in the range of RMB 10-30.

Secondly, according to a survey conducted by Shunde Hospital Guangzhou University of Chinese Medicine, the awareness rate of pharmacist outpatient among patients in the hospital was less than 20. Most patients were not clear about the specific difference between pharmacist outpatient and general outpatient. It is difficult to increase the consultation and follow-up rates at 11.03% (Chen et al., 2020).

Thirdly, the majority of people attending the pharmacy outpatient were over 45 years of age (67.64%) and had a wide range of needs for PC (Chen et al., 2020).

It can be seen that the main contradiction of these three issues lies in the promotion of PC outpatient and the need for a better platform to improve patient acceptance and satisfaction, although there are many large hospitals that are gradually using new internet platforms to promote PC outpatient, such as the aforementioned online pharmacist outpatient at the First Affiliated Hospital of Sun Yat-sen University, which is a good example.

4.4.4 Time costs

In the PC value chain mentioned earlier, savings of time cost are an important factor to consider in the integration of the value chain, and for actual healthcare clinical scenarios, time is a key variable that directly affects patients' lives. In order to examine the positive impacts of PC value chains on time costs, this study deliberately designed this question in two interviews.

The first is the time cost savings associated with the implementation of clinical pharmacist outpatient. The time of outpatient doctors in large tertiary hospitals is very valuable, and they are faced with nearly 100 patients with different complaints every day. Because of this, the average consultation time for each patient is often only 5 to 10 minutes. With such a short time limit, often only the general cause of the disease is known, and it is difficult for the clinicians to complete the follow-up work such as medication guidance, patient education, and even control and prevention.

Before the establishment of the clinical pharmacist outpatient, many patients were unclear about the details of their medication and returned to the department to consult the outpatient doctor, which interfered with the normal consultation of the outpatient doctor. After the setting up of the clinical pharmacist outpatient, consultation about drug use can be divided into the clinical pharmacist outpatient.

On the one hand, the reposition of patients increases the working efficiency of the outpatient department, which is brought by the optimization of the collaboration chain in the value-profit chain. On the other hand, as an important part of the pharmacy department's daily work, prescription audit often takes up a large amount of the pharmacist's time. If the clinical pharmacy department is to add value to its profits, the time for auditing prescription should be freed up to be devoted int services with more potential of adding value. Fortunately, with the development of technology, a range of automated prescription review and prescription auditing systems are now being rolled out across frontline pharmacy departments. This optimization is brought about mainly by the optimization of the information chain in the

value-profit chain. These two optimizations help save time cost.

There is no doubt that the automated prescription review system saves pharmacists' time, but more people put the question on equivalence. Whether the automated prescription review system can really assist the manual review of prescriptions. For this reason, we took Zhanjiang Central Hospital as an example, which analysed the effect of prescription reviews of proprietary Chinese medicines by the Automatic Rational Drug Administration Management System from January to December 2019. Eighty prescriptions of proprietary Chinese medicines were randomly selected each month for statistical analysis. By comparing the prescription data for the same period in 2018, it was found that the use of Chinese medicine injections decreased by 4.2%, and the use of essential drugs and generic names increased by 81.2% and 97.2% respectively, both of which were statistically significant differences. Moreover, there were also significant reductions in irregular prescriptions, inappropriate dosages, over-prescriptions, duplication of medication, and inconsistent medication diagnoses after implementation. It can be seen that the introduction of the automated prescribing system has not only improved the efficiency of pharmacists but has also made an outstanding contribution to the rationalisation of medication use.

4.4.5 Energy costs

An important topic for the PC value chain is how to minimise the overall experiential and physical costs to hospital pharmacy departments by integrating upstream and downstream resources.

Due to the abolition of the drug mark-up policy, the professional requirements of hospitals for clinical pharmacy practitioners are rising. Not only are pharmacists required to do a good job in basic drug distribution and drug guarantee, but the new PC, such as pharmacogenomics and pharmacy clinics mentioned earlier also require more effort from pharmacists. For some staff whose professional knowledge is not consolidated enough, hospitals are required to provide them with a full set of skills training. This means that hospital pharmacy departments should find the right channels to save their staffs' effort and allow them to experiment with direct-to-customer PC that can add more value.

End stage renal disease (ESRD) is the final stage of irreversible decline in kidney function caused by multiple renal system diseases. As a result, a large number ESRD patients are surviving on dialysis. By the end of 2013, a total of 326,000 ESRD patients were on dialysis in China (Chen, 2016) .

Compared to haemodialysis, peritoneal dialysis is a safer and more effective method, as well as being more economical and simpler. For hospitals, however, peritoneal dialysis solution itself has two major promotion problems.

Firstly, the fact that peritoneal dialysis fluid can be treated at home is an advantage in itself. However, for patients, peritoneal dialysis fluid needs to be changed frequently and is itself a huge, bulky, and heavy dosage. Patients urgently need the hospital to address the issue of transport from the hospital to the patient's home.

Secondly, the peritoneal dialysis solution itself was not as well promoted upfront as the haemodialysis method, so patient awareness was low.

The traditional form of peritoneal dialysis fluid is still primarily a medical institution-patient model. Similar to conventional drugs, patients collect their own peritoneal dialysis fluid from the hospital. However, as a value-added need, many patients prefer the hospital pharmacy department to provide transportation. This is a good point of the value-added service since dialysis is almost a lifetime care. Therefore, providing dialysis-related PC can effectively capture the lifetime value of the customer and increase his or her loyalty. Moreover, the patient can receive dialysis fluid regularly without having to leave home, increasing his or her satisfaction.

In practice, however, it becomes clear that the value-added benefits of the peritoneal dialysis fluid business hardly cover its high costs, which in this case refer mainly to the pharmacy department's energy costs and storage pressures. The pharmacy department needs a dedicated pharmacist to identify all the patients in their hospital who need to be provided with peritoneal dialysis services, to plan their peritoneal dialysis fluid delivery cycles, and to regularly maintain the patients' contact details, including home addresses. It is also difficult to guarantee the safety of the dialysate during transportation as the process requires the involvement of a third-party logistics company, and unprofessional logistics companies often have little interest in such bulky and heavy medical supplies. This makes this profitable model unsustainable.

The management of ESRD in foreign pharmacy departments is worthy of our consideration. For example, in the United States, there were approximately 616,000 patients with end-stage renal disease by the end of 2012, of whom only 30,000 were being treated with peritoneal dialysis. The majority of them adopted haemodialysis. In contrast, the proportion of new ESRD patients in the United States who chose peritoneal dialysis for life support was as high as 90.7% in 2011. The most direct reason for this change is that the Medicare Benefit Manual made clear provisions for the responsible parties involved in-home peritoneal dialysis,

distribution methods, distribution costs, and distribution implementer. Since January 2011, the US Medicare programme for old people has required manufacturers of peritoneal dialysis solutions to deliver the solution to patients' homes free of charge. In the United Kingdom, due to the increased emphasis on general physicians and community health teams, advice on peritoneal dialysis guidance is further downstream to the nephrology community nurses, and home dialysis liaison officers within the ward are designated to deliver it. Dialysis facilities are primarily contracted by commercial suppliers, and commercial companies with European Union procurement credentials are selected through a tender process with this service to manage distribution on a regional basis (Chen, 2016)

Based on the fundamentals of the value profit chain, not every part of the chain provides added value, which is exactly what peritoneal dialysis services do. However, if hospital pharmacy departments can effectively integrate upstream distributors, at least four issues can be effectively addressed.

Firstly, peritoneal dialysis fluid requires to be delivered to hospitals by upstream distribution companies. If distribution companies can assist with direct delivery to patients' homes, this can effectively save intermediate links.

Secondly, hospital pharmacy departments no longer need to expend effort on maintaining patient contacts and addresses, freeing up pharmacy staff to devote more energy to services with greater added value.

Thirdly, the distribution company itself has a larger and more suitable storage space and logistics and transportation capacity. Medical products such as peritoneal dialysis fluid, are large in size, low in value, heavy and easily damaged. The distribution company's warehouse has better conditions and advantages for long-term storage. The distribution company also has a more professional drug distribution team and capabilities, which can solve the safety and effectiveness of drug distribution to a greater extent than outsourcing third party logistics.

Fourthly, the distribution company is happy to participate in the profit-sharing of the peritoneal dialysis fluid distribution chain.

It follows that integration based on the upstream and downstream of the profit chain can effectively reduce the effort of hospital pharmacy departments and make process links as simple and professional as possible for those involved without compromising the quality of care.

The questionnaires (see Table 4.9) were carried out separately for those responsible for logistics and distribution in commercial companies and managers of peritoneal dialysis fluid services in the pharmacy departments of medical institutions, scoring the word descriptions

(not conforming to very conforming, corresponding to a score of 1-5). 35 questionnaires were distributed (25 to commercial companies and 10 to medical institutions) and 24 were returned (18 to commercial companies and 6 to medical institutions), with an average score taken from the table.

Table 4.9 Questionnaire for delivery of peritoneal dialysis fluid

	Commercial companies	Medical institutions
Peritoneal dialysis fluid distribution services consume the storage/logistics capacity of my unit.	4.5	2.1
The peritoneal dialysis fluid delivery service consumes a lot of my daily work energy.	2.2	1.3
Patients have increased satisfaction from this service.	4.9	4.8
Collaboration between commercial companies and healthcare providers reduces distribution costs.	4.7	5.0
Peritoneal dialysis service brings higher value-added profits to our unit.	3.2	3.0

Another tool for saving energy and costs, as we found out through interviews, is the widespread availability of automated pharmacy control technology in healthcare institutions. As a hardware input to the pharmacy, automation is one of the most effective means of achieving efficient and standardised drug management. By using automated equipment, the quantity, amount and expiry date of medicines are managed in a uniform manner, based on improved quality assurance, thus ensuring the safe and effective use of medicines by patients and freeing up the back-office staff of the pharmacy department. It also lays the foundation for the development of a full range of pharmacy services in medical institutions.

Traditionally, back-office staff in pharmacy departments need to devote a lot of energy to quality management of drugs, inlet and outlet management, expiry control and other items, and cannot be freed from their daily trivial work, and it is difficult to move from the back office to the front office in a real sense. In July 206, the first automated outpatient pharmacy in China, was put into operation in the PLA Hospital No. 302 Hospital, marking the gradual transformation of the pharmacy back office in domestic healthcare institutions towards automation.

In terms of quality management, by deploying an automatic dispensing system (known as ROWA) at the information chain end, it enables scanning and screening for incoming drugs, while unqualified drugs are communicated through the information chain structure directly to the supply chain (distribution companies, pharmaceutical manufacturers) for feedback. At the same time, ROWA builds a relatively independent and closed storage platform, with internal temperature and humidity available, all regulated and maintained by a central control system, and dispensing and distribution done automatically by a robotic arm. It helps realise fully

automated in-stockong, out-stocking, and storage.

In terms of inventory management, through the effective interface with the hospital's HIS system, medical insurance system, procurement platform system and the hospital's internal financial system at the information chain end, the inventory management bookkeeping is automated, which truly implements the management method of amount management, quantity statistics, actual consumption and actual sales proposed in the 1980s, accelerating the cash flow, improved economic efficiency and saved the back office administrative staff of the pharmacy department.

As a special commodity, the management of expiry dates requires a lot of effort and cost for pharmacy service providers, and confusion about expiry dates is a major complaint from patients. Article 49 of the newly amended Drug Administration Law stipulates that medicines that do not indicate their expiry date and production batch number, or that exceed their expiry date, are considered substandard medicines. Therefore, strengthening the management of expiry dates is an important task to implement the Drug Administration Law and ensure the safe use of drugs. Particular attention should be paid to medicines that are not easy to store, such as antibiotics, biological products, some chemicals and radiopharmaceuticals. The introduction of an automated information system has solved this problem by giving automatic alerts if a medicine is due to expire in the near future (within three months) and by allowing random access to the expiry dates of medicines currently in stock. This reduces the daily burden on pharmacists.

4.5 The value chain and new business of pharmaceutical care

In summary, it is easy to see the determination and boldness of the major provincial hospitals in Guangdong Province to reform their pharmacy departments. Whether it is the development of pharmacist clinics, the introduction of pharmacogenomics, the optimization of peritoneal dialysis fluid distribution services or the exploration of self-pay pharmacies, it can all be attributed to the reorganization and reshuffling of the PC value chain. Abandoning the drug supply business, which is no longer a value-added point, and shifting the focus and emphasis The pharmacy service concept is based on pharmacogenomics, exploring the lifelong value of customers, facing the increasing demand of patients for personalised medication, and embracing the new wave of pharmacy research and development, especially in the fields of oncology treatment and cardiovascular chronic disease control; or based on the pharmacy service collaboration chain, actively changing the role of the pharmacy department in the

overall organization, giving full play to the creativity and enthusiasm of staff, and developing PC. or based on the optimization of peritoneal dialysis fluid distribution services, actively cooperating with the upstream of the supply chain to achieve a win-win situation for commercial enterprises, medical institutions and patients by clarifying the value collaboration relationship with commercial distribution companies; or through self-pay pharmacies and Prescription outflow and other value-added models will be explored to further explore the value and provide solutions for patients in need of high-value original drugs.

It can be seen that hospital pharmacy departments are constantly looking for breakthroughs in all parts of the service value chain and integrating supply relationships up and down the value chain. Although the channels chosen vary in specific practice from hospital to hospital, the overall aim is the same: to put the patient at the center.

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Chapter 5: Driving Strategic Value Change: Patients Centered

5.1 The transition from “drug-centeredness” to “patient-centeredness”

In the “drug-centerd” phase of clinical pharmacy, the most common tasks that hospital pharmacy staff are exposed to are drug distribution, drug concentration monitoring, collection of new drug information, medication consultation. A small number of hospitals may carry out clinical visits on some hospital campuses. The pharmacy practice after the new healthcare reform still centerd on drugs. However, as mentioned before, the PC fee is always charged to the patients themselves, so it should be an instinct for pharmacy practitioners to see patients as customers. This means that the management mode of medical institutions should change to the management of “human’s” medication, and the working mode should also change from the traditional “supply guarantee” to “service provider”.

In the interviews with workers in the pharmacy departments of Guangdong Provincial Hospital of TCM and Guangdong Provincial People’s Hospital, we invited the interviewees to briefly outline their understanding and awareness of patient-centeredness in their own positions. Through the analysis of the interview corpus, we grouped the practical actions of patient-centeredness into six broad categories of practice.

5.1.1 Strengthening patient-centered thinking in the dispensing of medicines

In the interview, the outpatient pharmacist of Guangdong Provincial Hospital of TCM said that before the implementation of the “patient-centered” ideology, the assessment criteria of outpatient pharmacists focused more on service efficiency and accuracy, sometimes ignoring patient satisfaction. The outpatient window is the final terminal for drug delivery to patients, and its service level directly affects the customer image of the healthcare institution. Therefore, in line with the principle of “patient-centered”, the requirements for frontline pharmacists are further refined: not only are they required to have exquisite and meticulous business skills and profound accumulation of pharmacy knowledge, but also to have a clear understanding of the basic information, contraindications, methods of use and clinical norms of the medicines issued. At the same time, they are also required to follow professional ethics, refine their communication skills, focus on observing the physical, psychological and spiritual

conditions of patients, give appropriate services and feedback, focus on service with a smile and enhance emotional values.

5.1.2 Strengthening patient-centered thinking in the process of prescription review

Prescriptions are the basic basis for pharmacy dispensing and pharmacists should conduct detailed reviews of prescriptions and analyse the rationality of clinical use. However, during the interviews, we found that some pharmacists sometimes fall into the misconception of mechanisation and standardization in their judgement of unreasonable prescriptions. The principle of "patient-centered" prescription review requires pharmacists to be able to make a professional analysis of each prescription and to give individual judgements in response to the different circumstances of different patients. In particular, there is a need to deepen the collaboration with clinicians at the end of the chain. Timely and effective communication about the patient's medication needs, with a focus on identifying prescription errors, repeat medication and the patient's past medical history. This allows patients to feel that they are receiving an exclusive and customised medical solution, while also enhancing the efficiency of the collaborative chain operation.

5.1.3 Enhancing patient-centered thinking in the medication guidance process

As the content of the physician's prescription is relatively simple, it often only states the drugs used and the dose to be administered, but the exact method is not specified. However, there are inevitably individual instructions and medication regimens for different patients. In practice we have found that it is often difficult to communicate correctly and comprehensively to patients the principles of combining antibacterial and live drugs, the preparation of dry powder suspensions for young children, compliance, and side effects of medication for chronic diseases, and methods of storing medication, for example.

The patient-centered approach therefore requires pharmacists, in particular, to avoid preaching to the choir and to communicate the most effective medication instructions to patients in the light of their needs.

5.1.4 Strengthening patient-centered thinking in pharmacy science promotion

Although public hospitals now often have community pharmacy popularisation content, how to make this kind of pharmacy popularisation really work has always been an important issue for pharmacists to consider. We have found that targeted publicity and education for the target

group of pharmacists often better reflects the value of pharmacists and is more easily accepted by patients. for example, the popularisation of paediatric medication in schools and the publicity and popularisation of medication for chronic and geriatric diseases in institutions for the elderly. The distribution of publicity and medication brochures to specific target patients has improved the sense of access and satisfaction of patients.

5.1.5 Strengthening the assumption of “patient-centered” thinking in information technology consultation channels

As mentioned in the previous article, the “Internet+” model of medical services is now in full swing, and large tertiary hospitals in relatively developed areas of Guangdong Province have basically switched to online registration and consultation services, but in the process of carrying out such services, in response to the characteristics of middle-aged and elderly patients who are not highly receptive to information technology, the Affiliated Hospital of Sun Yat-sen University The Third Hospital of Sun Yat-sen University and the First People’s Hospital of Guangzhou are constantly optimising the user-friendly construction of their information technology platforms to minimise the learning costs for elderly patients. At the same time, traditional means such as window registration and window consultation are retained so that patients at all levels can be diverted to their most adapted communication channels.

5.1.6 Strengthening the assumption of “patient-centered” thinking in pharmacy monitoring

For some patients with rare diseases, a patient profile is created, and a medication assessment is performed. The patient’s medication problems are identified, such as what the goals of treatment are and whether they are being achieved with the medication; whether the current medication is appropriate, symptomatic and required for treatment; whether the dose of the medication is appropriate; whether there have been any adverse reactions to the medication; how the patient has responded to the treatment regimen; and which parameters of the medication need to be monitored. Each of these issues is assessed to determine if there are any problems with the medication regimen. The connotation of "patient-centeredness" requires pharmacists to communicate with patients face-to-face, bringing them closer together, increasing understanding, improving the doctor-patient relationship, raising the level of rational drug use, improving the quality of clinical care, bringing into play the role of

pharmacists in the medical process, raising the status of pharmacists in the medical chain, and improving their own professional quality. The new pharmacist's role in the medical process, the status of the pharmacist in the medical process and the quality of the pharmacist's own business have brought new vitality and space for the development of hospital pharmacy.

To this end, we have also designed a "patient-centeredness" section in the questionnaire, which covers the following items in Table 5.1.

Table 5.1 "patient-centered" section of the "Exploring New Models of PC" survey scale

Statement	The average level of importance	The average level of agreement
The department encourages pharmacists to design unique medication regimens for individual patients.	4.8	4.5
The department encourages pharmacists to set standard response strategies for patients with similar medical symptoms and common patient consultation questions.	2.2	4.2
Department encourages pharmacists to follow up on patients' medication status.	5.0	5.0
The department encourages pharmacists to collect feedback from patients on their medication, including adverse reactions, dosage form adjustments or unsolicited changes to treatment regimens.	4.3	4.6
Patients have easy access to the services offered by pharmacists.	3.8	2.1
Some active enquirers receive mutual support and recognition through the pharmacy service platform, forming a sort of "patient group".	2.2	3.0

Each of the six items corresponded to five specific patient-centered initiatives that this study intends to explore. Analysis of the 75 questionnaires returned led to several conclusions, as follows.

The first two items were designed concerning survey strategies used in traditional service with a focus on two different strategies that hospitals use in response to patient consultations. Strategy one is the so-called "a thousand of people have a thousand of prescriptions", which means that pharmacists formulate individualized drug regimens according to the different courses and manifestations of individual patients. Strategy two is the so-called "one thousand people have the same prescription", which encourages pharmacists to develop standard response strategies for patients with similar symptoms. The interviewer had expected that these two strategies would yield different results, but in the actual analysis of the questionnaire returns, very interesting conclusions were found.

The level of agreement was the focus of the investigation, and strategy one scored an average of 4.5 and strategy two an average of 4.2. Why do the two seemingly contradictory strategies have a high level of agreement in the eyes of the actual respondents?

This question was inquired in particular during the interview and the research pharmacist at Guangdong Provincial People's Hospital gave us a detailed answer.

The core of the "patient-center" is to provide PC in a way that is optimal for the patient. Some patients are more concerned about the cost of time, effort and money required for a consultation. For these patients, the establishment of standard operating procedures (SOPs) can save time and effort for both pharmacists and patients and provide an efficient service to patients.

For example, clinical warfarin administration is a very common medication consultation item in clinical pharmacy consultation. For this type of item, the Provincial People's Hospital set up a complete questionnaire to record in detail the dosage, duration of administration, disease status, etc. of the patient's medication, based on which the pharmacist can quickly give the patient advice on the rational use of medication.

However, some patients, especially those using targeted oncology drugs, need a customised approach based on their pharmacogenomic profile. It is for this reason that pharmacogenomics and other precision and individualised medicine concepts are being applied to CPS.

In regard to the level of importance, although most respondents agreed that individualised medication use and standardised consultation were not in conflict, the importance of standardised response strategies showed some deviation depending on the respondents' orientation. Clinical pharmacists all considered standardised response strategies to be relatively important (3.8 points), but clinicians and research pharmacists did not consider them to be an important part of improving the quality of CPS (1.4 points). The reason for such a discrepancy is still due to practical and specific practice barriers of the division of responsibilities in daily work demands. Moreover, clinical pharmacists believed that a standardised response strategy would be better suited to the automated prescription review systems that may become widespread in the future, freeing up the workload of clinical pharmacists.

As for the statement "The department encourages pharmacists to track the medication status of patients", it was the only item in all the questionnaires where all respondents rated 5 on both the importance and the approval levels. In the follow-up interviews, it was also learned that tracking the medication status of patients is an important part of the rational use of medication and one of the first projects where the concept of patient-centeredness began to be implemented. This tracking began with inpatients and was gradually extended to outpatients with the introduction of pharmacy clinics.

As for the statement “Patients have easy access to the services provided by pharmacists”, most respondents expressed that it is still difficult for patients to access the services of pharmacists directly compared to accessing the services of clinicians. The ease of access to services, or the overall process of promoting PC, has not yet been raised to a high priority, with the current focus on improving the quality of PC. This is reflected in the fact that the average importance score is only 3.8 and the level of agreement is only 2.1. In the follow-up interviews, it was learned that this phenomenon is now being significantly improved. In some large public hospitals where the foundation for CPS has been initially formed, such as Guangdong Provincial People’s Hospital and the First Hospital of Sun Yat-sen University. Some internet-based CPS are being or have been prepared. Especially in the latter hospital where the Pharmacy Cloud Clinic has already played a role during the outbreak of COVID-19 in early 2020. Patient availability is one of the directions for the development of clinical pharmacy departments in large public hospitals.

The last item examined whether CPS form a type of platform to pool and engage patients, which allows mutual support through platforming and scaling. At present, although the importance of such a platform effect is not yet well recognised by the respondent group (2.2 points), overall there is already a similar trend in some large public hospitals. In particular, the group of mothers-to-be who consult on pregnancy medication has started to form WeChat groups through WeChat online consultations to share their medication experiences, experiences and even their lives together.

In a nutshell, whether it is the previously mentioned clinical pharmacy clinics, peritoneal dialysis fluid distribution, or the information-based PC model, it is easy to see that the drugs have become a communication vehicle and a bridge. More importantly, drugs have become a way for patients to feel the service and care provided by the pharmacy department of the healthcare institution. This is also an important manifestation of “patient-centeredness”.

5.2 The transformation from “back-office support” into “front office service”

To achieve a patient-centered service model, it is important that staff in the pharmacy department move from backstage to frontstage. Hospital pharmacy department practitioners need to reflect a stronger sense of service and represent a higher service level. The pharmacy department also needs to reflect a richer sense of humanistic care and thinking. From the interviews, it was found that pharmacy departments in large hospitals possess a more open

attitude, they carried out many activities such as regular primary and community consultation services, direct communication with patients through WeChat, etc., all reflecting a sense of mission and responsibility to alleviate patients' suffering, cure them and improve their quality of life

5.3 Transformation of a "drug-issuing job" into "professional and technical job"

In the interviews, similar complaints were heard so many times that although hospital pharmacy departments have an overall development idea and development plan and are experimenting with new value-added business models such as personalised pharmacy, unfortunately, the transitioning clinical pharmacist team does not have complete knowledge. The long and boring work of issuing drugs and reviewing prescriptions has kept them away from clinical practice for too long. The entire pharmacist structure was decoupled from the actual care for too long, preventing pharmacists to be integrated into the whole process of patient diagnosis, treatment, and medication administration.

In order to understand the consolidation and change in CPS, the questionnaire was designed to pinpoint whether there are channels for frontline clinical pharmacy departments to be updated and transformed into a professional and technical workforce. The results are shown in Table 5.2.

Table 5.2 "Consolidation and enhancement" section of the "Exploring New Models of PC" scale

Description	The average level of importance	The average level of agreement
Pharmacists have access to the latest knowledge on the rational use of medicines.	4.8	5.0
Cutting-edge knowledge of rational drug use is encouraged to be applied in practice.	5.0	4.2
The value of a pharmacist is enhanced by his or her clinical knowledge.	4.2	3.5
There are people in the department who are willing to pass on new knowledge about rational medication use, whether or not the role has a formal position or name.	4.8	4.5
Pharmacists who find ways to introduce and promote new ideas on rational drug use in their departments are always appreciated.	4.3	3.8

In terms of results, all five items in the "consolidation and change" section received relatively high ratings for both importance and recognition. In particular, "Pharmacists have

access to the latest knowledge on rational use of medicines" and "Cutting-edge knowledge on rational use of medicines is encouraged to be applied in practice" were both given high importance (4.8 out of 5.0 points), which shows that respondents had an interest in the professional skills of PC providers. It is also reassuring to note that all respondents believed that knowledge about the rational use of medicines can be passed on to pharmacists. The majority of respondents (4.2 points) recognised that cutting-edge knowledge about the rational use of medicines is not limited to lectures and guidelines but should be actively applied in practice.

The main point of disagreement is that "The value of pharmacists is enhanced by their clinical knowledge." Some frontline pharmacists gave a low rating to the level of agreement. The most important aspect of a clinical pharmacist's job is to review prescriptions and regulate the rational use of medicines. However, most respondents agreed that there are always pioneers in the pharmacy department who are active in passing on new knowledge about the rational use of medicines (4.8 points for importance and 4.5 points for agreement) and this active sharing is appreciated and rewarded by the department (4.8 points for importance and 3.8 points for agreement).

It is gratifying to learn from interviews with leaders of the Guangdong Pharmaceutical Society that efforts are being made at the Society level to enhance the status of the pharmacy sector by improving the professional skills and clinical knowledge of the pharmacist. The Society invited clinical pharmacy experts to conduct training sessions in Guangdong Province during weekends. Experience has shown that pharmacists who can actively and systematically study the relevant professional skills training provided by the Society on the job can quickly improve their skills and be more professional in providing services to patients.

5.4 The transition from "passive process completion" to "active service delivery"

The pharmacist will also be an asset to the clinical pharmacy department, assisting in the optimization and innovation of the entire service process. Having achieved the first three requirements of "patient-centeredness", pharmacists are already more directly and deeply involved in the whole process of patient care and will inevitably be more closely linked to clinical departments. However, on the one hand, pharmacy is an ever-changing and evolving discipline, which requires pharmacists to not only have a wealth of professional knowledge, but also to be able to actively follow the relevant developments in the industry; on the other

hand, during the relevant interviews with the head of the pharmacist clinic, we learnt that due to the accelerated flow of knowledge on the Internet, the level of patients' knowledge of pharmacy is also increasing, and many patients are already consulting some of the more specialised pharmacy and pharmacology departments. Pharmacy and pharmacology are more specialised and sophisticated issues; some patients will offer to use the latest original drugs. The automated prescription review system, for example, is a great tool for pharmacists to save time and costs, but it also requires pharmacists to be proactive in learning the latest information management knowledge. On the other hand, pharmacists must actively use resources from upstream and downstream throughout the value chain in an effort to move up and down the value chain towards patient-centeredness, such as in the case of peritoneal dialysis fluid, where commercial companies can sometimes be an aid to the clinical pharmacy department, assisting in the optimization and innovation of the entire service process.

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Chapter 6: Conclusions and Outlook

6.1 Conclusion and significance

Previous chapters select large public hospitals in Guangdong Province as the main object of this study and explore how pharmacy departments in medical institutions can achieve "breakthroughs" and "breakout" under the situation of new healthcare reform. Through three basic research techniques: fieldwork, questionnaire survey and archive collection, this study focuses on how pharmacy departments in large public healthcare institutions can actively use CPS to bring new growth drivers to their departments.

In contrast to other sectors, the healthcare sector has its own distinctive characteristics and unique resistance to reform. During the interviews, it was noted although the interviewers' initial intention was to explore the business model of the pharmacy department in healthcare institutions using the context of economics and management, more often than not, the interviewers tended to extend the concept of "value addition" in a broader sense. A clear feature is that pharmacy practitioners are not only looking at the financial success of the value-adding process in terms of commercial profitability but are also looking for a balance between commerciality and public benefit, using criteria such as technicality, risk, satisfaction, differentiation as part of the measurement of "value-added" outcomes. In addition, although there is now an irreversible policy trend for hospital pharmacy departments to transit from profit centers to cost centers, the majority of pharmacy practitioners interviewed still maintained a positive and proactive mindset.

During the interviews, some pharmacy practitioners also described the model of pharmacy they aspired to. Perhaps the pharmacy department regains sufficient status and attention in medical institutions not as a "money printing machine" decided by the drug price make-up policy, nor as a post with meagre profits and benefits that only cares about the intake and distribution of drugs. The hospital pharmacy department hoped that by providing technical support and services close to patients, it can truly gain the trust and reliance of patients emotionally, improve the overall level of drug use in China through the rational use of medicine, and reduce the difficulty of patients in accessing PC by integrating upstream and downstream medical business and industry, adhering to the patient-centered philosophy. In

this way, the hospital pharmacy department can shift from upstream-oriented thinking to customer-oriented and value-added thinking.

Although it was found during the interviews that front-line pharmacy practitioners do not necessarily understand the concept of "value-profit chain" in the management sense, this concept has always been a part of the reform of pharmacy departments in medical institutions. The strategy of the traditional pharmacy department underlined drug guarantee, but the process of issuing and dispensing drugs no longer occupies the main position in the value-profit chain of hospitals under the zero make-up policy. Policy restrictions and full competition in the market have predetermined the future transformation of the pharmacy department from the upstream along the supply chain to downstream, which is in line with public and government expectations of medical institutions to deliver public good in treating patients. As a result, the main reform proposals for healthcare institutions have coincidentally fallen on the integration and optimization of the various segments of the value-profit chain.

For example, the self-funded pharmacy project changes the original supply chain, both from upstream and downstream. Through the practice of value-exchange profits, it can provide differentiated services for suppliers and patients. Another example is the introduction and application of various automated prescription review systems, cloud consultation rooms and other Internet means, completing a new round of innovation for the information chain. The introduction of pharmacogenomic technologies based on personalised medicine offers the entire PC chain a longer and broader scope for added value, elongating the entire value-added chain and providing patients with more hierarchical services while realising differentiation, fine, scientific and professionalisation of CPS. The clinical pharmacist clinic system aims at the collaboration chain, not only providing a window for patients to obtain pharmacy consultation, but also clarifying in practice how the traditional physician clinic and pharmacist clinic can further cooperate sincerely to achieve the effect of superadditivity.

6.2 Current situation: limitations and shortcomings of public hospitals

During the completion of the study, another round of COVID-19 outbreaks occurred in Guangzhou. Different from that in 2020, the strain of the virus in this outbreak was an Indian variant that was highly contagious and asymptomatic. Almost all of Guangzhou's tertiary hospitals were mobilized in this outbreak prevention effort. Pharmacists fully leveraged their social values and demonstrated professionalism in areas such as vaccine administration. Unfortunately, the value chain was not demonstrated in the course of the outbreak due to

Guangdong's epidemic prevention policies and ethics.

It is undeniable that despite the momentum of new models and initiatives throughout the clinical pharmacy service sector, some hospital administrators and decision-makers still expressed the problems in the development process and the hidden worries about the subsequent development during the interviews.

6.2.1 Difficulty in third-tired cities

In terms of the current overall trend, attempts at PC in large provincial hospitals and university-affiliated hospitals have taken shape. Many new paths, models and methods have been explored. However, a large number of these PCs can only take place in medical institutions of significant size, and it is difficult to promote these PCs to third-tired, remote, and small cities. The hardware is a restriction. For example, pharmacogenomics requires a special polymerase chain reaction (PCR) laboratory and comparative databases and standards. The software is also a restriction: For example, pharmacist clinics require a patient base in the healthcare institution, and outpatient pharmacists need to have a considerable clinical level. From the current perspective, it is still difficult to replicate some of these experiences in remote and small cities. This is a bottleneck for patients to enjoy access to the beneficial-to-all-people PC.

6.2.1 Some initiatives facing policy risks

As mentioned in the previous chapters, while models such as hosting by commercial companies and self-funded pharmacies may be a solution for integrating upstream and downstream value and profit chains from a purely commercial perspective, some of these attempts may not be permitted by the government given the special role of public healthcare institutions in China. In particular, the case of self-pay pharmacies is touching the most sensitive part from the policy perspective. For example, a number of large tertiary hospitals in Guangzhou are currently at risk of shutting down their self-pay pharmacies due to compliance review issues. This also goes back to the most fundamental issue: how pharmacy institutions can address the balance between their commerciality and public interest will remain an important research topic for some time to come.

6.2.3 Lack of access to pharmaceutical care

The development strategy mentioned in the previous chapters refers to “moving from the back office to the front office” and several large medical institutions in Guangzhou are encouraging their pharmacy departments to face patients and promote their services directly to patients. However, in interviews with random patients, it was found that only 11 out of 45 patients interviewed (24.4%) could distinguish between clinicians and clinical pharmacists, only 4 (8.8%) said they clearly understood the content of CPS, and only 2 (4.4%) said they had received consultation services from clinical pharmacists. In our interviews with clinical pharmacists, it was noted that the promotion of CPS was approaching a bottleneck. Some pharmacists said that it was difficult for the pharmacist team itself to explain to patients what benefits the PC could bring to them in terms of medication use. Overall, it will take time for the PC model to become accepted and popular among patients.

6.2.4 The current state of building a team of pharmaceutical care professionals

To truly differentiate and specialise PCs and achieve effective added value, the construction of an excellent PC talent team is essential. During an interview at Guangdong Provincial People’s Hospital, the interviewee (the director of the pharmacy department) introduced the construction of its PC talent team in detail. Although the overall PC talent introduction and training strategy has gained the hospital’s attention, there is still a discrepancy between the clinical pharmacy research skills and disciplinary frontier training and the actual patient-oriented clinical pharmacy service application skills. It is reassuring to note that with the continued involvement and guidance of medical institutions and social organizations at all levels, there are channels for the pharmacist community in Guangdong Province to obtain enhancement of their own value, thus enhancing the combativeness and professionalism of the whole organization.

However, it is foreseeable that when all the chains undergo the ultimate unification and efficiency enhancement, the lengthy and boring PC supply chain before the healthcare reform era will be completed changed from “sorters” and “middlemen” to “service providers” and “initiators”. The pharmacy sector of medical institutions that takes the lead will drive the medical industry and medical business to turn their attention to the core strategic value of “patient-centeredness”. Ultimately, a new set of value-added industries will be explored to benefit patients, reduce the burden on hospitals, achieve success for pharmacists and meet

government expectations.

6.3 Looking ahead: reforming the pharmacy service system in the post-epidemic era

At the time of writing this thesis, the global epidemic of COVID-19 was raging. From January to April 2020, healthcare facilities in Guangzhou, Guangdong Province were greatly affected. The prevention and control of the COVID-19 in the first half of 2020 had to adjust the content of the regular PC in several of the large healthcare institutions in this study. This is particularly evident in the areas of ensuring drug supply, guiding drug safety, and innovating pharmaceutical care models. The Chinese government has normalised the prevention and control of the COVID-19 since 2021, and the pharmaceutical departments of healthcare institutions are thinking about how to shift from public health emergencies to normal services. Overall, the main directions for future development currently appear to be the following.

6.3.1 Deepening Internet medical services and promoting the integration of Internet medical and pharmacy

During the interviews at the First Hospital of Sun Yat-sen University, it was easy to see that the “Internet hospital” model of treatment and long prescription management strategy played a very important role in the response to the epidemic crisis. Based on the integration of information from the “cloud pharmacy”, febrile patients, suspected patients and confirmed patients can be effectively identified and categorised for enquiry. More importantly, clinical pharmacists can effectively reorganise prescriptions for patients who are undergoing multi-disciplinary treatment or multi-drug combinations at the same time, avoiding duplication of medication and reducing drug interactions, thus bringing advantages to the integration of synergistic chains.

Take the Third Affiliated Hospital of Sun Yat-sen University New Coronavirus Pneumonia Hospital as an example: To cope with the huge impacts of the COVID-19 in early 2020, the Internet hospital of the Third Affiliated Hospital of Sun Yat-sen University opened up all the data interaction channels between the health information system (HIS), the drug supervision department, the medical insurance department, the payment platform, and the distribution company to track and manage the whole process including inquiry, prescription, trial, distribution, payment, management. Cloud pharmacists were selected from senior

pharmacists with more than 3 years of prescription and dispensing experience. The cloud drug catalogue and rules were selected and formulated by the chief of the pharmaceutical department. In this way, the hospital provided patients with a quality experience of enjoying top PC at home.

Moreover, the special demand for medical treatment and medicine collection during the COVID-19 outbreak tested the dispatching capacity of the pharmacy departments of medical institutions. The Internet Hospital of the Third Affiliated Hospital of Sun Yat-sen University cooperated with pharmaceutical distribution enterprises and integrated resources of high-quality cold chain transportation of the distribution enterprises to provide "one-stop" door-to-door service to deliver medicines, especially for cold chain medicines (such as insulin) that must be prepared for patients with chronic diseases. The internet hospital also set up a special temperature monitoring mechanism to achieve transparency and visualisation of the whole process of transportation for patients, hospitals, and logistics. The supply chain was optimally adjusted.

In addition to optimising the day-to-day work of pharmacies, ensuring the safety and stability of drug distribution, and helping government authorities to monitor the process, a more important aspect of internet healthcare is that it provides a platform for the timely and open dissemination of information from one place to another. This is crucial for the prevention and control of COVID-19 outbreaks. As a global public health event, COVID-19 not only required the health sector to provide medical care in the traditional sense in the early stages of an outbreak but also required medical staff to proactively reassure patients and pass on information.

According to the WHO, in addition to the spread of the virus, "information epidemics" can also be a health hazard. Controlling the "information epidemic" also requires strong scientific guidance and pharmacological support. This cannot be done solely by blocking information, but rather by professional pharmacists who effectively understand the anxieties and needs of patients and provide appropriate advice. In this process, pharmacists move from the backstage to the frontstage, communicating the correct concept of epidemic prevention to the public in a timely manner through channels such as display boards and social media that popularise science to the public, which is in line with the requirements of the clinical pharmacy profession.

6.3.2 Promoting the implementation of pharmacist prescription review, an important step forward for the pharmacist function

With the promotion of new healthcare reform, PC is facing a major transformation opportunity. It is an internationally accepted mechanism for doctors to prescribe and pharmacists to review prescriptions to ensure the rational use of medicines by patients, but unfortunately, this mechanism has not been well implemented in China.

With the progress of the economy and society, the types and quantities of drugs have increased, and the number of incidents of adverse drug reactions has also increased. Health-related medication problems continue to emerge. The knowledge related to these medications needs to be constantly updated and accumulated by pharmacists. Without the guidance of pharmacists in reviewing prescriptions, the safety of patients' medication can hardly be effectively guaranteed. The Code of Practice for the Review of Prescriptions in Medical Institutions (NHC & the State Administration of TCM, 2018) clarified that pharmacists are the first responsible person for auditing prescriptions.

However, the prescription audit is a highly technical and professional task. It is rare for social pharmacies to have comprehensive knowledge of pharmacy, including the physical and chemical properties, pharmacology, indications, dosage, contraindications, drug interactions, adverse reactions and precautions of the drugs used. Except for know-how, pharmacies should have a high sense of responsibility towards patients.

In order to enable pharmacists to combine theory and practice, to understand not only medicine but also the relationship between the development of disease and drug treatment, to use modern means and tools to solve practical problems in their work, to have the basic skills of prescription audit, Guangdong Province launched the training of prescription audit capacity of social pharmacy in 2019. This training aims to strengthen the practical training of social pharmacy pharmacists, help master the important elements of prescription audit important elements, supplement clinical knowledge, cultivate clinical thinking, give full play to the pharmacy service role of social pharmacy pharmacists, identify the existence or potential problems in medication use, effectively improve the ability to audit prescriptions and the level of rational medication use and ensure the safety of medication use by patients. It is hoped that through the prescription audit competency training, the importance and professionalism of pharmacists will be enhanced, the construction of pharmacist teams will be promoted, and the training of talents of pharmacist groups will be greatly promoted and enhanced. Through the training, a platform for pharmacists in Guangdong Province was built to learn and

communicate with each other, share their experience in the process of prescription audit and how to handle common problems, improve pharmacists' pharmacy service level and clinical practice ability, and encourage more pharmacists to participate in the teams of prescription audit and rational drug use.

It is worth mentioning that it was also in the same year that the world's first textbook on prescription auditing, Textbook for Pharmacists on Prescription Auditing, was officially released in China. The textbook is a rare and excellent number of materials that organically unite opinion and material, theory and practice, knowledge and skills, breadth and depth, ideology and science, basic knowledge, and new achievements in contemporary science. Its editorial team says they hope to do a reprint every three years, to continuously improve and revise, and to make the Textbook for Pharmacists on Prescription Auditing a classic publication.

6.3.3 The concept of "surgical pharmacists"

The rational use of medicines is a constant topic in the medical industry. With the development of pharmaceutical technology and social progress, the public demand for rational use of medicines is constantly increasing. Pharmacists, as the professionals in medical institutions who are most familiar with drugs, are undoubtedly the main responsible persons for the rational use of medication. In clinical work, doctors and pharmacists are involved in the medication link. In theory, pharmacists should be responsible for the whole chain management of medication in medical institutions, but in practice, pharmacists should pay more attention to the weak link of pharmacological supervision during clinical treatment.

Surgery is an important clinical department in medical institutions, and drug therapy is also an indispensable tool for surgical treatment. However, in reality, surgeons are more focused on surgical outcomes. Taking the solid tumour treatments as an example, about 60% or more of solid tumour treatment options are surgery. Undeniably, surgery has an irreplaceable role in the treatment of tumours. However, some real issues are coming into focus day by day, namely, the impacts of surgical procedures on patients, the co-management of tumours and complications complexity. Many details of perioperative pharmacotherapy management are often overlooked to some extent by healthcare professionals under a surgically dominated treatment regimen. As a result, it is beginning to be suggested in the pharmaceutical community that the rational use of medication in surgery is an important entry point for pharmacists.

Surgical pharmacy cannot only escort surgery but also reduce complications and improve patient outcomes. At present, many medical institutions in China are actively promoting the training of surgical pharmacists, advocating the standardization and specialization of this work, and linking surgical pharmacists with pharmacy clinics, and have achieved some good results. These initiatives are in line with the requirements of NHC to expand the scope of PC and to actively participate in clinical care, medication prescription review, treatment planning, medication monitoring and evaluation, and medication education (Wu, 2020).

6.3.4 Individualized pharmaceutical care

In recent years, with the transformation of PC and clinical needs, the model of "one prescription for one thousand people" is unable to meet the clinical needs of patients. By taking into account the patient's endogenous (genetics, age, gender, race, organ function) and exogenous drug efficacy factors (smoking, diet, drug interactions), individualised pharmacological treatment plans are developed to reduce the incidence of adverse drug reactions, enhance drug efficacy, ensure drug safety and reduce drug treatment costs. The personalised PC is increasingly well-received by clinical patients and the community, which is a great opportunity for hospital pharmacists to give full play to their pharmacy expertise and enter the clinical frontline, but of course, it also places higher demands and standards on hospitals and pharmacists.

In order to promote the standardised management of individualised medical testing technology in China and ensure the quality of clinical testing services and medical safety, the NHC (formerly the National Health and Family Planning Commission) first approved the establishment of the National Health and Family Planning Commission Individualised Medical Testing Training Base at Central South University in 2013 (NHC, 2016). The base has held five training sessions, training thousands of trainees. The content of the training includes the basic theory of precision drug therapy, solutions to precision drug therapy, individual drug metabolism enzyme gene polymorphism and individual differences in drug metabolism. The course considers individual disease states and their genetic factors, environmental factors, combined drug use and other factors while combining the latest drug treatment methods and tools to train a new generation of individualised drug therapists.

6.4 Research limitations and outlook

By the time the experiment was completed, it had not been completed perfectly due to a

number of constraints in the research process, and some work had not been completed for various reasons.

First, limited by the authors' professional understanding, we have structured the thesis from a policy and pharmacological perspective. It is clear that we are still unable to derive quantitative/semi-quantitative value-added models from a traditional economic context. During the interviews and data collection process, it was realised that the Chinese public hospital system is too large and complex compared to that in developed Western countries for our interviews to fully cover policymakers, policy implementers and policy beneficiaries. Therefore, due to the lack of a quantitative model, this study is unable to compare which drug reform measures are currently working better and which are not achieving the desired results in Guangzhou's large hospitals.

Secondly, due to the impact of the COVID-19, and in order to further implement the requirements of the NHC and the relevant measures of the Provincial Health Commission, the target hospitals of the interview tightened the management of their hospitals. Its management measures for personnel entering and leaving the hospital include but are not limited to setting up entrances and exits and setting up special personnel to control them, admitting personnel must carry their ID cards, health code verification, and explanation in detail of the reasons for coming to the hospital. Personnel entering the inpatient department are required to present the negative nucleic acid test report within 72 hours. People close to beds need to apply for the certificate of nursing. This caused huge problems for the implementation of interviews. Access to pharmacists and patients in the inpatient department was almost impossible for the interviewer under these policies. As a result, this study did not obtain sufficient primary data from the inpatient department.

Moreover, there are not many hospitals with a foreign background in China, only a small number of foreign hospitals such as United Family and Clifford Hospital. The PC and pharmacist values in these hospitals with foreign backgrounds are different from those in China. Therefore, this group of the hospital was not studied or interviewed in depth.

In addition, this study hypothesised that the content collection could be analysed to obtain a detailed portrait of the target group. Through preliminary cluster analysis, this study found that the most valuable reform documents in mainland China's healthcare system tend to be communicated through internal materials. Similarly, minutes of meetings and other written texts used for analysis are somewhat confidential in nature. The easily accessible literature is mainly a reiteration of material related to national policy, making it difficult to obtain research

fragments with differences. All the above-mentioned weaknesses are areas where the author is not able to do as much as he would like to, so it is a pity that all of them are not available. The only way to fill in the gaps in this study is for others to continue to explore them.

Finally, a big thank you to all those involved in the fight against the COVID-19 and a tribute to all the medical staff on the frontline. Every cloud has a silver lining.

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Annex A: Other Diagrams

Table 1 Major investment projects in China's semiconductor industry since January 2000 (domestic companies)

	Location	Activities	Investment (USD bn)	Capacity/ Technology
Shanghai Hongli Semiconductor Manufacturing	Shanghai	Production of 8inch and 12-inch wafers		
SAST Group	Shenzhen	2 wafer fab lines	1.2	40.000 wafers per month
Beijing Xunchuang integrated circuit	Beijing	Assembly and test	0.200	
China (Great Wall Computer Schenzhen)	Pudong Silicon Harbor, Shanghai	Assembly and test		50.000 square feet
Beijing Huaxia Semiconductor Manufacturing	Beijing	Wafer fab		8-inch, o.25 micron

Source: Ernst (2003)

Table 2 Changes in the proportion of major consultations in the clinical pharmacy clinic of Guangdong Provincial People's Hospital

Enquiry content	Pre-participation	Composition ratio	After participation	Composition ratio
Drug information	14	47%	6800%	25%
Usage and Dosage	6	20%	3400%	12%
Indications	5	17%	2600%	10%
Adverse reactions	3	10%	5400%	20%
Interaction	2	7%	3500%	13%
Contraindications	0	0%	5600%	21%
Total	30	1	273	1

Source：Tan et al. (2020)

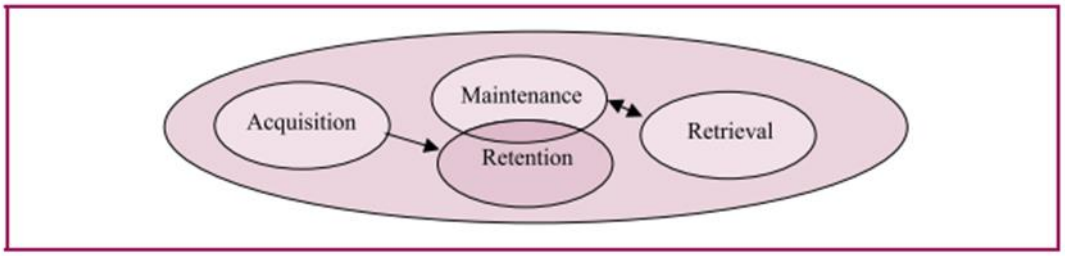


Figure 1 Internal organizational memory

Source: Danskin et al. (2005)

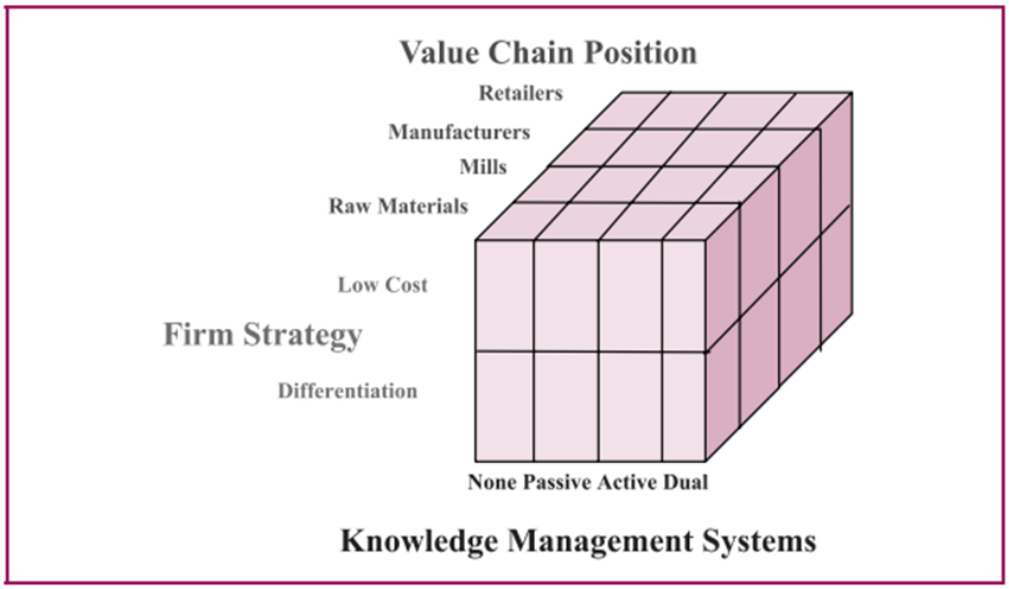
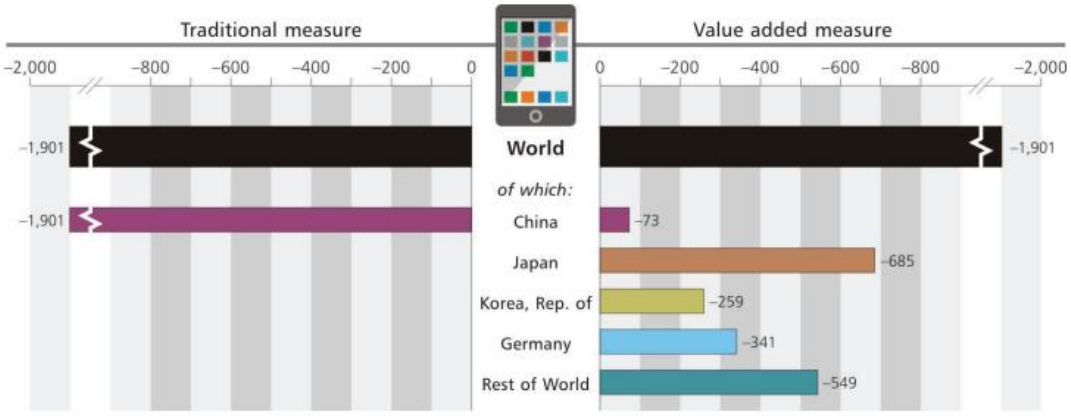


Figure 2 Knowledge management model

Source: Danskin et al. (2005)



Source: WTO and IDE-JETRO (2011) *Trade Patterns and Global Value Chains in East Asia: From Trade in Goods to Trade in Tasks* (p. 105).

Figure 3 2009 United States iphone trade balance (in USD million)

Source: Lee, Gereffi, and Barrientos (2011)

Figure 4 Diagram of the “Cloud Clinic” appointment at Pharmacy Clinic, Sun Yat-sen Hospital

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Annex B: Questionnaire

Exploring New Models of PC Questionnaire

Completion Instructions

Dear pharmacist, the scale you are about to see belongs to the ISCTE IUL Sino-Portuguese Cooperation Project on Public Health and Management. This topic mainly takes pharmacists in medical institutions as the research subject, and discusses the new model of pharmacy service under the new medical reform policy. This scale is the content of the sub-topic of "pharmaceutical service and emotional value of patients" in this topic. It is divided into two parts and requires your cooperation to fill in.

The first part is the collection of basic information. It should be noted that this part of the content is only used for the research of this subject. Your personal information and occupational status are only used to distinguish the degree of interest and the professional weight of the questionnaire, and will not be disclosed to this subject. For irrelevant persons, after the project is written, the relevant information of any individual questionnaire will not be reflected in the text, but the descriptive statistics of the overall sample may be published, I hope you know.

The second part is the specific survey questions of the project, which will be divided into five sections: "Organization Definition and Positioning", "Patient Emotional Relationship", "Effectiveness and Benefit", "Patient-Centered" and "Consolidation of Gains". -6 questions, please rate according to the importance and recognition of the assessment items. Importance refers to your personal reflection of the importance of this indicator in the development of pharmaceutical services, 5 points are very important, 1 point is not important; the degree of recognition is whether you think you or your organization meets the requirements described in the entry, 5 means strongly agree, 1 means disagree.

Again, you may decline to answer any or all of these questions if you think any of them is offensive or inconvenient to disclose.

Thank you again for your support of this project, and good luck with your work

Questionnaire project leader:

Part 1:

1. Your career orientation:

Please tick your corresponding type

Types	selection criteria	Your position
Policy makers	Heads of medical and health supervision departments at the municipal level or above, who have participated in the management of pharmaceutical services for more than 5 years	
Hospital administrators	Working in secondary and tertiary hospitals, responsible for the dean/deputy dean or director/deputy director of the pharmacy department of the hospital	
Clinical pharmacist	Worked in secondary and tertiary hospitals and participated in clinical pharmacy work for more than 2 years	
Clinical physician	Work in secondary or tertiary hospitals, have the title of attending doctor or above, and have conducted in-depth cooperation with clinical pharmacists for at least 1 year	
Researcher	Investigators working in universities or research institutes, whose research direction is clinical pharmacy or pharmacy management	

2. Your basic information

Organization:

Position:

Working years:

Education:

3. Your knowledge and participation in clinical pharmacy services:

A. unfamiliar, less involved

B. Unfamiliar, but has work intersection with clinical pharmacists

C. Familiar but not involved in clinical pharmacy services

D. Very familiar, I am a clinical pharmacy practitioner

Part 2:

Pharmacy Services Value Chain Assessment Scale

Item	Level of importance	Level of agreement
Organization Definition and Positioning		

From leaders to hospital administrators, always truly understand the core emotional needs of patients	5 4 3 2 1	5 4 3 2 1
The department has developed a system of organizations, policies, practices, processes and procedures that reinforces patient-centered values	5 4 3 2 1	5 4 3 2 1
The department has developed a complete evaluation system to quantitatively assess patient satisfaction	5 4 3 2 1	5 4 3 2 1
Patient Emotional Relationship		
Patients and pharmacists can build a more harmonious emotional relationship through pharmacy services than physicians	5 4 3 2 1	5 4 3 2 1
Emotional resonance and dependence are one of the important factors for patients to choose clinical pharmacist consultation services	5 4 3 2 1	5 4 3 2 1
Pharmacist intervention in clinical treatment process can effectively reduce the probability of doctor-patient disputes	5 4 3 2 1	5 4 3 2 1
The development of pharmacy services deepens the emotional connection with patients, and this emotional connection is always positive	5 4 3 2 1	5 4 3 2 1
Pharmacists are willing to provide long-term stable pharmacy consulting services for some chronically ill patients	5 4 3 2 1	5 4 3 2 1
Patients are willing to receive long-term stable pharmacy counseling services in one institution	5 4 3 2 1	5 4 3 2 1
Patients are willing to recommend or introduce the clinical pharmacy services of our hospital to other patients	5 4 3 2 1	5 4 3 2 1
Efficiency and Benefit		
Appropriate pharmacy service is the guarantee for the realization of rational drug use	5 4 3 2 1	5 4 3 2 1

Charges currently charged for pharmacy services provided by the department can cover their costs	5 4 3 2 1	5 4 3 2 1
Pharmacist outpatient clinics and the development of pharmacogenomics can effectively reduce the cost of medication for patients	5 4 3 2 1	5 4 3 2 1
Some patients are willing to pay more for value-added programs (or self-funded programs), and the department can always meet their requirements	5 4 3 2 1	5 4 3 2 1
Pharmacy services interventions overall improved medication intervention outcomes	5 4 3 2 1	5 4 3 2 1
Pharmacy service is the main business growth direction of our department in the future	5 4 3 2 1	5 4 3 2 1
patient-centeredness		
Department encourages pharmacists to design unique medication regimens for individual patients	5 4 3 2 1	5 4 3 2 1
The department encourages pharmacists to set standard response strategies for patients with similar symptoms and common consultation questions of patients	5 4 3 2 1	5 4 3 2 1
Department encourages pharmacists to track patients' medication status	5 4 3 2 1	5 4 3 2 1
The department encourages pharmacists to collect medication feedback from patients, including adverse reactions, dosage form adjustments, or voluntary changes to treatment regimens	5 4 3 2 1	5 4 3 2 1
Patients have easy access to services provided by pharmacists	5 4 3 2 1	5 4 3 2 1
Some active consultants get mutual assistance and recognition through the pharmacy service platform, forming a kind of "patient group"	5 4 3 2 1	5 4 3 2 1
Consolidate and Transform		

Pharmacists have access to the latest knowledge of rational drug use	5 4 3 2 1	5 4 3 2 1
Cutting-edge rational drug use knowledge is encouraged to be applied in practice	5 4 3 2 1	5 4 3 2 1
The value of pharmacists is highlighted with their clinical knowledge	5 4 3 2 1	5 4 3 2 1
There are people in the department who are willing to pass on new knowledge on rational drug use, whether or not the role has a formal title or title	5 4 3 2 1	5 4 3 2 1
Pharmacists who try their best to come up with new rational drug use concepts and promote them in the department will always be appreciated	5 4 3 2 1	5 4 3 2 1

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Annex C: The history of drug price reduction by the National Development and Reform Commission over the years (2005--2012)

Date	Document	No.	Execution Date	Link
20050918	Notice of the National Development and Reform Commission on Reducing the Retail Prices of 22 Drugs including Cefuroxime	[2005]1762	Oct 10, 2015	http://jgs.ndrc.gov.cn/jggs/yyjg/t20050928_44093.htm
20051104	Notice of the General Office of the National Development and Reform Commission on Printing and Distributing Individual Pricing Plans for 15 Drugs	[2005]2373	Nov 14, 2005	http://jgs.ndrc.gov.cn/jggs/yyjg/t20051123_50988.htm
20060518	Notice of the National Development and Reform Commission on Setting the Maximum Retail Prices of Antitumor Drugs such as Doxorubicin	[2006]890	Jun 12, 2006	http://jgs.ndrc.gov.cn/jggs/yyjg/t20060601_71572.htm
20060803	Notice of the National Development and Reform Commission on Setting the Maximum Retail Prices of 99 Antimicrobial Drugs including Penicillin	[2006]1542	Aug 28, 2006	http://jgs.ndrc.gov.cn/jggs/yyjg/t20060822_80999.htm
20061030	Notice of the National Development and Reform Commission	[2006]2337	Nov 20, 2006	http://jgs.ndrc.gov.cn/jggs/yyjg/t20061114_93284.htm

20070212	on Setting the Maximum Retail Prices of 32 Chinese Proprietary Tumor Drugs including Cinobufacin Injection Notice of the National Development and Reform Commission on Setting the Maximum Retail Prices of 278 Chinese Patent Medicines for Internal Medicine including Jiuwei Qianghuo Granules	[2007]312	Mar 15, 2007	http://www.sdpc.gov.cn/zcfb/zcfbtz/2007tongzhi/t20070228_119289.htm
20070405	Notice of the National Development and Reform Commission on Setting the Maximum Retail Prices of 260 Drugs including Praziquantel	[2007]751	May 15, 2007	http://jgs.ndrc.gov.cn/jggs/yyjg/t20070509_134106.htm
20070723	Notice of the National Development and Reform Commission on Setting the Maximum Retail Prices of 188 Kinds of Chinese Patent Medicines, including Zhuifeng Tougu Tablets	[2007]645	April 16, 2007	http://jgs.ndrc.gov.cn/jggs/yyjg/t20070409_127732.htm
20070918	Notice of the National Development and Reform Commission on Announcement of the Temporary Maximum Retail Price of Human Albumin	[2007]264	September 28. 2007	http://jgs.ndrc.gov.cn/jggs/yyjg/t20080710_223747.htm

20071031	Notice of the National Development and Reform Commission on Setting the Maximum Retail Prices of the First Batch of Prescription Drugs Produced by Designated Essential Drugs in Urban Communities and Rural Areas	[2007]2877	November 15, 2007	http://jgs.ndrc.gov.cn/jggs/yyjg/t20071114_172200.htm
20071211	Notice of the National Development and Reform Commission on Setting the Maximum Retail Prices of Colistin and Other Drugs	[2007]3405	January 7, 2008	http://jgs.ndrc.gov.cn/jggs/yyjg/t20071229_182721.htm
20090928	Notice of the National Development and Reform Commission on announcing the National Guideline Retail Prices of Essential Drugs	[2009]2489	October 22, 2009	http://jgs.ndrc.gov.cn/jggs/yyjg/t20091002_306367.htm
20100305	Notice of the National Development and Reform Commission on Adjusting the "National Development and Reform Commission's Pricing Drug List" and other related issues	[2010]429	April 1, 2010	http://jgs.ndrc.gov.cn/jggs/yyjg/t20100323_336435.htm
	Notice of the National Development and Reform Commission on Printing and Distributing the Catalogue of Drugs Priced by the National		August 1, 2005	http://jgs.ndrc.gov.cn/jggs/yyjg/t20050802_38461.htm

	Development and Reform Commission			
20101129	Notice of the National Development and Reform Commission on Reducing the Maximum Retail Prices of Some Drugs such as Ceftriaxone	[2010]2829	December 12, 2010	http://www.sdpc.gov.cn/zcfb/zcfbtz/2010tz/t20101130_383648.htm
20110307	Notice of the National Development and Reform Commission on Adjusting the Maximum Retail Prices of Some Antimicrobial and Circulatory Drugs	[2011]440	March 28, 2011	http://www.sdpc.gov.cn/zcfb/zcfbtz/2011tz/t20110307_398428.htm
20110804	Notice of the National Development and Reform Commission on Adjusting the Prices of Hormonal, Endocrine and Nervous System Drugs and Related Issues	[2011]1670	September 1, 2011	http://www.sdpc.gov.cn/jggl/jggs/t20110805_427317.htm
20120327	Notice of the National Development and Reform Commission on Adjusting the Prices of Digestive and Other Drugs and Related Issues	[2012]790	May 1, 2012	http://www.ndrc.gov.cn/zcfb/zcfbtz/2012tz/t20120330_470511.htm

Annex D: List of formal interviewees

Interview	Type	Statistics of data information
Mr. Xie (37)	First-line patient	First-line patient in PICU, SUN YAT-SEN Memorial Hospital
Mrs. Hu	First-line patient	First-line patient in Breast Oncology, SUN YAT-SEN Memorial Hospital
Anonymous patient 1	First-line patient	First-line patient in Biological Treatment Technology Center, SUN YAT-SEN Memorial Hospital
Wang Lei (41)	First-line patient	First-line patient in Center for Cellular and Molecular Diagnostics, SUN YAT-SEN Memorial Hospital
Anonymous patient 2	First-line patient	First-line patient in Guangdong Hospital of TCM
Li Yanling (27)	First-line patient	First-line patient in Guangdong Hospital of TCM
Yang Qinqin (65)	First-line patient	First-line patient in Guangdong Hospital of TCM
Mr. Gao (40)	First-line patient	First-line patient in Guangdong Hospital of TCM
Anonymous patient 3 (70)	First-line patient	First-line patient in Blood Transfusion, Guangdong Hospital of TCM
Anonymous patient 4 (66)	First-line patient	First-line patient in Blood Transfusion, Guangdong Hospital of TCM
Miss Liu (21)	First-line patient	First-line patient in Guangdong First Rongjun Hospital
Li Nianjun	First-line patient	First-line patient in Guangdong First Rongjun Hospital
Anonymous patient 5	First-line patient	First-line patient in Guangdong Provincial People's Hospital
Mrs. Kang (45)	First-line patient	First-line patient in Guangdong Provincial People's Hospital

Hu Ling	First-line patient	First-line patient in Guangdong Provincial People's Hospital
Lu Yu	Clinic Pharmacist	Outpatient pharmacist of Guangzhou No.1 People's Hospital
Li Jinbiao	Clinic Pharmacist	Clinic Pharmacist in Tianhe Outpatient
Liu Guodong	Clinic Pharmacist	Leader of drug procurement team of Guangzhou No.1 People's Hospital
Zhang Haohao	Clinic Pharmacist	Clinic Pharmacist of Guangzhou No.1 People's Hospital
Xia Jialin	Clinic Pharmacist	Clinic Pharmacist of Guangzhou No.1 People's Hospital
Li Liangzhi	Clinic Pharmacist	Clinic Pharmacist of Guangdong Hospital of TCM
Luo Haoyang	Clinic Pharmacist	PICU of Guangdong Hospital of TCM
Zhan Yongjing	Clinic Pharmacist	Clinic Pharmacist of Guangdong First Rongjun Hospital
Mr. Xiao	Clinic Pharmacist	Clinic Pharmacist of Guangdong First Rongjun Hospital
Mr. Zou	Clinic Pharmacist	Clinic Pharmacist of Guangdong Provincial People's Hospital
Mr. Wen	Clinic Pharmacist	Clinic Pharmacist of Guangdong Provincial People's Hospital
Wu Hongwei	Clinic Pharmacist	Clinic Pharmacist of Guangdong Provincial People's Hospital
Huang Hui	Clinic Pharmacist	PIVAS Pharmacist of Guangdong Provincial People's Hospital
Wu Shiheng	Clinic Pharmacist	Leader of drug procurement team of Guangdong Hospital of TCM
Wu Junyan	Senior director of pharmaceutical department	Director of Pharmaceutical Department of SUN YAT-SEN Memorial Hospital
Lin Hua	Senior director of pharmaceutical department	Director of Pharmaceutical Department of Guangdong Hospital of TCM

Luo Yini	Senior director of pharmaceutical department	Deputy Director of Pharmaceutical Department of Guangdong Hospital of TCM
Liang Yi	Senior director of pharmaceutical department	Deputy Director of Pharmaceutical Department of Guangzhou No.1 People's Hospital
Fang Peifeng	Senior managers of enterprises	Vice General Manager of Guangzhou Pharmaceuticals Co., LTD.
Huang Chunhe	Senior managers of enterprises	District Manager of Sinopharm-Guangdong Yuexing